Questions and answers about energy from waste facilities

There is significant public concern about the possible health risks and environmental impact of emissions from energy from waste facilities. The Scottish Environment Protection Agency (SEPA), as Scotland's environmental regulator, is responsible for protecting the environment and human health from all process and activities we regulate – including energy from waste facilities.

This document describes the role energy from waste plays in waste management in Scotland, and explains how we ensure that human health and the environment are protected.

General

What is energy from waste?

Energy from waste is the process of creating energy, in the form of electricity and/or heat, from incinerating waste. Like all other combustion plants burning solid or liquid fuels, the incineration process produces emissions in the form of:

- acid gases, particulates, dioxins and heavy metals to air;
- ash residues.

We regulate the environmental impact of these emissions under the Pollution Prevention and Control (Scotland) Regulations 2000, which includes the controls required under the European Waste Incineration Directive.

How can the heat from an energy from waste facility be used?

Energy from waste facilities can be designed to provide power (electricity) and/or heat, and the ratio of heat compared to power can be split to favour either. The distance you can send heat in a district heating scheme depends on how much energy is in the steam or hot water being sent out. The greater the energy content, the further it can be transported before system losses make it unsuitable. One waste company in Denmark transmits heat over 80km using booster stations to reduce energy losses. Further information on district heating in Denmark is available on our website[1].

Good quality district heating schemes use steam drawn off the turbine to heat the district hot water system, typically to around 80°C. By providing electricity, only low quality heat arising from steam condenser cooling operations is left, giving hot water which is – at best – about 40°C. That is sufficient for space heating large areas such as warehouses, sports centres etc, but is of little use domestically as most hot water systems run at 60°C.

An existing energy from waste facility in Lerwick provides heat to properties over 6km away. The Lerwick-based facility treats about 21,000 tonnes of residual waste per year and supplies over 900 domestic and commercial premises with heat, including leisure centres and a hospital.

The price range for a domestic heat exchanger providing heating and hot water is £1,000–1,500, plus installation costs. The price depends on the size of house and thus energy demand. Installation costs also depend on the type of heating system being replaced or upgraded. The size of the domestic heat exchanger is significantly smaller than a conventional boiler. The pipework sizes for distribution pipes are typically up to 200mm diameter and 25mm diameter on the actual house supply (the house supply size may increase for large houses).

[1] www.sepa.org.uk/waste/information__resources/events/previous_events/sustainable_waste_management.aspx

In Lerwick, when the energy from waste facility[2] is not operating there is a standby boiler system which uses heavy fuel oil as a back up heat source.

Where will the waste for any proposed energy from waste facility come from?

Every household and business in Scotland generates waste, and that waste must be managed. Although recycling has increased, the remaining waste has traditionally been disposed of in landfills. The *Zero Waste Plan*[3] describes ways to make sure that as much waste as possible is recycled, and to maximise the resource value in remaining waste by recovering its energy.

Is energy from waste a renewable energy source?

No, but the energy produced by energy from waste facilities replaces that generated by other fuels such as coal, oil and natural gas. *Scottish Planning Policy 6: Renewable Energy*[4] identifies that energy from waste, landfill gas and other technologies will be used to help meet Scotland's targets for increasing the amount of electricity generated from renewable energy sources, as this is a vital part of our response to sustainable development and climate change.

The Renewables Obligation is the main support scheme for renewable electricity projects in the UK. It places an obligation on UK suppliers of electricity to source an increasing proportion of their electricity from renewable sources. Renewable Obligation Certificates are issued to an accredited generator for eligible renewable electricity generated and supplied in the UK. More information is available from Ofgem[5].

Do energy from waste facilities undermine efforts to improve recycling?

No. Incineration is compatible with high rates of recycling. High recycling levels depend on efficient segregation of the recyclable materials: waste that cannot be technically or economically recycled can be incinerated and the energy recovered. The table below shows that countries which have high rates of incineration (compared to Scotland and the UK as a whole) also have high rates of recycling.

