SEPA
Scottish Environment Protection Agency

SEPA's Thermal treatment of waste guidelines 2009

Foreword by the Chairman

Scotland is at a watershed in the development of its future energy policies. In an environment of growing global resource pressures, rising energy prices, and with the increasing challenges we face in tackling energy security and climate change, a careful understanding of carbon management is of critical importance.

What is clear to me is the significant role that renewable energy will have to play, and it is vital that we recognise the inherent energy value and carbon benefits of using appropriate waste materials for energy. The location of facilities also needs careful consideration in order to support the future use of waste heat, as an integrated network of facilities will ensure that energy from waste is recovered efficiently.

The social, environmental and economic benefits of such a network of efficient facilities may then be enjoyed for many years to come.

David Sigsworth
SEPA Chairman

Foreword by the Chief Executive

SEPA's *Thermal treatment of waste guidelines 2009* build upon our 2004 guidelines and help to implement the Scottish Government's policy on the requirement to recover energy from waste in an efficient manner and in such a way that it does not impede waste prevention, reuse, or recycling. As such, these guidelines will be of vital importance to developers, the planning system, and SEPA regulators alike, in assessing and determining applications for the next generation of thermal treatment facilities in Scotland.

SEPA will use these guidelines when determining Pollution Prevention and Control (PPC) Part A permits for thermal treatment of waste facilities in Scotland. We will also work closely with planning authorities and developers to enable the development of a network of facilities that make a significant contribution to meeting the very real waste management, energy and climate challenges we all face. SEPA will also seek to continually improve the quality of data on waste to support the waste sector in making both the planning and financial case for new facilities to treat Scotland's waste.

Campbell Gemmell
SEPA Chief Executive

Addendum to SEPA's Thermal Treatment of Waste Guidelines 2009
May 2011

Introduction

1.1 SEPA is issuing this update to ensure that the guidelines are aligned with the Zero Waste Plan (ZWP) and the Waste (Scotland) Regulations 2011. The changes surround two keys issues; an updated approach to land use planning and changes to SEPA's statutory remit with respect to energy efficiency. The opportunity has also been taken to produce a set of 'frequently asked questions'.

2.0 Description of changes - planning

2.1 The Scottish Government's Zero Waste Plan[1] was published in June 2010 and sets out national government policy on waste. Annex B to the ZWP[2] describes the roles and responsibilities of those involved in the land use planning system in the delivery of infrastructure required to meet Zero Waste objectives and targets.

2.2 For planning purposes, the Zero Waste Plan constitutes the National Waste Management Plan along with:

- The National Planning Framework;
- Scottish Planning Policy;
- Planning Advice Note 63 (including revised versions);
- SEPA waste data sources (including Waste Data Digests and Waste Infrastructure Maps);
- SEPA's Thermal Treatment of Waste Guidelines 2009.

2.3 This addendum updates the Thermal Treatment of Waste Guidelines (TTWG) to align them with the ZWP and SEPA's revised role in responding to planning consultations for waste treatment facilities, including thermal treatment, under the ZWP.

2.4 Section 2 of the TTWGs has been superseded. SEPA's role as a key agency and statutory consultee for the land use planning system for both Development Plan and Development Management is described in revised SEPA planning guidance:

- Land Use Planning System Guidance Note 5 – Guidance on SEPA input to Development Plan Consultations for Zero Waste Plan issues;
- Land Use Planning System Guidance Note 6[3] – Guidance on SEPA input to Development Management Consultations for Zero Waste Plan issues.

2 Description of changes - permitting

2.1 The Waste (Scotland) Regulations 2011[4] came into force on 27 March and insert a new Regulation 9F into the Pollution Prevention and Control (Scotland) Regulations 2000 (as amended).

"Conditions of permits: incineration or co-incineration with energy recovery

9F.—*(1) SEPA shall ensure that any permit granted or varied on or after 27th March 2011 authorising the incineration or co-incineration of waste with energy recovery contains conditions ensuring that the recovery of energy takes place with a high level of energy efficiency.*

(2) In this regulation—
"co-incineration" has the same meaning as in Schedule 1 Part 1 Section 5.1;
"incineration" means the thermal treatment of wastes."

SEPA considers that meeting the TTWG energy efficiency requirements will be sufficient to meet this statutory requirement.

2.2 A set of FAQs covering this and other technical aspects of permitting thermal treatment facilities accompanies this addendum.

3 Future Changes

3.1 Once the regulatory changes proposed under the ZWP[5] in relation to thermal treatment facilities are finalised the guidelines will be fully reviewed and reissued.

Frequently Asked Questions - May 2011

Q: I intend to use some of the energy generated to pre-treat the waste before incineration. Can I count this towards my energy targets?

A. Normally any energy used to pre-treat waste for incineration cannot be counted towards your energy targets. However, you could count a proportion of that energy if it results in recycling and recovery of waste that is not subsequently incinerated.

For example, a mechanical/heat treatment process which accepts 100,000 tonnes per year of waste for treatment. If this results in 50,000 tonnes of recyclate and 50,000 tonnes of pre-treated waste for incineration, then you could count 50% of the energy supplied towards the target as the treatment has achieved 50% recycle/recovery.

Q: What is the basis of the energy targets?

A. The energy targets are based on work undertaken by AEA and Fichtner consultants during the period when the guidelines were being prepared.

Q: Do we use gross or net calorific values?

A. The targets are based on "gross" calorific values. Several applications have used "net" values which will overestimate the energy recovered. This is in line with the CHP QA methods referred to in the Guidelines. Care must be taken to ensure that when calculating efficiencies that the correct basis is used consistently throughout the calculation.

Q: How do we account for electrical power?

A. Electrical energy recovery can be measured at the generator terminals i.e. this assumes that all electricity is exported. However, SEPA believes that all energy inputs into the plant to allow waste to be thermally treated must be taken into account. Therefore, any electricity used in the process must also be counted. The examples provided in Annex 4 make this quite clear.

Q: The QI target of 100 for any size of Advanced Conversion Technique (ACT) is higher than non ACT plants. Why is this?

A. SEPA understands that ACT plants by their nature should be of inherently higher efficiency. In some cases ACT plants can gain higher public subsides than non ACT plants e.g. through the Renewables Obligation Certificates Scheme. The target reflects what is achievable for a well designed and operated ACT plant.

Q: Do the guidelines and targets apply to plants treating hazardous wastes? I see that your website indicates that this is not the case but the guidelines are silent on it.

A. In general SEPA would expect that plants dealing with most hazardous wastes should still be able to achieve the targets. However, in some cases where the plant has to deal with very difficult hazardous wastes and be required to operate in a "high energy" mode to ensure destruction of that waste, then it may be appropriate to set a slightly lower target. This can only be examined on a case by case basis.

Q. My process has increased energy penalties associated with the elevated flue gas temperatures required for the selected flue gas abatement systems. Can I get some additional allowance for the energy lost this way?

A. No. The selection of the required flue gas abatement system should be subject to the BAT considerations taking all aspects of the systems into account. The additional energy penalties for some systems are offset by increased efficiency and reduced reagent costs. You will need to balance negative effects on plant efficiencies against the benefits of each system.

Q. Why are Anaerobic Digestion (AD) plants included in the thermal treatment guidelines?

A. SEPA agrees that AD plants are not thermal treatment plants however we believe that the biogas produced should be used in the most energy efficient way. For this reason AD plants are included within the guidelines but only in respect of the use of the biogas, see Annex 4 example 3 for details.

Q. Do I have to use only residual waste in an AD plant?

A. No, separately collected wastes, e.g. mixed food and green wastes, are suitable feedstock in AD plants.

Q. In the absence of mature heat infrastructure networks what level of energy recovery would SEPA consider to be a high level of efficiency?

A. The Waste (Scotland) Regulations 2011[6] came into force on 27 March and inserted a new Regulation into the Pollution Prevention and Control (Scotland) Regulations 2000 (as amended)

"Conditions of permits: incineration or co-incineration with energy recovery

9F.—(1) SEPA shall ensure that any permit granted or varied on or after 27th March 2011 authorising the incineration or co-incineration of waste with energy recovery contains conditions ensuring that the recovery of energy takes place with a high level of energy efficiency.

(2) In this regulation—
"co-incineration" has the same meaning as in Schedule 1 Part 1 Section 5.1;
"incineration" means the thermal treatment of wastes."

SEPA considers that meeting the following energy efficiency requirements will be sufficient to meet this statutory requirement:

i) for plants with an incineration capacity equal to or less than 300,000 tonnes per annum compliance with the targets specified in Annex 1 to the Guideline including both the start up and longer term heat and power plan provisions; or

ii) for plants with an incineration capacity greater than 300,000 tonnes per annum, compliance with the targets specified in Annex 1 to the Guidelines including both the start up and longer term heat and power plan provisions and that the plant is, on start up, a recovery operation as defined by the EU Directive on Waste (2008/98/EC) R1 formula criterion of 0.65.

If the heat and power plan is not realised and/or the QI target not achieved SEPA can take appropriate enforcement action in line with our Enforcement Policy.

Q. At what stage should the heat and power plan be submitted to the planning authority/SEPA?

A. The heat and power plan should be submitted as part of the planning application to enable the Planning Authority to determine the suitability of the location and include any planning conditions regarding layout or design of the proposed facility considered necessary. However, a planning condition requiring submission and/or implementation of the plan will not be necessary as this will be a permitting issue for SEPA.

SEPA will advise in its response to the planning authority whether the proposed plan will be sufficient to enable SEPA to consent the facility as described above. The heat and power plan should demonstrate that high energy efficiency will be achieved through compliance with the TTWGs.

Links:

A1. *Scotland's Zero Waste Plan*:
www.scotland.gov.uk/Publications/2010/06/08092645/0

A2. *Scotland's Zero Waste Plan* - Annex B:
www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Waste-1/wastestrategy/annexb

A3. *Land Use Planning System - SEPA Guidance Note 6*:
www.sepa.org.uk/idoc.ashx?docid=847b5e1b-9fbe-4f92-90db-2c4e88d454a9&version=-1

A4. The Waste (Scotland) Regulations 2011:
www.legislation.gov.uk/ssi/2011/226/made/data.pdf

A5. *Regulations to Deliver Zero Waste: A Consultation on the proposed Zero Waste (Scotland) Regulations 2011*:
www.scotland.gov.uk/Publications/2011/02/09135833/0

A6. The Waste (Scotland) Regulations 2011:
www.legislation.gov.uk/ssi/2011/226/made/data.pdf

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Cover image: Steven's Croft biomass fired power station, Lockerbie
Picture courtesy of Alison Bell

Executive summary

The *Thermal treatment of waste guidelines 2009* set out SEPA's approach to permitting thermal treatment of waste facilities, according to the Scottish Government policies for waste management and its role as a consultee to the land use planning system. They also update and replace *SEPA's Guidelines for thermal treatment of municipal waste August 2004*[1].

The guidelines describe what is expected from developers and other key stakeholders in order to comply with SEPA's planning objectives and the Scottish Government's policies on waste. They also provide advice on the types of information SEPA requires when determining environmental licences for such facilities in relation to energy recovery.

Applying to all thermal treatment plants that recover energy from municipal waste and/or commercial and industrial waste, the practical implications of the guidelines are that plants should:

- only treat residual waste (ie waste remaining after all efforts have been made to extract recyclable materials, either prior to or after delivery to the plant) in order not to impede recycling and waste prevention efforts;
- be part of an integrated network of recycling and composting and other waste management facilities;
- recover and use the energy derived from waste efficiently.

The guidelines apply (but without excluding other potential thermal recovery technologies) to the treatment of waste by incineration, gasification, pyrolysis, plasma systems, and anaerobic digestion (gas use phase only).

Our role in planning

SEPA's role as a 'key agency' (defined in legislation as agencies required to co-operate with planning authorities in development planning), places a responsibility on it to comment on both the policies and the proposals relating to the thermal treatment of waste. SEPA is also a strategic environmental assessment consultation authority and a statutory consultee on development proposals. In order to do this fully and effectively, we must look at the following issues:

- The 'proximity principle'
- Capacity and need
- Site selection
- Treating residual waste only
- The recovery of heat and energy
- The 'best practicable environmental option'

All potential applicants are therefore encouraged to approach SEPA with their proposals at an early stage (preferably prior to the planning application stage) to discuss the potential environmental licensing requirements.

Our role in licensing

SEPA is the environmental licensing authority for waste thermal treatment plants, generally under the PPC regime which requires that:

- the development employs "best available techniques" and that alternative techniques have been fully considered;
- energy will be recovered efficiently in line with the Quality Assurance Scheme for Combined Heat and Power, with a detailed heat plan submitted;
- emissions from the plant will not have any adverse impacts on the environment and human health;
- the plant is suitably designed to deal with these wastes it intends to treat;
- all wastes generated on site will be minimised and where generated shall be recovered or disposed of without causing any significant harm to the environment or human health.

