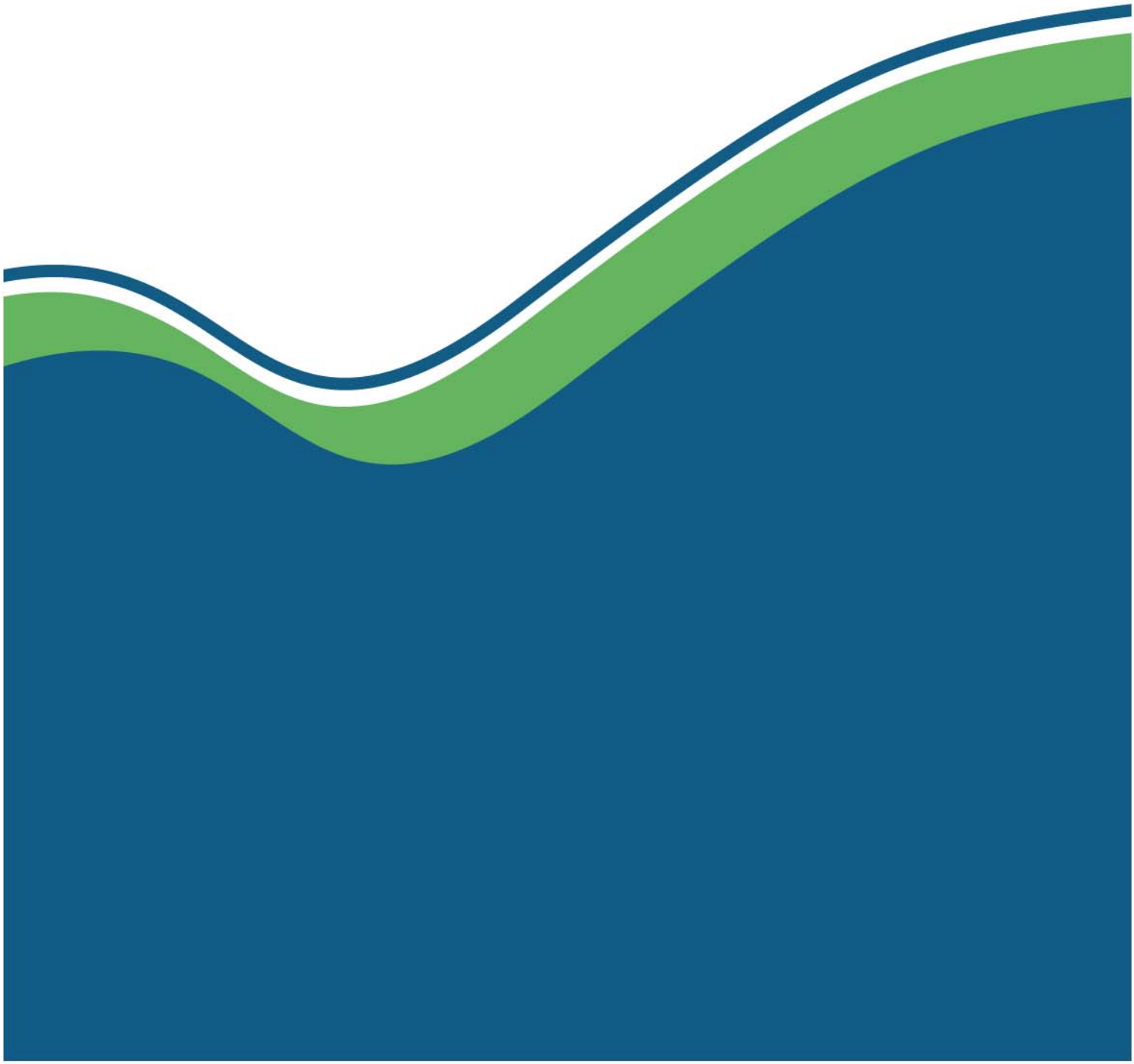
Thermal Treatment of Waste Guidelines 2014

May 2014



Introduction and Scope

The *Thermal treatment of waste guidelines 2014* ("the 2014 guidelines") set out SEPA's approach to permitting thermal treatment of waste facilities and our role as a statutory consultee of the land use planning system. They update and replace SEPA's *Thermal treatment of waste guidelines 2009.*

The 2014 guidelines are aimed at those involved in the land use planning system, local authority waste managers, the waste industry and SEPA staff. They will also promote public understanding of SEPA's approach to both planning applications and environmental licensing.

The guidelines apply (but without excluding other potential thermal recovery technologies) to the treatment of municipal and/or commercial and industrial waste by combustion, gasification, pyrolysis, plasma systems and anaerobic digestion ("AD"). While AD plants are not strictly thermal treatment plants, we believe 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.