	Recycled/composted	Incinerated	Landfill
Denmark	41.2	53.8	5.0
Netherlands	64.4	32.9	2.7
Belgium	51.8	35.7	12.6
Germany	57.2	22.9	19.9
Luxembourg	35.7	41.6	22.6
France	28.2	33.7	38.1
UK	18.0	8.0	74.0

Source: e-Digest of Environmental Statistics, Defra 2006[6].

Are there safer alternatives to incineration?

All waste management activities pose some risk to human health and the environment. It is because of that risk that we control their operation and emissions through the environmental permit we issue to them. Energy from waste facilities must comply with stringent emissions standards and that means they are unlikely to pose a threat to health.

Once all technically and economically recyclable materials have been removed from the waste stream, landfill is the only alternative to incineration. Even if landfill gas is captured and used for

[2] www.sheap-ltd.co.uk/site/Home%201.html
[3] www.scotland.gov.uk/Publications/2010/06/08092645/0
[4] www.scotland.gov.uk/Resource/Doc/171491/0047957.pdf
[5] www.ofgem.gov.uk/sustainability/environment/renewablobl/Pages/RenewablObl.aspx
[6] www.defra.gov.uk/evidence/statistics/environment/whatsnew.htm

energy production, its levels of energy recovery are low compared to incineration. Although energy from waste facilities produce carbon dioxide as a result of burning waste, landfilling waste produces both methane and carbon dioxide gas. Methane has a global warming potential of more than twenty times that of carbon dioxide.

How do proposals for energy from waste developments fit in with the Scottish Government's *Zero Waste Plan*?

The Scottish Government published Scotland's *Zero Waste Plan*[7] in June 2010.

The plan sets out the Scottish Government's vision for a zero waste society, one where all waste types are dealt with regardless of where they came from. It aims to achieve the best overall outcomes for Scotland's environment by:

- using resources more efficiently;
- minimising our resource demand;
- maximising the reuse, recycling and recovery of resources.

Waste contains usable resources, which can be recovered by:

- sorting the waste into separate recyclable streams for reprocessing;
- applying energy recovery to any waste remaining (known as residual waste).

Energy from waste could contribute up to 31% of Scotland's renewable heat target and 4.3% of our renewable electricity target under the Climate Change (Scotland) Act 2009. The Scottish Government proposes to introduce regulatory measures to ensure that energy from waste is truly sustainable. Doing so will make sure that only wastes offering no greater environmental or economic benefits through reuse or recycling are incinerated.

What is SEPA's position on energy from waste?

- Scotland needs to generate less waste, recycle more and safely maximise the use of the resources left in residual waste.

- Appropriately located and well managed energy from waste facilities, that meet modern requirements such as the stringent emission standards contained in the European Waste Incineration Directive (WID), should not cause significant pollution of the environment or harm human health.

- Facilities to recover energy from waste have a part to play in a national network of waste management facilities.

- Treating waste to generate energy should not be at the expense of actions taken to prevent or recycle waste.

- Recovering energy from waste can contribute to a balanced energy policy where the energy generated is recovered as far as practicable using combined heat and power schemes in compliance with Best Available Techniques (BAT).

Land use and planning permission

What is SEPA's role in planning applications for energy from waste facilities?

[7] www.scotland.gov.uk/Publications/2010/06/08092645/0

We provide our views to the planning authority on the environmental impact of energy from waste facilities. We do this by commenting on strategic and local development plans and by responding to consultations on planning applications in our role as a statutory consultee. The advice we give in relation to planning applications for energy from waste facilities is:

- whether the application would be given consent (ie whether we are likely to issue a permit to operate) under the appropriate regulations;

- whether it will comply with the *Thermal treatment of waste guidelines 2009*[8]. These guidelines will be reviewed to reflect the requirements of the legislation proposed under the Scottish Government's *Zero Waste Plan*. We will publish revised guidelines around the same time as regulations are finalised.