Waste thermal treatment plants are generally subject to environmental licensing requirements as Part A installations under the Pollution Prevention and Control (Scotland) Regulations 2000[25] (PPC), as amended, and may also be subject to the technical requirements of the Waste Incineration Directive (WID)[3].

Facilities may also be licensed via PPC Part B, or the 'Waste management licensing' regime. However, SEPA cannot impose conditions relating to the recovery of energy or energy efficiency within waste management licences or PPC Part B permits, due to the existing regulatory framework. Further, there may be some cases where a waste thermal treatment plant also operates under a permit granted under the Greenhouse Gas Emissions Trading Scheme Regulations 2005 (EU ETS)[27].

SEPA's environmental licensing policy for waste thermal treatment plants details the requisite licensing requirements for waste thermal treatment plants, in terms of the nature of the waste to be treated and/or their size.

Regardless of the conditions in any environmental licence, however, SEPA believes that energy recovery and efficiency and consequent carbon reduction opportunities are relevant matters for consideration at the planning application stage, and we will therefore advise planning authorities as appropriate. Applicants for waste thermal treatment plants not licensed as a PPC Part A installation should therefore continue to have regard to the guidelines, even though SEPA may not impose any consequential requirements within their environmental licence.

At the application stage for a Part A permit, the applicant must demonstrate that the techniques they propose are appropriate for the use to which they are to be put and that they will be capable of recovering energy efficiently. The degree of efficiency is dependent on whether or not they recover electrical and/or heat energy individually or together.

Standards to be applied in energy recovery

SEPA has adopted and set targets under the Quality Assurance for Combined Heat and Power (CHPQA) standard[31] [as published by the Department for the Environment, Food and Rural Affairs (Defra)], as the appropriate approach to establishing the required energy efficiency for facilities. We would therefore expect that new waste thermal treatment plants achieve a minimum energy efficiency, as described in the CHPQA standard on starting operations. The required heat plan should thereafter demonstrate how progress towards a QI equal to or in excess of those indicated in Table 1 of **Annex 1** will be achieved within the shortest practicable time, in order to comply with the criteria for the CHPQA standard and, subsequently, the Directive on Co-generation of Energy[32]. This will provide indicative efficiencies of between 30% and 45% depending on the size of the facility and its fuel type

We would also expect *existing* waste thermal treatment plants, or plants already with planning consent and under construction, to submit a heat plan, where this is deemed practical, demonstrating how progress towards a QI equal to or in excess of those indicated in Table 1 of **Annex 1** can be achieved within the shortest practicable time for the reasons explained above.

The bigger picture

SEPA recognises that Scotland does not yet have mature or extensive heat-use networks. However, there are immediate opportunities for reliable and extensive heat use by co-locating thermal treatment plants with existing energy and heat intensive industries, or near to public developments such as leisure complexes and shopping centres. Another alternative is to develop facilities in areas with the potential for the co-development of heat-using industries. Low grade heat could be a driver for the development of eco industrial parks, with a focus on waste treatment, reprocessing and manufacturing using waste materials, renewable energy production and local food production. Each of these would, in turn, contribute to more robust regional economies. Applicants should therefore consider the location of their development very carefully to maximise the opportunities for effective energy use.

Further, the Scottish Government recognises the need to develop sources and users of renewable (and non-renewable) heat in Scotland. The Scottish action plan on renewable heat[9] sets a clear framework for development of heat use in Scotland over time. This framework and the development of a renewable heat incentive at a UK level will enable, over time, the levels of energy recovery from waste to extend beyond the initial requirements for permitting. Scottish Government policies on heat use are discussed in more detail in Section 1.

1 Introduction and background

1.1 Purpose of these guidelines

SEPA's view on the thermal treatment of residual municipal waste was set out in its *Guidelines for thermal treatment of municipal waste August 2004*[1]. These guidelines were material to the preparation of development plans and to the determination of planning applications for thermal treatment plants. The updated 2009 guidelines will carry the same status as a "material planning consideration" where relevant.

The announcement of the Scottish Government's policy for waste management in January 2008[2] clarified the future targets and policy direction in Scotland. These targets and policies are summarised in Sections 1.1 and 1.2. In order to support the policy, the *Thermal treatment of waste guidelines 2009* update and replace the 2004 guidance.

The 2009 guidelines advise applicants on what SEPA expects from thermal treatment developments, in particular for an application for an environmental licence for a thermal treatment facility. SEPA will require thermal treatment facilities to be capable of recovering heat or heat and power (referred to as CHP, 'combined heat and power') as far as practicable in line with the requirements of the Waste Incineration Directive[3].

SEPA intends that the guidelines will apply to all thermal treatment plants recovering energy from municipal waste and/or commercial and industrial waste, with the primary purpose being to set out to developers what is expected from them. This is so that SEPA can:

- co-operate with planning authorities in the preparation of development plans to fulfil its statutory duty as a key agency;
- comment on a planning application in SEPA's role as a statutory consultee;
- confirm compliance with the Scottish Government's policies on waste and advise if the development is capable of being consented;
- advise on the types of information required in the determination of environmental licences for such facilities in relation to energy recovery.

The development of the 2009 guidelines is based on a range of inter-related issues, including:

- the understanding that Scotland will need to develop thermal treatment as part of its integrated range of facilities to manage waste in Scotland and achieve its landfill diversion targets for biodegradable municipal waste;
- recognition of the growing pressures to move biodegradable commercial and industrial wastes and other recyclable material away from landfill to conserve resources and reduce the climate impacts of landfill gas;
- the realisation that the security of future energy supplies is a growing domestic issue and that, in particular, specific waste materials can make a significant contribution to reducing Scotland's reliance on energy imports and reducing its carbon footprint;
- the availability of combined heat and power technologies that can recover and utilise embedded energy at optimised levels of thermal efficiency;
- a growing awareness of the environmental, social and economic benefits of the provision of low cost heat as a supplementary benefit to the production of electricity from the thermal treatment of waste;
- the opportunity to develop facilities that are capable of recovering energy from waste materials along with other sources of renewable fuels, including biomass from forestry, agriculture and sewage sludge.

The practical implications of the 2009 guidelines will be that thermal treatment plants handling waste should:

- only treat residual waste (ie that remaining after all efforts have been made to extract recyclable materials either prior to or after delivery to the plant) in order not to impede recycling and waste prevention efforts;
- be part of an integrated network of recycling and composting and other waste management facilities;
- recover and use the energy derived from waste efficiently by ensuring high levels of electrical conversion efficiency and/or heat use capability.

Further explanation of the relevant environmental licensing requirements is detailed in **Section 3**.

The 2009 guidelines will apply (but without excluding other potential thermal recovery technologies) to the treatment of waste by incineration, gasification, pyrolysis, plasma systems, and anaerobic digestion. The energy efficiency elements of the guidelines will apply only to the gas use phase of anaerobic digestions facilities. They are aimed at the land use planning system, local authority waste managers involved in procurement, the waste industry applying for planning permission and environmental licences, and waste producers and energy utilities, in guiding their future proposals for the development of thermal treatment facilities in Scotland. They will also enable the public to understand SEPA's approach to both planning applications and environmental licensing. In addition, these guidelines will be used by SEPA's regulatory and planning staff.

The 2009 guidelines are also relevant to the renewable energy sector in respect of biomass to energy systems where grown biomass and waste is co-fired. For the purpose of these guidelines, SEPA defines biomass in the following way:

- primary biomass (grown for the purpose of producing energy);
- secondary biomass (produced as a consequence of activities arising from farming and forestry, where these are not deemed to be wastes);
- tertiary biomass (waste biomass).

The use of tertiary biomass to create energy should be viewed positively due to its low life cycle impacts, the potential for this sector to produce renewable heat, and the contribution it can make to renewable energy targets and the mitigation of climate change. There are significant potential benefits to both the waste and biomass industries in combining primary, secondary, and tertiary sources of biomass to produce energy. In addition, Scottish policy on the development of renewable heat use will enable, over time, the levels of energy recovery from waste to extend beyond the initial requirements for permitting. SEPA's report, *Evaluation of energy from biowaste arisings and forest residues in Scotland*[4] provides useful background information on the energy value of waste and forestry biomass sources. To help understand when a material is or is not a waste, SEPA has produced guidelines on the definition of waste[5].

1.2 The Scottish Government's policy on waste

The National Waste Plan 2003[6] set targets for the prevention and recycling of municipal waste in Scotland. Significant progress has been made in improving the recycling of municipal waste since 2003, with a national recycling figure of 31.2% achieved in 2007.

In January 2008, the Scottish Government announced its future policies for waste in Scotland[2], including the move towards a 'zero waste' society and the achievement of European targets for the diversion of waste from landfill. Also in this statement was a presumption against large scale inefficient energy from waste facilities, a cap on energy from waste for municipal waste of 25%, and a requirement that all energy from waste facilities recover energy efficiently. The Cabinet Secretary announced that the Scottish Government would prepare a revised National Waste Management Plan for Scotland, which would have the following objectives:

- a strong emphasis on waste prevention, with the aim of stopping the growth in municipal waste by 2010;
- increased priority for recycling and composting, with the aim of aligning Scotland with the highest performing countries in Europe through a target of 70% recycling and composting of municipal waste by 2025 (the Government also expects Scotland to reach new targets of 40% by 2010; 50% by 2013 and 60% by 2020, and meet the landfill diversion targets set out below);
- a 25% limit on energy from waste for municipal waste by 2025;
- a further reduction in the use of landfill, with the aim that no more than 5% of municipal waste should be landfilled by 2025;
- greater emphasis on commercial and industrial waste, with new targets to reduce the amount of this type of waste sent to landfill and for increased recycling and re-use of construction and demolition waste;
- a requirement that energy from waste facilities recover energy efficiently.

The implementation of the revised National Waste Management Plan for Scotland, which will replace the National Waste Plan 2003[6], will identify the need for a wide range of new waste treatment and disposal facilities for both municipal and commercial and industrial wastes. In many cases facilities will seek to generate appropriate economies of scale and associated cost and transport benefits by treating both municipal and commercial and industrial waste. Such an approach may assist in addressing the proximity principle by enabling more decentralised facilities at both a local authority and waste strategy area level in Scotland. Specific capacity requirements may be identified on a regional basis as a consequence of the new National Planning Framework[7] and the review of the National Waste Management Plan.

The Scottish Government targets for recycling and the landfill diversion targets for biodegradable municipal waste, specified in the Landfill Directive, are challenging. In order for the directive's targets to be met in Scotland, we must not biodegradable landfill municipal waste of more than:

- 1.32 million tonnes by 2010
- 0.88 million tonnes by 2013
- 0.62 million tonnes by 2020

1.3 Renewable energy, climate change and heat use

The Scottish Government and SEPA have recognised that Scotland must play its part in tackling climate change. This will include adopting energy conservation and efficiency measures and low carbon energy technologies. The Scottish Climate Change Bill[8] sets a target for reducing greenhouse gas emissions by 80% by 2050.

The Forestry Commission Scotland has reviewed the potential for increasing the supply of wood biomass for use in providing renewable energy[10]. In combination with woody biomass, waste biomass is now widely acknowledged as the major contributor to renewable bio-energy in Scotland. In combination these sources of fuel can provide both renewable electrical power and renewable heat.

As part of a package of renewable energy measures, the Scottish Climate Change Bill[8] will include a provision to create a duty to publish a Renewable Heat Action Plan for Scotland and a requirement to report regularly on progress.

The Scottish Government recently consulted on a Renewable Energy Framework[11] and the results of this consultation are available[12]. The framework proposed an indicative target of 11% heat demand to be sourced from renewable heat by 2020. The Action Plan is being finalised, and will be published within the Renewable Energy Action Plan during the summer 2009. It will promote renewable heat in a range of areas, including raising awareness and consumer information; skills needs, particularly for installation; building regulations; and encouraging heat mapping at a local authority level.