The guidelines describe what is expected from developers in order to comply with the Pollution Prevention and Control (Scotland) Regulations 2012 ("PPC Regulations") and provide advice on the type of information SEPA requires when determining permits.

The practical implications of the PPC Regulations and these guidelines are that plants should:

- be designed, equipped and operated using Best Available Techniques and in such a manner that the requirements of the Industrial Emissions Directive (2010/75/EC) ("IED") are met and ensure that no significant pollution is caused;
- only recover energy from waste which has been subject to all reasonably practicable measures to recover materials for recycling.
- ensure that the recovery of energy takes place with a high level of energy efficiency.

These are the core objectives of SEPA's PPC permitting process for thermal treatment of waste facilities.

Annex B of the Zero Waste Plan (ZWP) states that for planning purposes the *Thermal Treatment of Waste Guidelines 2009* forms part of the National Waste Management Plan. As such, these guidelines, and updates of them, are a material planning consideration in the preparation of development plans and in the determination of relevant planning applications.

2.0 Policy Context

The imperative for action to address climate change is driving policy development across a number of fronts and the country is set for decades of unprecedented activity in this sphere. The Climate Change (Scotland) Act 2009 sets a target to reduce greenhouse gas emissions by at least 80% by 2050 and an interim reduction target of at least 42% by 2020.

SEPA has a key role in helping Scotland respond to climate change and sustainable resource use through our activities as a regulator, advisor and a statutory consultee in planning.

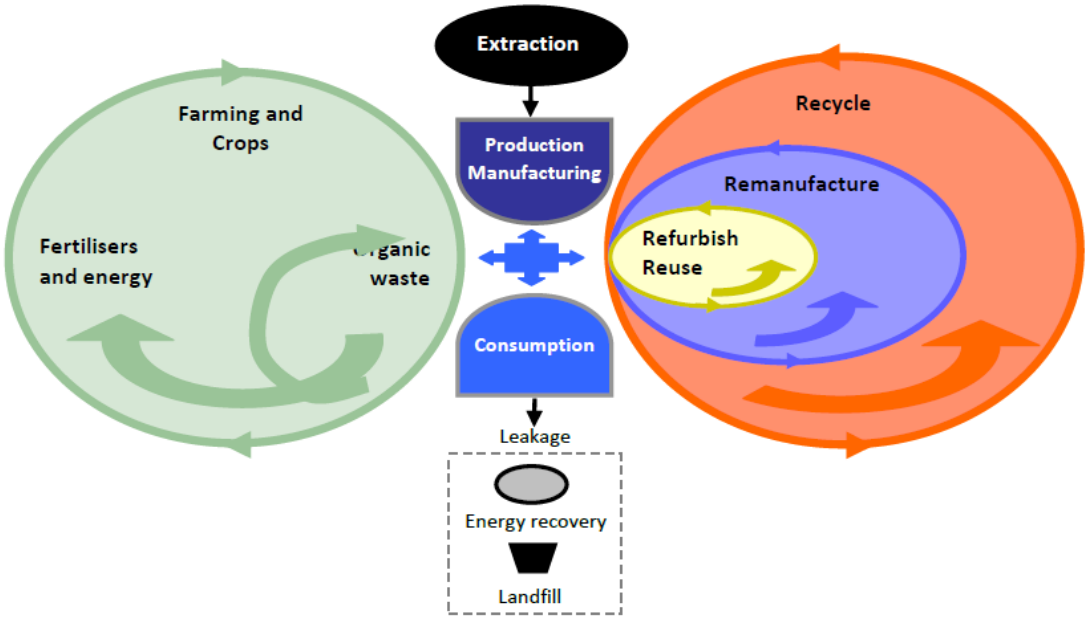
2.1 The Scottish Government's Zero Waste Plan

The Zero Waste Plan 2010 envisions a society where *"goods and materials are continually cycled to support the sustainable growth of the Scottish economy, and waste is progressively designed out"*.

The Zero Waste Plan sets a target of 70% reuse and recycling of all waste generated in Scotland by 2025. Significant progress has been made towards both this and the interim targets with Scotland recycling over 41% of household waste in 2012.

A critical step in this journey was the introduction of the Waste (Scotland) Regulations 2012. By making the separate collection of key recyclables (metal, plastic, paper, card, glass and food) mandatory, these regulations seek to maximise the quantity and quality of materials brought to the market and minimise the residual fraction. Also, these separately collected recyclables are now banned from going directly to energy recovery or landfill.

Figure 1: Zero Waste – a more circular model of resource use



While good progress is being made to recycle more, there continues to be waste that cannot be recycled either technically or economically. This is commonly referred to as 'residual waste' and is what many householders and businesses understand to be

'black bag waste'. In 2011 around 2.5 million tonnes of this waste was disposed of to landfill which represents the lowest option in the waste hierarchy. As recycling systems improve, more people engage with them at home, at work and on-the-go and non-recyclable materials are progressively designed out of products, this residual fraction will decrease.