How does SEPA determine at the planning stage whether a facility is likely to obtain a permit to operate?

An energy from waste facility requires both planning permission from the local authority and a permit under the Pollution Prevention and Control (Scotland) Regulations 2000 (PPC) from SEPA before it can operate.

Planning Advice Note 51: Planning Environmental Protection and Regulation[9], states:

> "When SEPA comments on a planning application and is also the environmental regulator, it should assess the land use aspects of the planning application to clarify whether, on the information available at the time, the proposed development is potentially capable of being consented under the licensing regime."

We strongly encourage applicants to apply for planning permission and any environmental licence (such as PPC) at the same time. That's because we prefer all the technical information required for all permissions and licences to be submitted at the same time as the planning application. However, we recognise that not all of the information required for environmental licences is always available at the planning stage – for example if the detailed design is incomplete.

As a minimum, the planning application must provide the necessary information on key environmental matters. We will not issue a permit if we believe the site will cause significant pollution to the environment or harm human health. We will inform the planning authority and the developer as early as possible in the planning process if we think we will be unable to grant the necessary environmental permit.

The information submitted at the planning stage should also include a detailed examination of energy recovery and use of heat and power generated to demonstrate that the facility will maximise its thermal efficiency. No development should start on site until a heat plan for the potential use of heat recovered has been provided, and the facility must be constructed in accordance with the details submitted.

What is the role and responsibility of local authorities in the planning process?

The local authority is responsible for land use planning and approving or rejecting applications for planning permission for waste management sites such as energy from waste facilities and landfills. As the planning authority, the local authority decides where an energy from waste facility should be built.

What happens if planning permission is not granted?

[8] www.sepa.org.uk/waste/waste_regulation/idoc.ashx?docid=b61dc32b-f2e8-4f65-b237-8e67c5194f08&version=-1
[9] www.scotland.gov.uk/Publications/2006/10/20095106/3

If planning permission is not granted then the facility cannot be built. The applicant can appeal against the decision to the Scottish Government's Inquiry Reporters Unit or the Court of Session.

What happens if planning permission is granted?

In order to operate an energy from waste facility, the operator must apply to us for a permit under the Pollution Prevention and Control (Scotland) Regulations 2000 (as amended). We will follow the legal requirements set out by the European Union and the Scottish and UK Governments to ensure that the facility complies with relevant legislation.

There is no legal requirement to submit an application for a PPC permit before receiving planning permission.

Permitting

When determining an application for a permit under the PPC Regulations, SEPA's main aim is to ensure that the facility is operated in such a way, and under such conditions set in the permit, that human health and the environment remain protected from any harmful emissions.

Before reaching a decision to grant a permit, we must be satisfied that the applicant has demonstrated that the proposed facility meets the requirements of the legislation. The applicant must:

- not begin operation before receiving a PPC permit;
- submit a comprehensive application;
- take account of best available techniques (BAT) when describing all activities and their environmental impact (including 'abnormal' operations);
- advertise their application in a local newspaper and the Edinburgh Gazette.

The application will be subject to statutory consultation, which includes the opportunity for public participation. We decide whether or not to grant a PPC permit, and the local authority is a statutory consultee in that process.

We then have to judge whether or not the application meets the requirements of the law. If it does, we will issue a permit defining what the applicant can and cannot do, including minimum performance standards. We are legally obliged to issue a permit if an application meets the legal requirements. We cannot grant a permit if it does not.

How can I get a copy of an application to operate an energy from waste facility?

We will make public as much of any application as possible on our website. Some parts of the application may not be available for practical reasons (such as large diagrams); however, you can view a hard copy in the local SEPA Registry Office. Please contact us[10] for more information.

What conditions will SEPA set in a permit?