Section 1 links:

1. *Guidelines for thermal treatment of municipal waste August 2004*:
   www.sepa.org.uk/waste/waste_regulation/energy_from_waste.aspx
2. The Cabinet Secretary's 'New vision for waste' statement, 24 January 2008:
   www.scotland.gov.uk/News/This-Week/Speeches/Greener/vision-for-waste
3. Waste Incineration Directive (2000/76/EC):
   http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0076:EN:HTML
4. The evaluation of energy from biowaste arisings and forest residues in Scotland:
   www.sepa.org.uk/waste/moving_towards_zero_waste/waste_hierarchy/recovery.aspx
5. SEPA guidance: *Is it waste? Understanding the definition of waste*:
   www.sepa.org.uk/waste/waste_regulation/is_it_waste.aspx
6. National waste plan 2003 and area waste plans:
   www.sepa.org.uk/waste/waste_publications/waste_plans.aspx
7. National Planning Framework (version before Parliament – January 09):
   www.scotland.gov.uk/Publications/2008/12/12093953/20
8. Climate Change (Scotland) Bill:
   www.scottish.parliament.uk/s3/bills/17-ClimateChange/b17s3-introd.pdf
9. Scottish renewable heat plan and Government response:
   www.scotland.gov.uk/Resource/Doc/215382/0057632.pdf
10. Forestry Commission Scotland – *Wood Fuels Task Force Report* and Ministerial response:
    www.forestry.gov.uk/pdf/WFTFfinalreport.pdf/$FILE/WFTFfinalreport.pdf
    www.forestry.gov.uk/pdf/sgwoodfuel.pdf/$FILE/sgwoodfuel.pdf
11. Draft framework for the development and deployment of renewables in Scotland, 5 November 2008:
    www.scotland.gov.uk/Publications/2008/11/05115324/0
12. Draft renewables consultation responses:
    www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/REFSummary

Other sources of relevant information:

Energy white paper: *meeting the energy challenge:*
www.berr.gov.uk/whatwedo/energy/whitepaper/page39534.html

The Sustainable Development Commission paper: *A Burning Issue*:
www.sd-commission.org.uk/publications/downloads/A%20Burning%20Issue%20-%20energy%20from%20waste%20in%20Scotland.pdf

Scottish Government Zero Waste Think Tank:
www.scotland.gov.uk/Topics/Environment/Waste/wastestrategy/zero-waste-think-tank

The Landfill Directive:
http://ec.europa.eu/environment/waste/landfill_index.htm

The requirements of the Landfill Allowance Scheme:
www.scotland.gov.uk/Publications/2005/06/08111144/11463

Scottish Government Renewable Energy Framework (heat and banding):
www.scotland.gov.uk/Publications/2008/11/05115324/16

2 SEPA's role as a planning consultee

2.1 SEPA and planning

The Planning etc (Scotland) Act 2006[13] makes provision for strategic development planning authorities and planning authorities to seek the views of key agencies in the preparation of strategic and local development plans respectively. As a key agency SEPA therefore expects to engage early in development plan preparation. The 2009 guidelines will provide an effective lever in spatial policy development, as well as in developing policies and allocating sites.

As part of their preparation, development plans are subject to Strategic Environmental Assessment (SEA). This involves assessing policies and proposals in the development plans (including those relating to thermal treatment of waste) in order to identify their significant environmental effects and, where appropriate, how they might be mitigated. The selection of sites and consideration of reasonable alternatives for proposals is a key activity in the assessment, and should be clearly reported in the environmental report. In its role as both a key agency and a Strategic Environmental Assessment consultation authority, SEPA will comment on both policies and proposals relating to thermal treatment.

SEPA is also a statutory consultee on development proposals, and *Scottish planning policy SPP 10: Planning for waste management*[14] makes it clear that SEPA's thermal treatment guidelines should be used by planning authorities in developing policies, allocating sites and assessing development proposals. This section sets out how SEPA intends to use the guidelines to fulfil its role in the land use planning system and to outline the type of information which would assist it to comment effectively on development proposals.

One of the reasons for consulting SEPA on development proposals is to find out whether a development is likely to be capable of being consented by SEPA. In terms of waste management proposals, an additional purpose of the consultation is to indicate whether the development is likely to be consented in the context of the National Waste Strategy, the National Waste Plan[6] and area waste plans.

To avoid overlap with planning conditions, SEPA will, when consulted, offer advice on matters relevant to planning and indicate which matters should be reserved for environmental licensing. As a priority, SEPA will also be working on internal guidance on SEPA's approach to assessing "consentability" at the planning stage.

In order to fulfil SEPA's role as a planning consultee, all planning applications must provide sufficient information to address a range of criteria. Details of the criteria that are relevant to National Waste Strategy issues and which SEPA is required to consider are set out in Section 4 of SEPA's internal guidance for commenting on planning applications. Key principles relevant to planning applications for thermal treatment facilities are set out in the following sections.

2.2 The 'proximity principle'

National planning policy and guidance outlines that waste should be handled as close to source as possible: otherwise known as the 'proximity principle'. *Scottish Planning Policy 10*[14] explains that this refers principally to dealing with waste as close as possible to where it is produced. As far as possible this principle will apply at Area Waste Plan level. The proximity principle applies to avoiding the adverse environmental impacts of unnecessary transport. It is therefore a key land use planning consideration in terms of the location of a proposed facility. Further advice on the proximity principle is currently contained within paragraph 2.1.2 of the *National Waste Plan 2003*[6] and *Scottish Planning Policy*.

In order to demonstrate compliance with the proximity principle, applicants should provide information about:

- where the waste arises or will arise;
- the quantities and types of waste;
- the current destination of waste for treatment/disposal.

We also recommend that information on existing and proposed treatment facilities in the area and transport methods is provided, to demonstrate how the facility will assist the delivery of an integrated network of waste management facilities.

2.3 Capacity and need

Planning advice note PAN 63: Waste management planning[15] provides detailed planning advice on the need for a waste management facility, which is highlighted as a planning consideration within this document.

The requirement to demonstrate need is also highlighted within Scottish Planning Policy, which explains that SEPA can provide information to assist in establishing and verifying need. In this regard, SEPA holds waste data information on the capacity of existing facilities and existing waste arisings in the area, and developers should contact their local SEPA office for advice. Information on data held by SEPA is also available on the waste data page on SEPA's website[16]. It is understood that work on existing and required waste management capacity may be carried out as one of the actions of the second National Planning Framework[7], and this should assist developers and planning authorities to consider the need for the development. The review of the National Waste Management Plan will assist this process.

It is the applicant's responsibility to submit information in support of the need for the development. This information is similar to the type considered for the proximity principle and is as follows:

- Baseline information quantifying amount, geographical location/source and type of waste to be dealt with at the site, including details of any waste growth assumptions used.
- Details of existing waste treatment/disposal practises and facilities for the waste stream concerned and rationale for the additional facility.
- Details of existing and proposed waste treatment facilities in the area, ie the existing and proposed capacity.
- Details of the proposed scale of the development and how it relates to the Scottish Government's 25% cap[17] on the thermal treatment of municipal waste by 2025.
- Any action the developer may take to further increase the recovery of recyclate at the proposed facility.

This type of information will help to establish whether the proposed capacity of the facility will help support sustainable waste management and not impede recycling and waste prevention. The Scottish Government's presumption against large scale inefficient energy from waste facilities should also be noted. To this end, SEPA has defined capacity in the following way based largely on the practicalities of heat use:

- Small scale < 100,000 tonnes per annum
- Medium scale 100,000 – 300,000 tonnes per annum
- Large scale > 300,000 tonnes per annum

2.4 Site selection

The selection of sites and reasonable alternatives for proposals is a key Strategic Environmental Assessment issue (as noted in Section 2.1). Therefore, in due course, the plan-led approach will provide more effectively for the determination of applications that explain why the proposed site is considered to be preferable to any other shortlisted sites

In the meantime, the application should address the planning site selection process, how this was drawn up, and why site selection criteria were chosen. This should be based on national, strategic and local planning policy, including consideration of locating the facility close to existing or future users of heat and power. SEPA has produced a paper[18] on how to approach site selection based upon national planning policy and guidance, which may be of assistance.

Planning for waste management facilities[19], a research report undertaken for the Office of the Deputy Prime Minister, also provides detailed guidance on the footprint/land take and relevant planning characteristics of different facilities. This was used to produce SEPA factsheets on technologies[20].

In many cases, where environmental impact assessment applies, that information will be captured in the environmental statement in relation to alternatives, the characteristics of the development; location and the potential impact. Applicants should refer to *Scottish planning series planning, circular 8/2007: The Environmental Impact Assessment (Scotland) Regulations 1999*[21].

2.5 Treating residual waste only

The developer should demonstrate that only residual waste will be treated within the facility, and how they will ensure this takes place. For sites with an onsite material reclamation facility the requirement in respect of residual waste applies to material feeding into the thermal treatment facility. This is a land use planning issue as, for example, provision of facilities to extract recyclable and compostable material may affect the site size and layout.

Applicants should submit information regarding:

- the types of waste to be treated;
- the proposed condition of the waste on arrival;
- how additional recyclable and compostable material will be extracted at the facility prior to the thermal treatment process, if appropriate, with details provided of the facilities required on site to achieve this. This should include details of how ash from any combustion plant will be dealt with.

2.6 Recovery of heat and power

Section 3.1 explains that the core purpose of the 2009 guidelines is to ensure that new thermal treatment facilities do not impede recycling or waste prevention opportunities and that they maximise the recovery of energy. This position is reinforced by *SPP10: Planning for waste management*[14], which emphasises that thermal treatment technology is more beneficial if both heat and power can be recovered, or if it delivers combined heat and power. It is also reinforced by *SPP 6: Renewable energy*[22], which highlights that energy from waste forms part of renewable energy technologies. This issue of heat and power recovery must be fully addressed through development plans and at the planning and environmental licensing application stages, in order to determine whether or not the location is acceptable. Consequently, SEPA will consider this issue of heat and power recovery and compliance with the 2009 guidelines when commenting on planning applications.

The type of information that should be addressed at the planning stage is set out in **Annex 2** of this document, which details the requirements of a heat and power plan for submission with the planning application and for an environmental licence application (PPC). This plan should detail how the facility operators will utilise the energy produced by the facility. The information is relevant to the planning application process as it demonstrates that the location of the facility is such that energy recovery is possible and also ensures that any design requirements (eg provision of pipe-work to edge of site, technology choice, etc) are built in at the planning stage.

Please note: SEPA will co-operate and engage in the preparation of development plans to explore opportunities for the favourable location of thermal treatment of waste plants and end users.

2.7 Demonstration that the proposal is the best practicable environmental option

At present, area waste plans identify the 'best practicable environmental option'[23] for treatment of municipal waste, which can help to inform individual proposals where municipal waste is to be handled. In the context of a planning application, demonstrating that a proposal is the 'best practicable environmental option' would not require undertaking a full assessment as carried out as part of the area waste plan process. Instead, it means considering the environmental effects of the proposed development, comparing it to the existing waste management practises (the 'do nothing' option) and other potential alternatives (where viable), in order to assess whether the proposal represents the 'best' option in environmental terms. While the environmental impact assessment requires an outline of the main alternatives studied by the applicant, and an indication of the main reasons for the choice (taking into account environmental effects), a best practicable environmental option assessment would also address:

- carbon emissions (including the assessment of transport implications);
- climate change implications (eg global warming and net release of greenhouse gases such as carbon dioxide and methane);
- non renewable resource use.

It is recognised that there are often practical considerations, such as costs, and developers may wish to highlight how these have been taken into account when explaining the choice.

SEPA staff can signpost examples of how developers have addressed the best practicable environmental option issue, and provide advice and assistance. To assist, use could be made of life cycle analysis.

2.8 Making use of life cycle analysis

The main environmental impacts for municipal waste included in the 'best practicable environmental option' decision-making process for area waste plans were assessed using life cycle analysis. This is a technique that assesses the environmental impacts of the whole system, rather than its individual parts. It takes into account all aspects of the waste management system, including infrastructure, transportation of waste and the relative impacts and benefits of managing different materials in different ways. It should be noted that life cycle analysis should not be used to make decisions in isolation. Rather, it is a tool to assist the overall decision-making process and needs to be used in conjunction with other factors, such as cost and deliverability. Life cycle analysis can also be useful in evaluating options for some aspects of commercial and industrial wastes management. Information on the use of the Waste and Resources Assessment Tool for the Environment (WRATE), as well as SEPA guidance on life cycle analysis can be found within Section 2 links[24].

Life cycle analysis normally covers the following issues:

- Global warming impacts
- Eutrophication
- Acidification
- Abiotic resource depletion
- Human toxicity and freshwater aquatic toxicity

2.9 Relationship between planning application process and SEPA's environmental licensing process

Due to the wide range of information required by SEPA in order to comment in its capacity as consultee at the planning application stage, all potential applicants are encouraged to discuss their proposals with SEPA at an early stage. It is strongly recommended that applicants contact SEPA at, or prior to, the planning application stage to discuss the potential environmental licensing requirements. This will ensure that all relevant information can be gathered and presented with the application for planning consent and/or environmental licence.

In many cases, planning applications are made in advance of the application for an environmental licence. If the information supplied with the planning application is deficient this can, and has, resulted in SEPA expressing reservations or objecting on key environmental matters. It is therefore essential that the planning application (including any environmental impact assessment required by the planning authority) contains the information SEPA needs in order to provide a full and complete response to the planning consultation. It should be noted that the type of information required covers more than the National Waste Strategy issues outlined above, also encompassing matters such as air quality, hydrogeology, noise and odour.