But residual waste will persist for some time, even with high levels of recycling. Scotland must find ways of moving its management up the waste hierarchy. To that end, the Waste (Scotland) Regulations 2012 introduced a ban on landfilling Biodegradable Municipal Waste from 01 January 2021. This creates the timescale for action and new technologies must be brought forward in time. One alternative to landfill is thermal treatment to produce electricity, heat, fuels or chemicals.

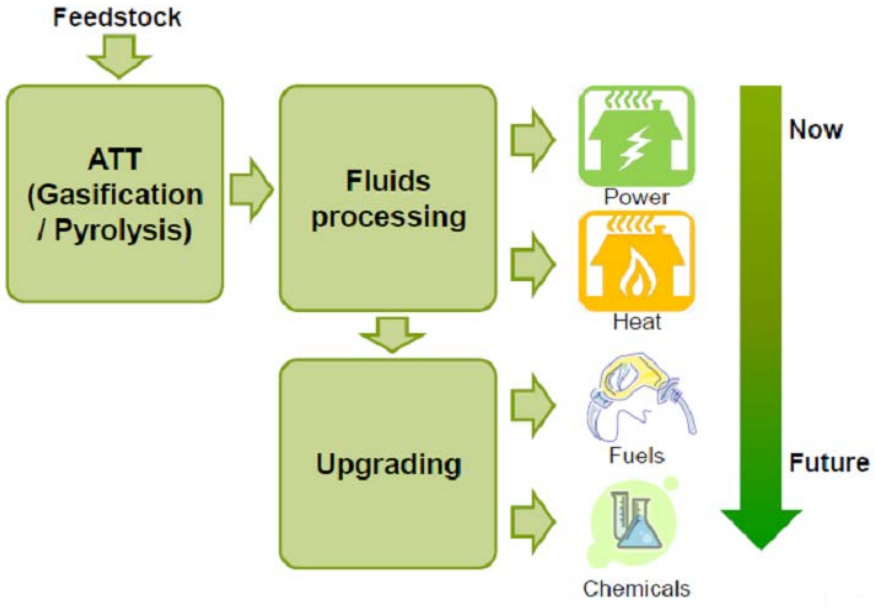
2.2 Renewable Energy - The Renewables Obligation

The Scottish Government's policy on waste identifies energy recovery as an option, although lower in the hierarchy than prevention, re-use and recycling. Only the energy generated from the recently grown materials in the waste (e.g. food residues rather than oil based plastic) is considered renewable. Energy from residual waste is therefore a partially renewable energy source, sometimes referred to as a low carbon energy source.

Where energy recovery is pursued, it must be done in the most efficient manner possible. This is why combustion is only eligible for support under the ROS where the facility in question is a qualified combined heat and power generator.

Gasification and pyrolysis technologies treat waste and biomass to produce syngas and/or liquid fuels which can then be used to generate energy. These technologies also have the potential, in the longer term, to produce a wider range of energy outputs – electricity, heat and liquid fuels as well as biomethane and renewable low carbon chemicals. They also attract a greater level of support from the Renewables Obligation Scheme than combustion processes.

Figure 2: Future Opportunities



Source: Renewable Energy Association

2.3 Renewable Heat

Many businesses could benefit from either purchasing heat from a local network, or by selling heat to a network and securing valuable additional income. Scottish Government's Draft Outline Heat Vision contains the following statement of ambition.

"By 2050 Scotland will have a largely decarbonised heat sector with significant progress made by 2030. This ambition will be realised through a number of means, including renewables and Carbon Capture and Storage, but is based on the fundamental first principles of keeping demand to a minimum, most efficient use of energy and recovering as much "waste" heat as practically possible, at least cost to consumers."

The Scottish Government has set a target of 11% of the heat consumed in 2020 to come from renewable sources. The Heat Vision sets out actions on energy efficiency, consumer information and heat mapping at a local authority level to complement and add weight to measures being introduced across the UK, such as the Renewable Heat Incentive.

2.4 SEPA's Position on Energy from Waste

Scotland needs to generate less waste, recycle more and safely maximise use of the resources left in residual waste in line with the Zero Waste Plan and the waste hierarchy. Recovering energy from residual waste should not be at the expense of actions taken to prevent, reuse or recycle waste and segregated, marketable recyclable waste must not be sent for energy recovery.

For residual and non-recyclable wastes which persist, appropriately located and well managed energy from waste facilities, that meet modern requirements and the stringent emission standards contained in the IED, should not cause significant pollution of the environment or harm to human health.