Our permit will detail many things, covering every aspect of the facility's operation, including:

- facility operating standards;
- plant maintenance standards;
- types and quantities of waste allowed;
- how waste is to be handled and disposed of;
- strict emissions limits;
- how emissions are monitored;
- how emissions are reported;

[10] www.sepa.org.uk/about_us/contacting_sepa.aspx

- noise and vibration limits;
- environmental monitoring requirements;
- methods for reporting breaches, or possible breaches, of limits and permit conditions to SEPA;
- disposal (including recycling) routes for residues such as bottom and fly ash.

What is the role of NHS Health Boards?

We consult the local public health bodies when we receive an application for a permit to operate an energy from waste facility under the Pollution Prevention and Control (Scotland) Regulations 2000. We ask them to comment on the potential health impacts of the proposed facility based on emission information sent to them. We take their views into account when we decide whether to grant a permit.

What types of waste can an incinerator burn?

To ensure that the proposed facility will operate in accordance with Best Available Techniques (BAT), the applicant has to demonstrate that it is capable of handling the waste types specified in the application, and that the abatement equipment will be suitable. We are required to list the permitted wastes in any granted permit, including any hazardous wastes. That listing is based on the European Waste Catalogue System.

If the applicant wants to amend the wastes allowed then they must apply to us for a variation. That variation application could be advertised and subject to review by statutory consultees, which will also include public consultation. Any facility applying for a variation to burn hazardous waste in addition to non-hazardous waste must advertise and undergo statutory consultation.

To ensure that efforts to increase recycling are not undermined, the Scottish Government is proposing to introduce legislation which will restrict the types of waste which may be incinerated to residual waste (waste remaining after all reasonable efforts have been made to extract recyclable materials) and other suitable waste types such as treated timbers, tyres and waste oil. SEPA will regulate the inputs to the incinerator over the operational life of the facility.

Can SEPA refuse an application for a PPC permit?

We can refuse the application if it does not demonstrate that the applicant will ensure the energy from waste installation is operated so as to comply with any condition set in a permit, for example requiring the use of Best Available Techniques (BAT) in all aspects of its operations (including technology and administration/management). These conditions are site-specific and the techniques to be used must be justified by applicants.

SEPA must also refuse the application if we think the applicant will not be the person in control of the installation.

What if I do not agree with SEPA's decision?

You should first contact the local office[11] dealing with the application. If the staff responsible for the application, or their managers, cannot address your concerns, then they will tell you which senior manager in SEPA you can contact.

Only the applicant can appeal to the Scottish Government regarding a permit refusal, or specific conditions attached to an approved permit.

Emissions and air quality

[11] www.sepa.org.uk/about_us/contacting_sepa/regional_offices.aspx

How will the proposals affect local air quality?

We will require the applicant to use advanced air quality modelling techniques to predict the effect of emissions. Their results will then be assessed by our modelling experts, who ultimately decide if the modelling has been performed correctly. We will assess these results to ensure that any effect on air quality is within acceptable levels.

Will emissions to air be a problem for 'sensitive receptors'?

The air quality modelling described above predicts the ground level concentrations in the surrounding environment, including at 'sensitive receptors' such as hospitals, nurseries and nearby homes. The modelling is based on worst-case scenarios and must be within the limits in the air quality standards[12]. The modelling results are used to consider the predicted impact on any sensitive receptor.

What difference does the weather make?

The weather affects how discharges from a chimney are distributed in the local environment. We take the weather into account when assessing any permit application. As part of an application, the operator will carry out pollution dispersion modelling, which aims to predict how the emissions will react in different weather conditions (ie not just the normal weather) at the proposed location. This includes any specific conditions that are prevalent and particular to the local area, such as haar, local topography and any effect they could have on dispersion of emissions.

What is the risk of damage to human health?

In October 2009 SEPA published a report *Incineration of waste and reported human health effects*[13]. Carried out by Health Protection Scotland, the report looked at a range of previous studies on the health effects of incinerators, concluding that due to many uncertainties it is difficult to be definitive about the effects. However, it is clear from the studies that any past health effects on populations living near incinerators is likely to have been small.