SEPA recognises that in some circumstances the information readily available at the planning stage may not be sufficient to satisfy the requirements of the PPC application, for example detail design is incomplete. As a minimum, the planning application must provide the necessary information to inform SEPA on key environmental matters including a detailed examination of energy recovery and use.

A key objective of these guidelines is to deliver efficient energy recovery in thermal treatment of waste developments. In this respect we strongly recommend that the guidelines are used in their entirety by the planning system.

The following checklist sets out the key issues to be addressed at the planning and licensing stages:

- Compliance with the proximity principle.
- Demonstration of 'need'.
- An explanation of the site selection process based on national planning guidance.
- demonstration that only residual waste will be treated with details provided of any facilities required.
- Demonstration of how energy recovery will be maximised and that the location of the site is such that this can be achieved.
- Demonstration that the proposal represents the best practicable environmental option for the waste stream.

SEPA will also require sufficient information at the planning stage on environmental impacts to enable it to comment as to whether the development is 'capable' of being consented by SEPA.

Key environmental licensing issues

Under the Pollution Prevention and Control (Scotland) Regulations 2000[25] (otherwise known as 'PPC'), SEPA is the environmental licensing authority for waste thermal treatment plants. Key areas to be addressed by a thermal treatment application are as follows, and are also detailed in **Section 3**:

- A demonstration that the development employs 'best available techniques' and that alternative techniques have been fully considered.
- A demonstration that energy will be recovered efficiently.
- A detailed demonstration that emissions from the plant will not have any adverse impacts on the environment and human health.
- A detailed list of waste types and amounts in order to demonstrate that the plant is suitably designed to deal with these wastes.
- All wastes generated on site will be minimised and where generated shall be recovered or disposed of without causing any significant harm to the environment or human health.

Please note: When responding to planning applications as a statutory consultee, SEPA will highlight those areas which it can control through its licensing regime and those which it considers appropriate for the Planning Authority to control through planning condition.

2.10 Partnership issues

Partnerships between local authorities, energy utilities, economic development agencies and the waste industry may be necessary in developing suitable thermal treatment facilities that provide both the necessary waste management solutions and the efficient use of energy at an acceptable cost. These partnerships will principally relate to the arrangements necessary to the development of long term uses of the heat produced from thermal treatment facilities, including installation of heat distribution schemes, as well as to the use of other potential sources of biomass available as feed-stock in the area. It is likely that most facilities will treat both municipal and commercial and industrial wastes and may also seek to utilise additional feed-stocks including dewatered sludge and the primary and secondary bio-fuels detailed in **Section 1.1**.

The amount and type of municipal, commercial and industrial waste and other sources of biomass will depend largely on local industries and geographical considerations, as well as the outcome of emerging policies in areas such as landfill bans. However, significant opportunities exist for partnerships that utilise both waste and non waste sources of biomass for energy purposes.

Section 2 links:

13. Planning etc. (Scotland) Act 2006
    www.opsi.gov.uk/legislation/scotland/acts2006/asp_20060017_en.pdf

14. *Scottish planning policy SPP 10: Planning for waste management*:
    www.scotland.gov.uk/publications/2007/08/28161910/0

15. *Planning advice note PAN 63: Waste management planning*:
    www.scotland.gov.uk/70382

16. SEPA waste data
    www.sepa.org.uk/waste/waste_data.aspx

17. Scottish Government guidance on determining 25% baseline and input/output calculation methodology in relation to the 25% figure is to be produced as part of the review of the National Wast Management Plan:
    www.scotland.gov.uk/Topics/Environment/Waste/wastestrategy

18. SEPA guidance on site selection (see last paragraph):
    www.sepa.org.uk/waste/moving_towards_zero_waste/waste_planning/development_planning.aspx

19. Office of the Deputy Prime Minister research report, *Planning for waste management facilities*:
    www.communities.gov.uk/documents/planningandbuilding/pdf/148385.pdf

20. SEPA fact sheets on technologies:
    www.sepa.org.uk/waste/information__resources/resources.aspx

21. *Scottish planning series planning circular 8-2007: The Environmental Impact Assessment (Scotland) Regulations 1999*:
    www.scotland.gov.uk/Publications/2007/11/30082353/0

22. *Scottish planning policy SPP 6: Renewable energy*:
    www.scotland.gov.uk/Publications/2007/03/22084213/0

23. Detailed guidance on the interim use of best practicable environmental option:
    www.sepa.org.uk/waste/moving_towards_zero_waste/national_waste_plan/best_practicable_environmental.aspx

24. Detailed guidance on the use of life cycle analysis:
    www.sepa.org.uk/waste/waste_publications/research_and_development.aspx
    www.sepa.org.uk/waste/moving_towards_zero_waste/lifecycle_assessment_lca.aspx

25. The Pollution Prevention and Control (Scotland) Regulations 2000:
    www.opsi.gov.uk/legislation/scotland/ssi2000/20000323.htm

Other sources of relevant information:

SEPA guidance on commenting on planning applications for National Waste Strategy interests:
www.sepa.org.uk/waste/moving_towards_zero_waste/waste_planning/development_management.aspx

3 SEPA's permitting policy for waste thermal treatment plants

3.1 Environmental licensing

SEPA believes that the majority of waste thermal treatment plants will be subject to environmental licensing requirements as Part A installations under the Pollution Prevention and Control (Scotland) Regulations 2000[23] (PPC regulations), as amended. The Integrated Pollution Prevention and Control Directive (IPPC)[26] requires Part A installations to operate in such a way that all preventative measures are taken against pollution, in particular through the application of the best available techniques, and to ensure that no significant pollution is caused. Additionally, SEPA believes that a significant number of these plants will be subject to the technical requirements of the Waste Incineration Directive (WID) (2000/76/EC)[3].

There may therefore be a small number of waste thermal treatment plants that will not be subject to PPC Part A controls, normally because of the nature of the waste to be treated or due to their size. These plants may still be required to be licensed via PPC Part B or the waste management licensing regimes, as appropriate. Plants subject to PPC Part B are required to apply best available techniques, as described above, with respect to emissions to air only.

Applicants are strongly advised to consult with SEPA at a very early stage on the nature of the environmental licence required. This is a critical step in any development.

SEPA cannot impose conditions relating to the recovery of energy or energy efficiency within waste management licences or PPC Part B permits; this is due to the existing regulatory framework. Further, there may be some cases where a waste thermal treatment plant also operates under a permit granted under the Greenhouse Gas Emissions Trading Scheme Regulations (EU ETS)[27]. This may be the case when a plant is also considered to be a combustion activity in excess of 20MW thermal input and which is not burning hazardous or municipal waste as part of the fuel mix. In such cases, the PPC regulations place limitations on the types of conditions that may be imposed in relation to the emission of carbon dioxide. Specialist advice is required from SEPA if this situation may apply to you.

Regardless of the conditions that may be imposed in any environmental licence, SEPA firmly believes that energy recovery and efficiency and consequent carbon reduction opportunities are relevant matters for consideration at the planning application stage, and we will advise planning authorities as appropriate. Applicants for waste thermal treatment plants which will not be licensed as a PPC Part A installation should therefore still refer to the 2009 guidelines, even though SEPA may not impose any consequential requirement within their environmental licence.

In view of the above, further references in this section will not be to environmental licences in general, but rather to permits for Part A installations under the PPC regulations ('PPC permit').

3.2 Techniques and technology

The main basis for determining the appropriate standards that should be applied in a PPC permit is known as the 'best available techniques' (BAT)[28]. The PPC regulations define this as: "the most effective and advanced stage in the development of activities and their methods of operation, which indicates the practical suitability of particular techniques for providing in principle the basis for emission limit values (ELVs) designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole".

The PPC regulations provide further definition on what is meant by 'best' and 'available techniques', and list the matters that should be given special consideration (subject to the likely costs and benefits and the principles of precaution and prevention) when determining BAT (Schedule 2 of the PPC regulations).

The Waste Incineration Directive (WID)[3] was implemented in Scotland by the Waste Incineration (Scotland) Regulations 2003[26]. The directive lays down specific technical requirements for incineration and co-incineration plants which must be achieved. Requirements comprise the mandatory minimum technical and emission standards for waste thermal treatment plants that are incineration or co-incineration plants under WID, and will also be considered by SEPA to be the minimum requirements in terms of the PPC regulations for waste thermal treatment plants that are not incineration or co-incineration plants. However, such requirements are not the only consideration; it is possible that the setting of more stringent emission limit values than those detailed in the directive may be required under the PPC regulations for certain installations, for example to comply with air quality standards and/or objectives. The applicant will need to demonstrate best available techniques across the full range of areas listed in Schedule 2 to the PPC regulations, bearing in mind the likely costs and benefits of the measures.

A core purpose of these guidelines is to ensure that new waste thermal treatment plants do not impede recycling or waste prevention opportunities and that they promote the efficient recovery of energy. Accordingly, at the planning and PPC permit application stages, information should be provided to demonstrate that energy is recovered as far as practicable and that energy is used efficiently. To confirm compliance with the 2009 guidelines, SEPA strongly recommends that this information is supplied in the form of a heat and power plan. Further information on developing one of these plans is available in **Annex 2**. If the PPC permit application is made after the planning application stage then an updated heat plan should be submitted, with the PPC permit application taking into account any new information obtained since the planning application was made.

At the PPC permit application stage, applicants must undertake an assessment which demonstrates that the techniques proposed are appropriate for the use to which they are to be put. Techniques not only includes the technology to be used but also how the installation is designed, built, maintained, operated and decommissioned. (Regulation 3 of the PPC regulations.) The degree of energy efficiency of these types of facilities depends on whether or not they recover electrical and/or heat energy individually or together. While the 2009 guidelines do not indicate a preference for any particular technology, PPC permit applications must fully justify the choice of techniques to be applied. However, it should also be noted that incentive systems such as the Renewable Obligation (Scotland) (ROS)[30] may favour particular types of technologies.

It should be noted that 'waste thermal treatment' is a generic term covering processes that involve the use of heat to treat waste. Incineration is the most common thermal treatment process, but this is not exclusive. A meaning of 'thermal treatment' is provided in the Waste Incineration Directive (WID)[3] and further guidance on the meaning of thermal treatment found in the *WID Practical guide*[29].

To avoid doubt, some processes use heat as part of the treatment, but the addition of heat itself to a process is not considered by SEPA to be thermal treatment as defined in the WID. For example, anaerobic digestion, which generates a gas that can be used as a fuel, is primarily a biological treatment process which uses some heat to facilitate the biological processes. However, for the purposes of the 2009 guidelines and to ensure that energy is recovered from waste as efficiently as possible, anaerobic digestion plants will be treated by SEPA in a similar way with respect to energy, as waste thermal treatment plants as defined by the WID. As a consequence, SEPA considers that anaerobic digestion plants will have to meet the requirement to recover and use efficiently the energy contained in the generated bio-gas as far as is practicable.

The 2009 guidelines will therefore be applied to, and appropriate conditions imposed in PPC permits for waste thermal treatment plants, even if the thermal treatment itself is not subject to the requirements of the Waste Incineration Directive[3]. For example, as explained above, an application for an anaerobic digestion facility, which could be licensed under PPC Part A on grounds of its size and would not otherwise be subject to WID requirements, will have to include information on how energy in the bio-gas will be used efficiently, including recovering energy as far as practicable.

3.3 The recovery and efficient use of energy

Where there are opportunities to effectively use energy from waste in the form of electricity and heat in a mature heat network infrastructure, high overall thermal efficiency levels in excess of 60% can be achieved.

SEPA recognises that Scotland does not yet have mature or extensive heat use networks. The Scottish Action Plan for Renewable Heat summarised in **Section 1** will provide a framework for development over time. However, there are immediate opportunities for reliable and extensive heat use by co-locating thermal treatment plants with existing energy and heat intensive industries or public developments such as leisure complexes, shopping centres, eco-industrial parks and food production systems. Applicants should therefore consider the location of their development very carefully to maximise the opportunities for rapid energy uptake. Options for using recovered energy for cooling should also be considered via use of heat pumps etc.

SEPA considers that measuring thermal efficiency is a sensible approach as it is an accurate reflection of the need to recover heat in achieving higher levels of efficiency. However, we also recognise that, until a national policy and incentive framework is developed to stimulate heat use, a simple target for thermal efficiency could initially act as a barrier to the recovery of energy from waste as far as would be practicable.

SEPA has therefore set energy efficiency targets and adopted the Quality Assurance for Combined Heat and Power (CHPQA) standard[31] [as published by the Department for the Environment, Food and Rural Affairs (Defra)] as the approach to establish how much energy is being recovered from waste thermal treatment plants.

SEPA would expect that new waste thermal treatment plants on starting operations achieve a minimum level of energy recovery based on high efficiency electrical power generation. As a consequence, any PPC permit application for a new waste thermal treatment plant will need to demonstrate that it can achieve at least 20% (gross calorific value basis)

energy recovery as electricity. For plants starting with electricity and heat or heat only, SEPA would expect an equivalent level of energy recovery at the outset. Subsequently, through the application of a heat and power plan, SEPA would expect to see heat being used appropriately and the plant moving towards good quality combined heat and power status within the shortest practicable time. This includes complying with the criteria for achieving certification under the CHPQA standard and, consequently, the requirements of the Directive on Co-generation of Energy (2004/8/EC)[32]. Thereafter, as public policy and incentives for heat use develop, facilities should be in a position to achieve even higher levels of efficiency over time. SEPA's expectations and additional details on the use of the CHPQA scheme by SEPA are set out in **Annex 1**.

The design and construction of the plant must provide for the available floor space/infrastructure/facilities to allow for the installation of additional energy recovery equipment, such as heat exchange and/or heat pump systems. A point of connection to allow steam/hot water to be taken to a heat recovery system will be required; for example in the case of high efficiency electricity generating steam turbines, suitably designed steam off takes should be installed to provide high quality heat for use in an appropriate heat network/supply.

Achievement should be demonstrated by providing information in accordance with the CHPQA standard[31]. SEPA does not expect that any applicant will be required to provide a formal CHPQA certificate during the environmental licensing process, although possession of such certification will provide reassurance regarding the applicant's proposals.

For clarity, in adopting the CHPQA standard, SEPA is also adopting the terminology, definitions of, and methods used in that standard.

SEPA would expect that existing waste thermal treatment plants, plants already with planning consent, and those under construction, should submit a heat and power plan that demonstrates how progress towards good quality combined heat and power standards can be achieved. In these circumstances SEPA intends, in due course, to insert relevant conditions into PPC permits for existing facilities requiring the submission, by the end of 2010, of a heat and power plan.

3.4 Information requirements

It is incumbent on the applicant for a PPC permit to operate a proposed waste thermal treatment plant to provide the information required in Schedule 4 to the PPC regulations [including the additional information required by the Waste Incineration Directive (Para 1B of Schedule 4 to the PPC regulations) where the proposed plant is an incinerator or co-incinerator]. SEPA has published guidance on making an application for a PPC permit[33, 34].

By adequately addressing these issues within an application, SEPA is more likely to consider the application as duly made. This will avoid the application being returned and/or requests for further information being made, which can result in a delay to its determination. Ultimately, if the applicant cannot provide the relevant information in the PPC permit application, it can be deemed to be withdrawn. Similarly, if the information demonstrates that the requirements of the PPC regulations cannot be met then the granting of the PPC permit may be refused.

The following list presents the key points that should be addressed when applying for a PPC permit. (Please note that it is not exhaustive and developers should still contact SEPA prior to submitting an application.)

1. The applicant must carry out an environmental impact assessment which proves that the projected emissions will not have any significant adverse impact on the environment and human health (this can be the assessment undertaken for planning purposes, if it includes all of the required information). This would include noise emissions and odours, as well direct, indirect and fugitive emissions to air, water or land, for example via hydro-geological or air quality impact assessments.

   Rationale: In accordance with the PPC regulations, SEPA will place strict controls on emissions and may also impose stricter emission limit values than those specified in the Waste Incineration Directive, as local conditions require. A robust impact assessment is required to reassure SEPA and the local community that operations will be undertaken without adverse impact on the environment or human health.

2. The applicant must demonstrate that the techniques (including technology) they intend to adopt will comprise best available techniques (BAT). This must also include a description of the main alternatives they have considered. Notwithstanding this, a demonstration will also be required to show compliance with the technical requirements of the Waste Incineration Directive[3] (if appropriate) and also with relevant guidance such as: *Sector Guidance Note IPPC S5.01: Guidance for the incineration of waste and fuel manufactured from or including waste*[35]; and the *European BAT Reference Document (BREF) on waste incineration*[36] and the *Waste Incineration (Scotland) Regulations 2003 Practical guidance version 2*[29], dated April 2005.

Rationale: In order to ensure that the best available techniques are being used by the applicant, SEPA will, during the determination of any application, take into account alternative techniques and, if necessary, reflect these techniques in any PPC permit granted. A description of the technique adopted and alternatives considered will reassure SEPA that a proper BAT assessment has been undertaken and that the best techniques are being adopted. The relevant technical guidance documents listed above provide information on the availability of techniques with an indication of BAT. Any applicant will need to submit relevant documentation to justify what they propose as BAT, and how they will address issues raised in the above guidance documents. SEPA will have full regard of the contents of these guidance documents (and subsequent updates) when determining the application and drafting the conditions to be placed in a PPC permit.

3. SEPA expects the applicant to provide a detailed list of the amount of waste and waste types that will be treated in the thermal treatment plant, as well as a demonstration that all waste likely to be accepted can be treated to comply with BAT and prevent or minimise the impact on the environment and human health.

   Rationale: SEPA is required to specify the amount of waste and waste types to be treated in any PPC permit granted for a waste thermal treatment plant. This is to ensure that the amounts and types of waste are suitable and appropriate for the technology and techniques that are to be adopted.

4. The applicant should demonstrate that all waste likely to be generated on site, such as ashes and air pollution control residues, will be minimised or, where that waste is produced, recovered. Where this is technically and economically impossible, waste must be disposed of while avoiding or reducing any significant impact on the environment or human health. A clear description needs to be made about where wastes are generated and their nature (eg maintenance waste, bottom ashes and air pollution control residues from abatement plants). Applications must also show the proposed disposal (including recycling/reuse) route for these wastes and that it is using the best available technique.

   Rationale: This is specifically required by Schedule 4 to the PPC regulations. Controls on the techniques used to dispose of and/or recycle the residues from the waste thermal treatment plant can be imposed in a PPC permit to ensure that harm to the environmental or human health is avoided.

5. The applicant should demonstrate that the energy recovered from the waste at the proposed facility is as high as practicable and that utilisation of power and/or heat will be provided and used efficiently.

   Rationale: This information is specifically required by Schedule 4 to the PPC regulations on ensuring energy is recovered as far as is practical. SEPA considers that the information it requires to make this assessment can be best provided in the form of a heat and power plan. **Annex 2** contains details of the requirements of such a plan for submission with any application for any PPC permit. SEPA understands that the organisation of delivery of heat to users will take time, and that the heat and power plan should detail the early options for heat use as well as future potential options. The time over which the heat and power plan will be delivered will be specific to each application. During the PPC permit application process, SEPA also requires the applicant to demonstrate how that energy will be used as efficiently as possible. SEPA will also consider the amount of electricity or heat that will be used by the plant in that determination and needs to be convinced that this energy will be utilised as efficiently as possible.

3.5 Public participation, appeals and enforcement

As a consequence of the Public Participation Directive[37], new or substantially changed waste thermal treatment plant applications will be subject to enhanced public participation. This involves public consultation on the application when it is received by SEPA and further public consultation when SEPA has come to any decision on a draft PPC permit.

Any applicant can appeal a decision by SEPA to refuse to grant a PPC permit or to appeal the specifics of any condition imposed within a permit. Details on making an appeal are provided at the time of refusal to grant or on the granting of a PPC permit.

Where conditions are included in a PPC permit SEPA expects that those conditions will be complied with. SEPA's enforcement policy details the types of enforcement action that could follow non compliance with PPC permit conditions.

Section 3 links:

26. The Integrated Pollution Prevention and Control (IPPC) Directive:
    http://ec.europa.eu/environment/air/pollutants/stationary/ippc/index.htm

27. The Greenhouse Gas Emissions Trading Scheme Regulations 2005:
    www.opsi.gov.uk/si/si2005/uksi_20050925_en.pdf

28. Further information relating to BAT (please see PPC supplementary guidance note 3 – Required standards and BAT including factors to be considered in determining BAT):
    www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/sepa_guidance.aspx

29. *The Waste Incineration (Scotland) Regulations 2003 Practical guidance, Edition 2 April 2005* ISBN 0-7559-3993-X:
    www.scotland.gov.uk/publications/2005/04/19140354/03551

30. The Renewables Obligation (Scotland) Order 2009 (subject to annual updates):
    www.opsi.gov.uk/legislation/scotland/ssi2009/draft/sdsi_9780111003268_en_1

31. The Quality Assurance Combined Heat and Power (CHPQA) standard:
    www.chpqa.com

32. Directive on the promotion of cogeneration based on a useful heat demand in the internal energy market:
    http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:052:0050:0060:EN:PDF

33. Index to SEPA's PPC website, including information of the regulations, charging and making an application:
    www.sepa.org.uk/air/pollution_prevention__control.aspx

34. Application forms and charging scheme information:
    www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/application_forms.aspx

35. *Sector Guidance Note IPPC S5.01: Guidance for the incineration of waste and fuel manufactured from or including waste*
    www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/s5_waste.aspx

36. *European BAT Reference Document (BREF) on waste incineration:*
    http://eippcb.jrc.ec.europa.eu/reference

37. Public Participation Directive:
    www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/public_participation_directive.aspx

38. Use of CHPQA Methodology for permitting energy from waste plants in Scotland: AEA, 9 October 2008:
    www.sepa.org.uk/waste/waste_regulation/energy_from_waste.aspx

Other sources of relevant information

Legal background

EU Emissions Trading Scheme:
www.sepa.org.uk/air/eu_emissions_trading_scheme.aspx

SEPA's enforcement policies:
www.sepa.org.uk/about_us/policies.aspx

Technologies and techniques

Summary information on the range of thermal treatment and other waste treatment technologies:
www.sepa.org.uk/waste/information__resources/resources.aspx

Energy recovery and energy efficiency

Use of CHPQA Methodology for permitting energy from waste plants in Scotland: AEA, 9 October 2008:
www.sepa.org.uk/waste/waste_regulation/energy_from_waste.aspx

BAT Reference document on energy efficiency:
http://eippcb.jrc.ec.europa.eu/reference

UK Technical guidance note on energy efficiency:
www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/uk_horizontal_guidance/h2.aspx

Applying for a PPC permit

PPC Practical guide to PPC Part A version 2:
www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/sepa_guidance.aspx

Guidance on making an application for a PPC permit:
www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/application_forms.aspx

Annex 1: Application of the combined heat and power quality assurance scheme, with respect to SEPA's thermal treatment of waste guidelines 2009 (referred to in Section 3.3)

A. Applications

SEPA expects applications for planning permission and/or a Part A PPC permit to provide evidence of compliance with SEPA's *Thermal treatment of waste guidelines* 2009 over three key phases; Initial operation, Implementation of the heat plan, and Achievement of a required threshold.

A1. Initial operation

Applicants should demonstrate that on commencement of operations:

- The power efficiency (electrical or mechanical) will be **at least 20%**. The power efficiency shall be estimated and calculated in accordance with the requirements of the relevant Combined Heat and Power Quality Assurance (CHPQA) methodology.
- Where thermal treatment plants initially generate power and heat together or heat only then the demonstration should show that the equivalent energy recovery efficiency will be **at least 20%** on commencement.
- Where a thermal treatment plant initially generates power and heat together, the relevant Quality Index (QI) value for that type of plant and fuel type should also be estimated and supplied.
- The boundaries used for calculating energy efficiencies should be set using the CHPQA methodology as noted in **Annex 3**. These may differ from any installation boundary specified in the PPC application describing the installation and should therefore not be confused. The boundaries used for energy efficiency estimates and calculations should be clearly identified in any application.
- A demonstration that, where a proposed thermal treatment plant will not have heat recovery equipment installed at the commencement of operations (ie power only), that the installation and future development of heat recovery is not precluded by the initial design and construction of the plant. The demonstration shall include information on how future equipment can be installed and likely timescales for installation (in accordance with the heat plan in **Annex 2**). Technology choices must take into account future recovery and utilisation of energy.

A2. Implementation of a heat and power plan (as described in Annex 2)

This should show how, within a period of five to seven years from commencement of operations, further energy can be recovered over and above the initial operational energy recovery. The heat and power plan should provide details of how the applicant proposes to achieve the QI values specified in the table below and should give an indication of anticipated progress in terms of annual QI values for each year up to the end of the heat plan period.

A3. Achievement of the required threshold

This should be completed by the end of the heat and power plan period, as set out in Table 1 below.

Table 1: Heat and power plan targets

	Thermal treatment plant not including ACT plants		ACT plant
	Capacity ≤70,000 tonnes /year	Capacity >70,000 tonnes/year	Any capacity
QI value	**85**	**93**	**100**
Indicative efficiency	**30-35%**	**35-40%**	**45%**

The QI value is to be estimated and calculated in accordance with the relevant CHPQA method for that type of thermal treatment plant and fuel type.

Where a thermal treatment plant only provides heat then SEPA would expect that the energy recovery efficiency should be as a minimum the equivalent level for a power and heat plant as indicated in Table 1 above.