Today's incinerators are subject to much stricter legislative controls. They use improved technology and produce less emissions, so any effects would be very small – if detectable at all.

What risk is there from dioxins emission?

Dioxins are formed by burning materials that contain chlorine. As well as industrial emissions, other significant sources include domestic stoves and fires, garden bonfires, fireworks, vehicle exhausts and tobacco smoke.

In 1995, 55% of all UK dioxin mass (total) emissions (in excess of 600g) came from waste incineration. Stricter controls on incinerators and their emissions were introduced in 1996, including a dioxin emission limit set at one nanogram (one thousand millionth of a gram per cubic metre [ng/m^3]) of flue gas. Consequently, emissions fell and in 2003–2004 the incineration of household waste produced between 0.04g and 0.21g of dioxins in total (<1%). The emissions limit was further reduced on the implementation of the Waste Incineration Directive in 2003: it now stands at 0.1ng/m^3 of flue gas.

A 2009 Department for Environment, Food and Rural Affairs (Defra) report showed dioxin mass emissions from incineration of municipal solid waste to be 0.02g in 2006. That compares to 2.64g from road transport, 4.41g from residential combustion and 60.59g from accidental fires. Research by the Food Standards Agency has also shown that, since 1992, there has been a 70% reduction

[12] www.legislation.gov.uk/ssi/2010/204/contents/made
[13] www.documents.hps.scot.nhs.uk/environmental/incineration-and-health/incineration-of-waste-and-reported-human-health-effects.pdf

in the amount of dioxins and polychlorinated biphenyl (a toxic chemical with high potential for accumulating in the food chain) released into the environment as a result of a combination of improved technology and stricter, more effective regulations. The concentrations of dioxins found in individual foods in a study in 2001 were all below EU safety limits.

While there is no safe level of exposure to dioxins, the research and information above show that emissions from incinerators are much less than other everyday sources, and that the risk of health effects from dioxins from incinerators is so small as to be undetectable.

(Units of weight expressed above refer to I-TEQ units for dioxin measurement.)

What risk is there from particulate material?

'Particulate material' refers to fine particles suspended in the atmosphere. It comes from a variety of sources, some of which are natural, and can affect human health. It can be various sizes but controls are in place for PM_{10} (particles with a size less than 10 microns – ie 0.01mm) and $PM_{2.5}$ (less than 2.5 microns, ie 0.0025mm). The smaller the particle the longer it remains in the air.

We request permit applications and Environmental Impact Assessments include particulate matter when assessing the effect of emissions. The outcome of that assessment will determine the contribution to the annual mean air quality objective, and is one of the factors we use in our impact assessment and decision-making.

The Air Quality Standards (Scotland) Regulations 2007, and the amended Air Quality Limit Values (Scotland) Regulations, define air quality standards for many airborne pollutants relevant to energy from waste processes. Further information on the application of air quality standards to this type of development is available on Page 51 of *The Pollution Prevention and Control (Scotland) Regulations 2000 - A Practical Guide*[14].

A review of the mass emissions of PM_{10} particulates from a variety of sources was undertaken in 2001 by the UK Government's Air Quality Expert Panel[15]. It identified that, in the UK, transport generated the highest levels of PM_{10}, with mass annual emissions of 48.4 kilotonnes (kT). Power generation produced 17.7kT, domestic heating generated 31.1kT, and waste disposal operations (including waste incineration operations, landfills etc) produced 1.5kT. Road and kerbside levels of particulates cause the most local air quality limit breaches in the UK. The report also noted that burning natural gas generates the same proportion of PM_{10}, $PM_{2.5}$ and $PM_{0.1}$ as the incineration of waste.

It is important to also note that, due to regulatory changes, significant reduction in particulate emissions in the UK has been achieved over recent years (ie PM_{10} emissions fell by 42% during 1990–2001 and are expected to fall a further 28% by the end of 2010).