'ACT' means advanced conversion technologies, as defined in the Renewable Obligation (Scotland) Order 2009[30]. For the purposes of clarity we have provided below the detailed definition from the order due to the proposal that only electricity from the anaerobic digestion of non-sewage biomass and 'advanced' gasification and pyrolysis techniques will qualify for double renewable obligation certificates under the new banding provisions. 'Standard gasification and pyrolysis will continue to qualify for renewable obligation certificates at the current rate.

'AD' means electricity generated from gas formed by the **anaerobic digestion** of material which is neither sewage nor material in a landfill.

'Advanced gasification' means electricity generated from a gaseous fuel which is produced from waste or biomass by means of gasification, and has a gross calorific value when measured at 25°C and 0.1 megapascals at the inlet to the generating station of at least 4 megajoules per metre cubed.

'Standard gasification' means electricity generated from a gaseous fuel which is produced from waste or biomass by means of gasification, and has a gross calorific value when measured at 25°C and 0.1 megapascals at the inlet to the generating station which is at least 2 megajoules per metre cubed but is less than 4 megajoules per metre cubed.

'Advanced pyrolysis' means electricity generated from a liquid or gaseous fuel which is produced from waste or biomass by means of pyrolysis, and

(a) in the case of a gaseous fuel, has a gross calorific value when measured at 25°C and 0.1 megapascals at the inlet to the generating station of at least 4 megajoules per metre cubed, and

(b) in the case of a liquid fuel, has a gross calorific value when measured at 25°C and 0.1 megapascals at the inlet to the generating station of at least 10 megajoules per kilogram.

'Standard pyrolysis' means electricity generated from a gaseous fuel which is produced from waste or biomass by means of pyrolysis, and has a gross calorific value when measured at 25°C and 0.1 megapascals at the inlet to the generating station which is at least 2 megajoules per metre cubed but is less than 4 megajoules per metre cubed.

The information above is required within any application for a Part A PPC permit by Schedule 4 to the PPC regulations. Any failure to supply all of the information specified in Annexes 1 or 2 may result in the application being returned to the applicant as "not being duly made".

B. Permits

Where a Part A PPC permit is granted by SEPA in respect of an application for a thermal treatment plant, then that permit is likely to, amongst other things, include requirements to:

i) achieve the minimum power (or equivalent) efficiency specified in para A1;

ii) operate and maintain the thermal treatment plant in such a manner to avoid prejudicing additional energy recovery over that achieved on initial commencement of operations (para A1);

ii) maintain and update the heat and power plan (para A2), including a requirement to make annual reports on progress.

iv) achieve a required threshold (para A3).

SEPA will, from time to time, review the requirements of the Part A PPC permit in accordance with Regulation 11 of the PPC regulations.

C. Longer term aims for heat use

In accordance with the best available techniques principle, SEPA expects operators to commit to continual environmental improvement, including an ongoing identification and realisation of additional energy recovery and beneficial use of energy. Scottish and UK Government policy on renewable heat use set out in Section 1, including heat use incentives, will provide a supportive policy framework that should enable progressive increases in renewable heat use over time and towards typical energy use efficiencies in excess of 60%.

D. Further information

Further information on the requirements specified above can be found in the AEA/Fichtner report to SEPA; *Use of CHPQA methodology for permitting energy from waste plants in Scotland*[38], dated 9 October 2008 (number ED02806).

Annex 2: The requirements of a heat and power plan

1. Introduction

The recovery of the inherent energy in the waste processed through a thermal treatment facility provides benefits in addressing a range of issues including climate change, energy security and resource efficiency. The 2009 guidelines now require applicants to indicate how they will utilise the energy in waste efficiently. SEPA believes that high energy recovery efficiencies are readily achievable where energy is recovered as both electricity and heat.

The following information provides the outline format for the heat and power plan that applicants should provide with their planning and Part A PPC permitting applications, to detail how the facility operators will utilise the energy produced by the facility. SEPA will review the heat and power plan periodically to assess progress in meeting the energy recovery objectives and could, if necessary, amend the permit accordingly. Consideration should also be given to the benefit of early discussion with both the local planning authority and the local enterprise company on the requirements for the plan.

SEPA expects a heat and power plan to be submitted at the time of making an application for planning permission and at the time an application is made to SEPA for a Part A PPC permit. Where an application for a Part A PPC permit licence is made after an application for planning permission (ie they are made at different times), the heat and power plan should be updated to take into account any new information available. SEPA acknowledges that at pre-design stage some information may only be available as design estimates, etc. Applicants should make every reasonable effort to ensure that the heat and power plan is completed as far as is practicable, making use of the best information available including estimates and heat uptake forecasts.

The time-scale for implementation of a heat and power plan will normally be between five and seven years, with this timescale starting on commencement of operation of the facility. SEPA recognises that each facility will be different and, as such, will not set specific fixed annual targets during this planning period. Applicants will, however, be expected to provide expected annual progress targets in the form of appropriate Quality Index (QI) values. These progress targets should be tailored to the individual scheme in question but should avoid placing all of the heat use in the latter years of the plan. Please refer to Annex 1 for the expected QI values to be achieved by the heat and power plan.

2. Section format for the heat and power plan

The heat and power plan submitted by applicants should follow the format set out below. SEPA would expect periodic revisions to the heat and power plan over time.

Heat and power plan format:

- Section 1: Description of the facility technology
- Section 2: Description of the waste to be treated and its energy value
- Section 3: Heat and power plan
- Annexes: Any supplementary information referred to in the submitted plans

The heat and power plan

Heat and power plan submission on behalf of (company) for the (site):

Date: ----------

Author: ----------

Designation in company: ----------

Outline of heat and power plan

Section 1: Description of the facility technology

This section must provide the following information:

1.1 The types of heat capture systems the facility will utilise in order to be capable of exporting heat, and details on how the heat could be exported.

1.2 Detail of grid connections for electrical power export, if appropriate, showing evidence from Ofgem (the electricity and gas regulator) that connection to the grid has been authorised or when connection to the grid is likely to be authorised.

1.3 Indicate how heat would be supplied to users, eg potential route of pipe-work to users, indicating any issues such as right of access/way, distribution piping type, hot water storage, back up boiler systems.

Section 2: Description of the waste to be treated and its energy value

This section must provide the following information:

2.1 The waste types and volumes that the facility will process (ie municipal residual waste, commercial and industrial waste etc).

2.2 The calorific values of the wastes to be treated. Major groups of waste must have their individual calorific values provided and an average calorific value should be given based on the relative volumes of major waste groups (eg where municipal waste is to be treated with industrial and commercial waste).

2.3 A breakdown of the energy produced by the facility. Where appropriate, this must include:

- Electrical generation in megawatt hours (MWh) and gigajoules (GJ), produced over a year, showing the details of the calculations for days of operation and planned down time.
- Heat export capability in MWh and GJ.
- Parasitic loads for both electrical and heat energy in MWh and GJ to be used within the facility. Seasonal variation in heat use demand and how this will be managed.

2.4 Detail any assumptions used in generating the heat and power plan, eg down time, seasonal variations, calorific values etc.

2.5 Provide information on the anticipated position with respect to renewable obligations certificates for the electricity from the facility.

2.6 Provide indicative pipe routes and land areas safeguarded for the installation of any necessary heat recovery and distribution equipment.

SEPA appreciates that some of this information may be duplicated in other parts of the application; however it is requested here to allow ease of use and assessment of the heat and power plan.

Section 3: Heat and power plan

This section should provide the following information:

3.1 Identified heat users, including heat demand.

- For each facility using the heat or power, applicants must provide details on the type of facility, the nature of its operation, its location, the annual heat demand expected, and any assumptions in the figures, including information on seasonal variations in heat demand and how this will be addressed.
- Energy use from the facilities/users in MWh and GJ and as a percentage of the total annual energy production as detailed in Section 2.
- Details of the nature of discussions and agreements with potential users.
- Implementation timetable (in years); typically the delivery should not exceed five to seven years, but implementation timescales will be agreed on a case by case basis.

3.2 Potential future heat users, including indicative heat demand.

- For each facility please provide details on the type of facility, the nature of its operation, its location, an indicative annual heat demand, and any assumptions in the figures, including information on seasonal variations in heat demand and how this will be addressed.
- Energy use from the facilities/users in both MWh and GJ as a percentage of the total annual energy production as detailed in Section 2.
- Details of the nature of discussions and agreements with potential users and information on action that needs to be taken to realise these heat use options within the heat plan period.
- Implementation timetable (in years); typically the delivery should not exceed five to seven years, but implementation timescales will be agreed on a case by case basis. Users who may come on line outside the heat plan period can also be identified separately.

3.3 Expected annual Quality Index (QI) values for each year of the heat and power plan and the final QI that will be achieved by the plan. This should also be expressed as a percentage efficiency.

3.4 Outcome of discussion with the planning and economic development department of the local authority, with the local enterprise agency and other relevant development partners or potential heat users.

- Detail the views of, or any discussion with, the local authority planning department on the use of the planning system, including planning gain to drive heat use in emerging developments in the area.
- Detail the views of or any discussion with, the local authority planning department and economic development functions on the development options noted above in Sections 3.1 and 3.2.
- Identify any other development opportunities in the area where heat use could be applied. For example the location of business parks; industrial estates; new housing developments and large scale public infrastructure; and development land designated in development plans, including regeneration potential.
- Detail engagement with the local enterprise office and/or the economic development service of the local authority. What are their views as to the development options where heat use would be viable or beneficial? Do they see any further opportunities in the vicinity of the facility? What action will they take to support the use of heat?
- Detail any other discussions of a strategic nature that have taken place, eg potential development partners and any other developments that may be interested in using waste heat from the facility etc.

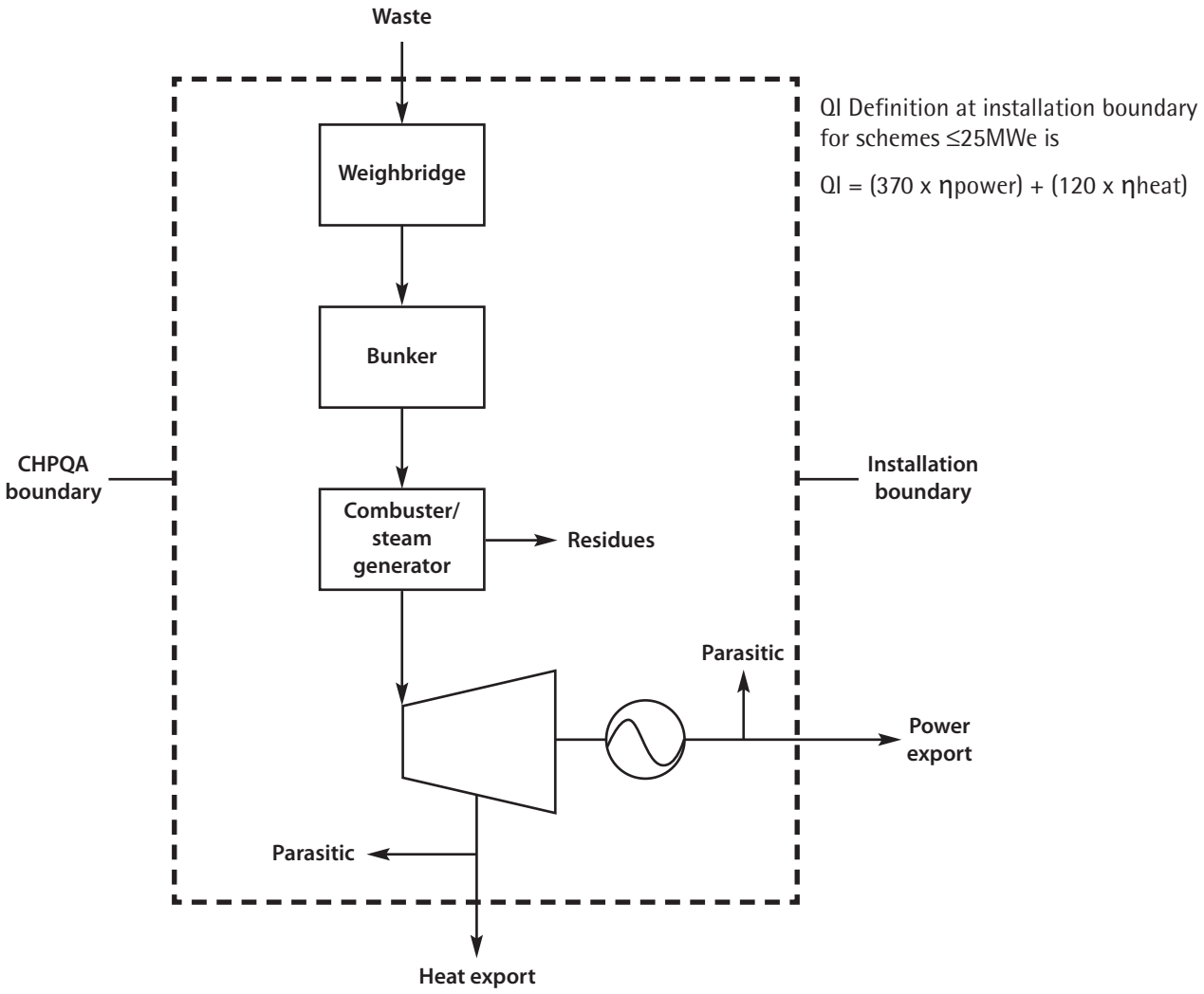
Annex 3: System boundaries

The following examples of system boundaries are for demonstration purposes only. It is important that applicants agree system boundaries with SEPA during the application process. With respect to system boundaries please note the comments in Annex 1, Section A1.

3.1 Boundaries for conventional energy from waste technologies

For conventional moving grate or fluidised bed technologies, this approach is relatively straightforward – fuel input energy is considered at the waste reception. The energy content of the solid heterogeneous fuel input is typically calculated using an energy balance following the losses method. This is set out in CHPQA guidance note 20.

Simplified Installation/CHPQA boundaries for a conventional energy from waste facility:

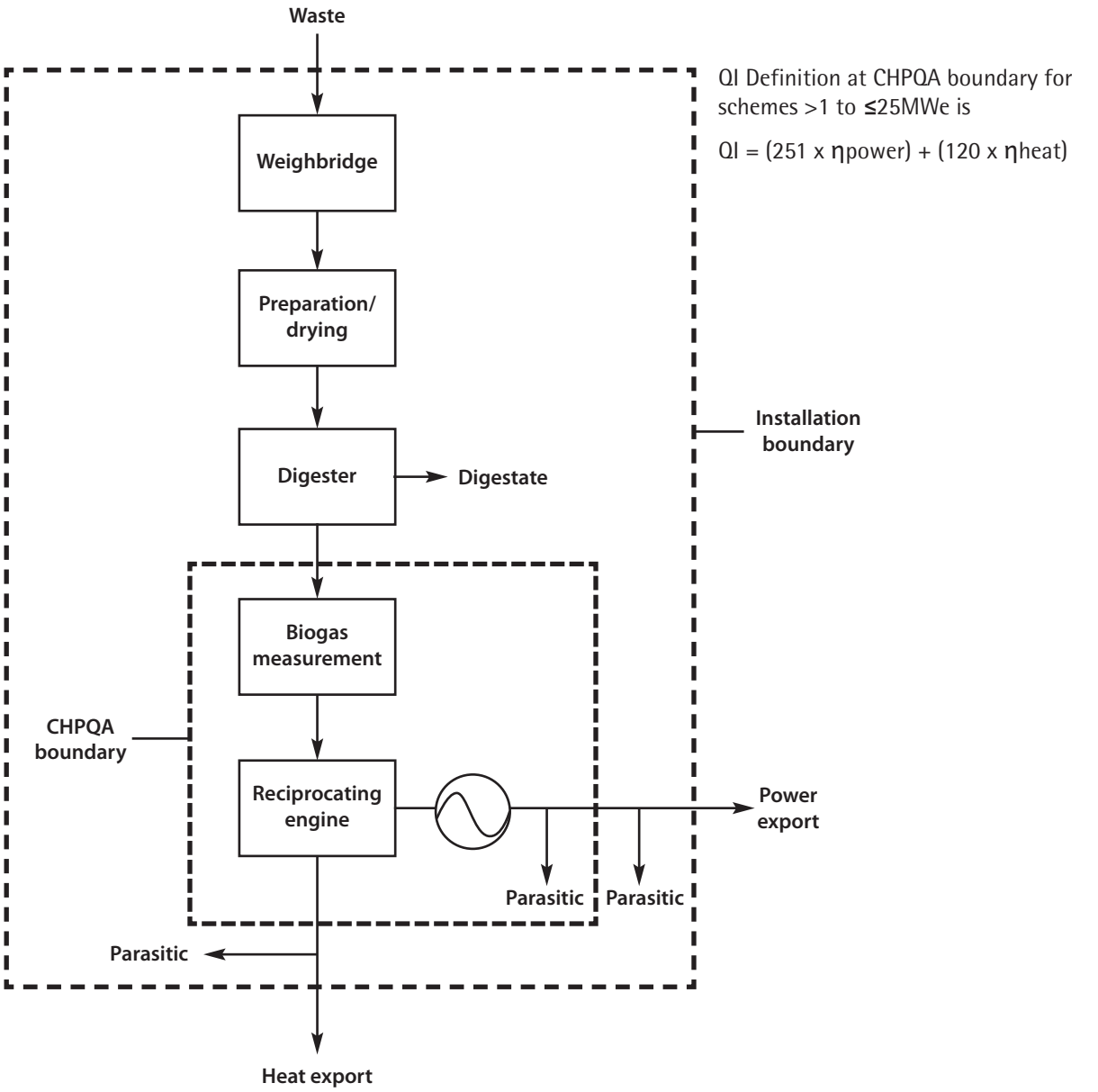


3.2 Boundaries for advanced conversion technologies

Where advanced conversion technologies (ACT) such as gasification and anaerobic digestion are utilised, there are wider possibilities for the consideration of scheme boundaries. For example, standalone gasifiers produce a synthetic gas (syngas) that can be fired in reciprocating engines – offering higher efficiency electrical generation. Similarly, the digester gas produced from the anaerobic digestion of wastes or biomass can be utilised in reciprocating engines. There are two possibilities here for adoption of a suitable fuel input boundary – either at the reception point for the solid waste or at the gas supply – with the gas being considerably more homogeneous than the solid waste and thus considerably easier (and thus lower cost) to measure. It is likely that the latter will only be appropriate for anaerobic digestion facilities due to the difficulty of measuring syngas outputs from a gasification process.

CHPQA Guidance note 44 sets out the boundary that should be used for ACT schemes that use reciprocating gas engines or gas turbines – this is measurement of the biogas or syngas as the fuel input.

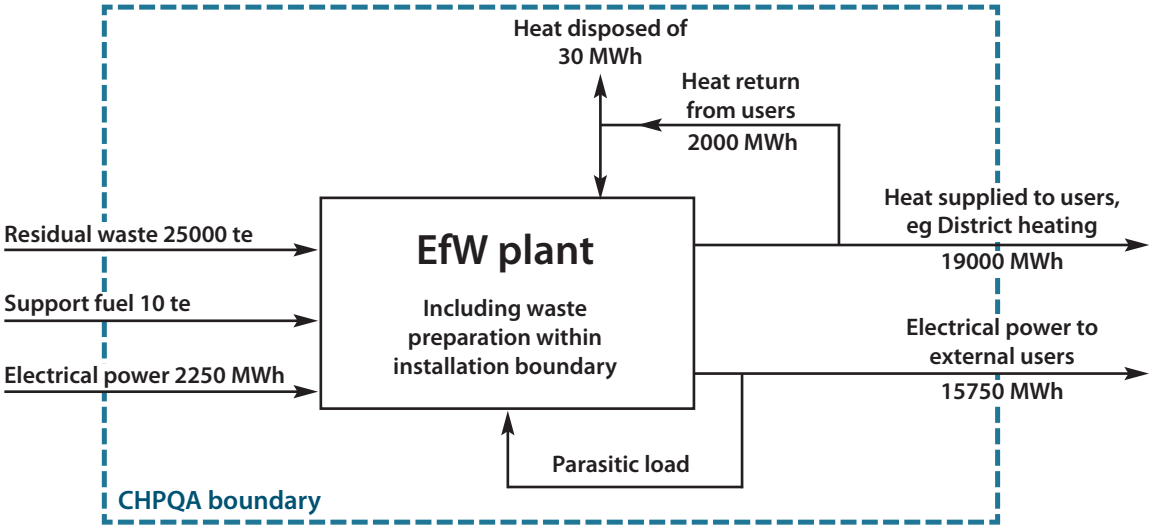
Simplified installation/CHPQA boundaries for an anaerobic digestion energy waste facility:



Annex 4: Indicative examples of CHPQA index calculation

Example 1: Energy from waste plant supplying electricity and heat

All figures are on an annual basis of 7880 hours and based on weights or meter readings.



Energy inputs

Residual waste	25000 te		
Gross calorific value	10.8 $MJkg^{-1}$		
Energy input	$25000 \times 10^3 \times 10.8 \times 10^{-3} \div 3.6$	=	75000 MWh
Support fuel	10 te		
Gross calorific value	43 MJkg		
Energy input	$10 \times 10^3 \times 43 \times 10^{-3} \div 3.6$	=	119 MWh
Electrical power	2250 MWh	=	2250 MWh

Total gross energy input **77369 MWh**

Energy outputs

Power efficiency ηpower

$$\eta power = \frac{\text{Electrical power provided to external users}}{\text{Gross energy input}} = \frac{15750 \times 100\%}{77369} = 20.4\%$$

Heat efficiency ηheat

$$\eta heat = \frac{\text{Heat energy provided to and used by external users}}{\text{Gross energy input}} = \frac{19000 \times 100}{77369} = 24.6\%$$

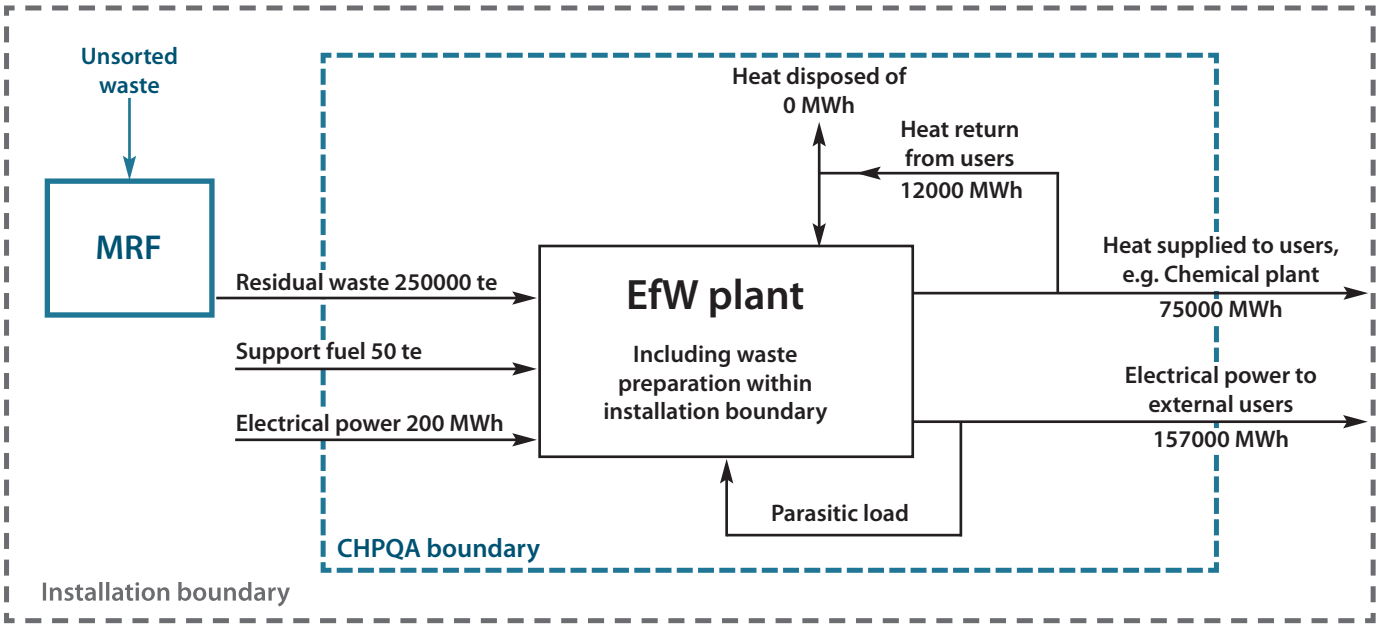
CHPQA Index

$X \times \eta power + Y \times \eta heat = 370 \times 0.204 + 120 \times 0.246 = 105$

Where X = 370 and Y = 120 for solid waste <25MWe

Example 2: Energy from waste plant supplying electricity and heat

All figures are on an annual basis of 7880 hours and based on weights or meter readings.