The Scottish Government is currently consulting on Draft 2010 Air Quality Standards (Scotland) Regulations, which will introduce a Scottish $PM_{2.5}$ air quality standard. The consultation and draft regulations are available at: www.scotland.gov.uk/Publications/2010/01/25153504/0

Do these facilities create bad smells?

Any facility handling biodegradable wastes can cause a bad smell if adequate controls are not in place or if the wastes are not managed properly. We require facilities to control odours, for example by keeping the waste handling and storage areas under negative pressure and by extracting room air to the combustion plant or a suitable bio-filter.

More information on how we regulate potentially odorous sites can be found in our *Odour guidance*

[14] www.scotland.gov.uk/Publications/2001/10/10153/File-1
[15] www.defra.gov.uk/environment/quality/air/airquality/panels/aqs/

2010[16].

Emissions and land

What happens to any ash emissions?

Energy from waste produce two types of ash:

- incinerator bottom ash (IBA) which is the non-combustible residue left in the incinerator:
- air pollution control residues (APC or 'fly ash') which is the residue left in the air pollution abatement equipment.

We require energy from waste operators to fully investigate all potential recovery or disposal options for both types of ash at the permit application stage. We will ensure that the proposed disposal or recycling route is the Best Available Technique (BAT) for dealing with the ash. Incinerator bottom ash (IBA) can be recycled into aggregate products but APC residues are classified as hazardous waste and must be disposed of at a suitable facility. The design of the energy from waste facility must enable fly ash to be collected and placed in closed containers before being removed from the site.

What are the toxicity controls on ash disposal methods?

As part of any PPC permit conditions, we require chemical analysis of the various residues created by a process. That includes minimum sampling frequencies. That data is used to classify the waste as hazardous, non-hazardous or inert (ie inactive or unreactive).

Most types of waste can be disposed of in landfill, but the EU Landfill Directive requires that landfill sites must now be classified as hazardous, non-hazardous, or inert. The landfill site's classification dictates what wastes it can accept. Some waste types might also need pre-treatment to meet the acceptance criteria. That is generally carried out at offsite waste treatment sites, which are subject to separate SEPA control. Further information on acceptance of waste to landfill is available on our website[17].

Permitting – monitoring compliance

What powers does SEPA have if site operators do not comply with permit conditions and limits?

We can close any part, or all of, an operation by serving a suspension notice if the operator is found not to be complying with the permit. However, that is an extreme measure and would only be used where there is likely to be an imminent risk of serious pollution.

We have a wide range of enforcement powers. Action can be in the form of:

- informal discussions;
- formal letters and meetings;
- enforcement notices requiring specific action within a specific timescale;
- recommending prosecution to the Procurator Fiscal.

The action we take depends on the situation. A minor breach of a permit might lead to just a warning letter, but a major breach could result in an enforcement notice demanding that the operator takes specific actions, or even a report to the Procurator Fiscal recommending prosecution.

The courts impose fines for offences at their discretion, but they are normally limited to a maximum

[16] www.sepa.org.uk/air/odour.aspx
[17] www.sepa.org.uk/waste/waste_regulation/landfill.aspx

of £40,000 for each offence. However, the courts can impose unlimited fines in some circumstances.

What should I do if I suspect a site operator is in breach of their permit conditions?

Contact your local SEPA office[18] or call our free 24 hour pollution hotline on 0800 80 70 60.

Scottish Pollutant Release Inventory

The Scottish Pollutant Release Inventory (SPRI)[19] is a database of annual mass releases of specified pollutants to air, water and land from SEPA-regulated industrial sites. Operational energy from waste facilities must complete an annual SPRI report, which we publish after verifying.

[18] www.sepa.org.uk/about_us/contacting_sepa.aspx
[19] www.sepa.org.uk/air/process_industry_regulation/pollutant_release_inventory.aspx