Energy inputs

Residual waste	250000 te		
Gross calorific value	9.6 $MJkg^{-1}$		
Energy input	250000 x 10^3 x 9.6 x 10^{-3} ÷ 3.6	=	666666 MWh
Support fuel	50 te		
Gross calorific value	43 MJkg		
Energy input	50 x 10^3 x 43 x 10^{-3} ÷ 3.6	=	7740 MWh
Electrical power	200 MWh	=	200 MWh

Total gross energy input 674606 MWh

Energy outputs

Power efficiency ηpower

$$\eta power = \frac{\text{Electrical Power provided to external users}}{\text{Gross energy input}} = \frac{157000 \times 100\ \%}{674606} = 23.3\%$$

Heat efficiency ηheat

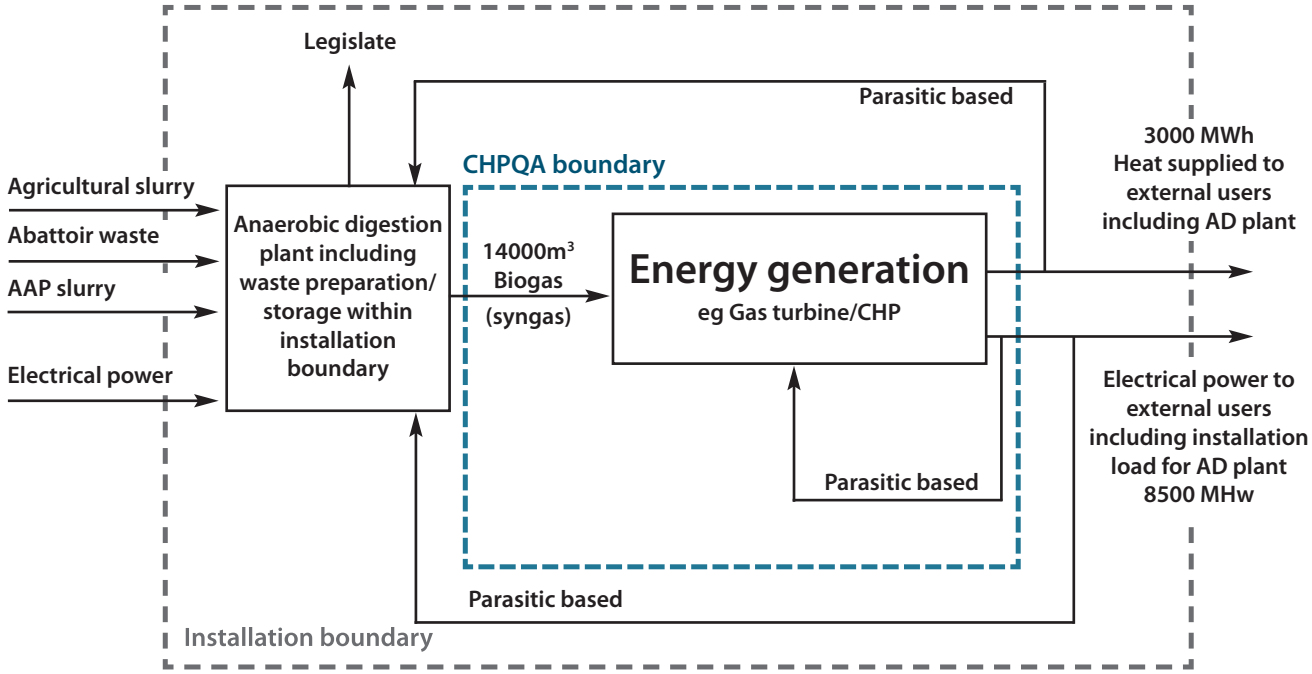
$$\eta heat = \frac{\text{Heat Energy provided to and used by external users}}{\text{Gross energy input}} = \frac{75000 \times 100}{674606} = 11.1\%$$

CHPQA Index

X ηpower + Y ηheat = 370 x 0.233 + 120 x 0.11 = 99.4

Where X = 370 and Y = 120 for solid waste <25MWe

Example 3: A D Plant supplying external heat users and electricity



Energy inputs

Biogas	14000 M^3 h^{-1}		
Calorific value	6.1 GW m^{-3}		
Total gross energy input	14000 x 6.1x10^3 x 10^{-3} ÷ 3.6	=	23722 MWh

Energy outputs

Power efficiency ηpower

$$\eta_{power} = \frac{\text{Electrical power provided to external users}}{\text{Gross energy input}} = \frac{8500 \times 100\ \%}{23722} = 35.8\%$$

Heat efficiency ηheat

$$\eta_{heat} = \frac{\text{Heat energy provided to and used by external users}}{\text{Gross energy input}} = \frac{3000 \times 100\%}{23722} = 12.6\%$$

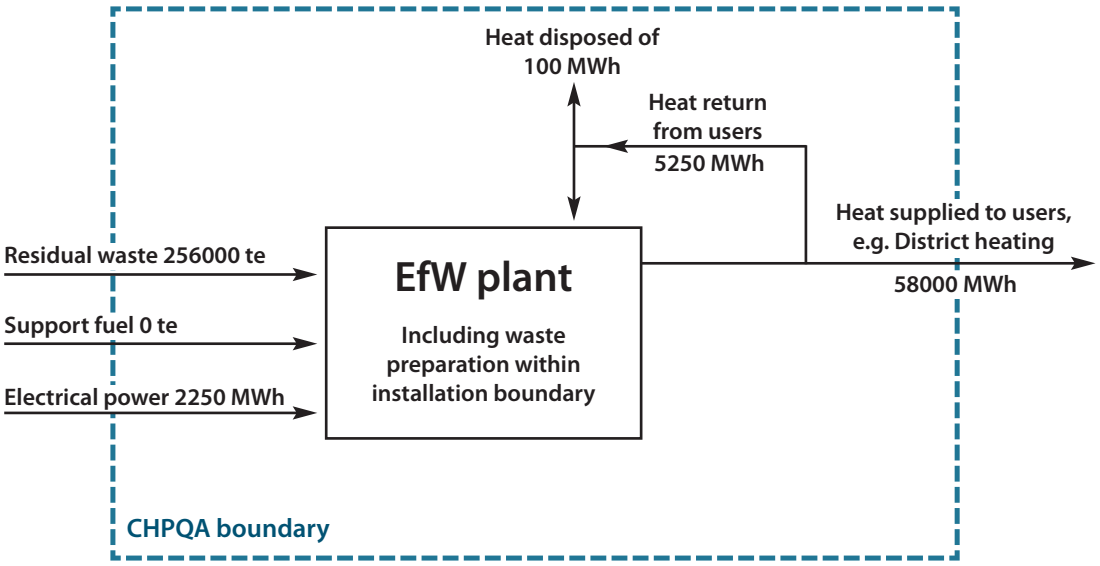
CHPQA Index

X x ηpower + Y x ηheat = 251 x 0.358 + 120 x 0.126 = 105

Where X = 370 and Y = 120 for Syngas >1MWe

Example 4: Energy from waste plant supplying heat to a district heating scheme

All figures are on an annual basis of 7880 hours and are based on weights or meter readings.



Energy inputs

Residual waste	25600 te		
Gross calorific value	9.5 $MJkg^{-1}$		
Energy input	25600 x 10^3 x 10.8 x 10^{-3} ÷ 3.6	=	76800 MWh
Support fuel	0 te		
Gross calorific value	43 MJkg		
Electrical power	2250 MWh	=	2250 MWh

Total gross energy input **79050 MWh**

Energy outputs

Power efficiency ηpower

$$\eta power = \frac{\text{Electrical Power provided to external users}}{\text{Gross energy input}} = \frac{0 \times 100\ \%}{79050} = 0\%$$

Heat efficiency ηheat

$$\eta heat = \frac{\text{Heat Energy provided to and used by external users}}{\text{Gross energy input}} = \frac{58000 \times 100}{79050} = 73.3\%$$

CHPQA Index

X x ηpower + Y x ηheat = 370 x 0+ 120 x 0.733 = 88
Where X = 370 and Y = 120 for solid waste <25MWe

Annex 5: Glossary

Acidification
Acidification is the loss of nutrient bases through the process of leaching and their replacement by acidic elements. Although this is a natural process, it is commonly associated with atmospheric pollution which enhances the rates of acidification.

Area waste plan
The National Waste Strategy: Scotland 1999 established 11 waste strategy area groups. Each group was charged with producing an area waste plan presenting the strategic plan for the waste arising in that area based on National Waste Strategy principles. These reports were published in 2003 along with the National Waste Plan.

Anaerobic digestion
Anaerobic digestion (AD) is a managed biological process in which biodegradable waste is broken down by naturally occurring micro-organisms in the absence of oxygen to produce a stabilised residue.

Best available techniques (BAT)
The PPC regulations define BAT as the most effective and advanced stage in the development of activities and their methods of operation, which indicates the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.

Best practicable environmental option (BPEO)
The BPEO used in the waste strategy is the outcome of a systematic and consultative decision-making procedure, which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefits or the least damage to the environment as a whole, at acceptable cost, in both the long-term and short-term.

This has been further developed during the area waste planning process and is now defined as the waste management solution which all stakeholders collectively agree achieves the best balance between economic, environmental and social costs and benefits, in a deliverable and affordable manner, and in compliance with the law.

Combined heat and power (CHP)
A system which utilises waste heat from electricity production to provide hot water and space heating for neighbouring buildings.

Dewatered sludge
Sewage sludge dewatered using ether centrifuges or filter presses.

Energy from waste
The recovery of energy value from waste by burning the waste directly or by burning a fuel produced from the waste.

Eutrophication
Eutrophication is the enrichment of waters by micronutrients. This enrichment speeds up the growth of algae or higher life forms, leading to a disturbance in the balance of organisms present in the water, which can affect water quality through the depletion of oxygen levels.

Existing waste incineration installation
Under the Waste Incineration (Scotland) Regulations 2003, an existing waste incineration installation is one which:

(i) is in operation before 28 December 2002 following the grant of a relevant approval;

(ii) is put into operation by 28 December 2003 (28 December 2004 for a co-incineration plant) following the grant of a relevant approval before 28 December 2002;

(iii) is put into operation by 28 December 2004 following the grant of a relevant approval, where the application for such an approval was duly made before 28 December 2002.

Feed-stock
The material used as fuel within the treatment plant.

Gasification
Heating organic material in a low-oxygen atmosphere at temperatures typically of 800–1400°C to give off a fuel gas. This technology was used to produce gas from coal, although it is relatively new process in its application to waste treatment.

Incineration
A combustion process involving waste. The Waste Incineration Directive definition of incineration plant includes oxidation of waste as well as other thermal treatment processes such as pyrolysis, gasification or plasma processes in so far as the substances resulting from the treatment are subsequently incinerated.

Material planning consideration
When deciding on whether a consideration is material and relevant, it should serve, or be related to, the purpose of planning, and it should fairly and reasonably relate to the particular application.

Municipal waste
Waste from households, as well as commercial and industrial waste which, because of its nature and composition, is similar to waste from households.

National Planning Framework for Scotland
A framework to guide the spatial development of Scotland to 2025.

National Waste Plan 2003 and National Waste Management Plan (currently under review)
The National Waste Plan was developed in 2003 by the (then) Scottish Executive with the aim to establish the direction of policies for sustainable waste management, bringing together area waste plans for the 11 different waste strategy areas in Scotland. At the time of writing this is under review by the Scottish Government, and the revised National Waste Management Plan is to be published at the end of 2009.

Oxidation of waste
Burning waste in excess oxygen conditions at high temperatures.

Plasma systems
Plasma arc gasification is a waste treatment technology that uses high electrical energy and high temperature created by an electrical arc gasifier. This arc breaks down waste primarily into elemental gas and solid waste in a device called a plasma converter.

Pyrolysis
Heating organic material in the absence of oxygen at temperatures typically of 400-800°C. This produces a predominately gaseous fuel product, occasionally some liquid fuel and a solid residue.

Residual waste
Remaining waste material once activities to reduce, re-use, recycle, have been undertaken.

Thermal treatment
A generic term covering processes that involve the use of heat to treat waste. Incineration is the most common thermal treatment process.

Thermal treatment plant
Any technical equipment used for the incineration of waste.

Waste Incineration Directive (WID)

The Waste Incineration Directive is a directive issued by the European Union and relates to standards and methodologies required for the practice and technology of incineration.

Waste strategy area group

A key component of the National Waste Strategy was the establishment of 11 waste strategy area groups across Scotland. The groups are charged with making the strategy a reality at a local level, developing local solutions in response to local needs.

Note on use of terminology

Thermal treatment is a broad term and is used to cover plants that use a variety of different technologies. The differences in the technologies relate to varying temperatures and oxygen levels in the combustion chamber of the plant. Terms such as enriched oxygen incineration, gasification and pyrolysis refer to these different temperature and oxygen regimes and SEPA is of the view that they are all thermal treatment techniques. The Waste Incineration Directive covers all such technologies and all these types of plant need to meet the same stringent emissions standards.

In addition, it should be noted that these terms, ie enriched oxygen incineration, gasification and pyrolysis, each refer to a broad range of different processes. For example, there are over 80 different gasification processes in the world. Some of these processes can meet the stringent emissions standards required in this country, but others do not. Care needs to be taken, therefore, on how these terms are used. It should also be noted that gasification, pyrolysis and thermal oxidation are processes that apply not only to waste, but also to non-waste fuel and non-waste biomass as well.

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