SEPA recognises that Scotland does not yet have mature or extensive heat-use networks. However, immediate opportunities do exist for contributing to the development of such a network by co-locating thermal treatment plants with existing energy and heat intensive industries, or near 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.

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 considers that it is important for new developments to maximise the opportunities to use existing and proposed heat and energy sources. We will continue to encourage planning authorities to consider this an integral element in their assessment of land allocations for their development plans. We will expect that

where heat networks and heat generators do exist that any new development proposed in the vicinity will be connected to these sources.

3.0 Our Role in Planning

The Planning etc (Scotland) Act 2006 makes provision for planning authorities to seek the views of key agencies in the preparation of strategic and local development plans. As a key agency SEPA engages with planning authorities early, and regularly, in the preparation of their development plans. The advice we give in terms of waste management and development planning is set out in Appendix 1 and 2 of our guidance note on development planning.

SEPA is also a statutory consultee in relation to planning applications for a range of development activity, including thermal treatment plants. We require key information to allow us to advise on a range of environmental issues within our remit, such as flood risk. In line with PAN 51 guidance, we also need certain information about a development to be submitted with a planning application in order to be able to provide a view on whether the associated activity is capable of being consented.

The information we require to fulfil our role as statutory consultee is different but complementary to that which we require in order to determine whether a process associated with a planning application can be authorised. To avoid overlap with environmental licensing, SEPA will offer advice on matters relevant to planning and indicate which matters should be reserved for environmental licensing. The advice SEPA gives specifically in relation to planning applications for thermal treatment facilities is set out in our guidance note LUPS GU6.

Scottish Planning Policy refers to SEPA's thermal treatment guidelines and Annex B of the ZWP identifies that for planning purposes "*SEPA Thermal Treatment of Waste Guidelines 2009*" form part of the National Waste Management Plan. SEPA's planning guidance notes identified above provide detailed advice in support of these guidelines which are a material consideration in the planning process.

4.0 Our Role in Permitting

4.1 Industrial Emissions Directive

The Industrial Emissions Directive (2010/75/EU) (IED) was adopted on 24 November 2010 and is the successor to the IPPC Directive. The IED also merges seven separate directives including the Waste Incineration Directive (2000/76/EC).

Therefore, as part of the transposition of the IED into Scot's Law, the Waste Incineration (Scotland) Regulations 2003 have been repealed. All reference to incineration has been brought into the Pollution Prevention and Control (Scotland) Regulations 2012.

Chapter IV of the IED lays down specific technical provisions and comprises the mandatory minimum technical and emission standards for incineration or co-incineration plants. Regulation 29 of the PPC Regulations requires that Permits contain conditions necessary to give effect to those provisions. SEPA's Permit template for Chapter IV plants sets out these conditions and it is recommended that applicants take the template into account when preparing an application.

Article 42 of the IED provides an exemption from the Chapter IV provisions for gasification or pyrolysis plants where "the gases resulting from this thermal treatment of waste are purified to such an extent that they are no longer a waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas". Should applicants wish to take advantage of this provision, early discussion with SEPA is strongly advised.

4.2 Pollution Prevention and Control (Scotland) Regulations 2012

Waste thermal treatment plants (with the exception of some small biomass and animal carcass incinerators) will be subject to environmental licensing as Part A installations under the PPC Regulations. Part A installations are required 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.

Applicants are strongly advised to consult with SEPA at a very early stage on the nature of the environmental licence required.

It is critical that all necessary information is submitted with the application. While there is a mechanism to seek further information to allow an application to be determined this should be used to augment or clarify information already provided. The mechanism is not intended to rectify fundamental information gaps within any application. PPC Part A applications are subject to public consultation both at the time the application is made and when SEPA have come to a draft decision. Consulting on incomplete applications can result in confusion, unnecessary public concern and an ineffective public consultation. Therefore any failure to supply all of the information specified will result in the application being returned to the applicant as not being "duly made".

Where further information is sought to supplement an application SEPA may have regard to any further relevant public representation made as a consequence.

SEPA expects information sufficient to demonstrate the following to accompany the application:

- the development employs “best available techniques” and that alternative techniques have been fully considered;
- emissions from the plant will not have any adverse impacts on the environment and human health;
- mixed municipal waste accepted for incineration does not, as far as is practicable, contain recyclable metals and dense plastics.
- the recovery of energy will take place with a high level of energy efficiency;
- the plant is suitably designed to deal with the 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.

4.2.1 Best Available Techniques

The basis for determining the appropriate standards that apply in a PPC permit is known as the ‘best available techniques’ (BAT). 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 the basis for emission limit values (ELVs) and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole”.

The PPC regulations also 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.

The applicant must demonstrate BAT across the full range of areas listed in the PPC regulations, bearing in mind the likely costs and benefits of the measures. 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 include the technology to be used but also how the installation is designed, built, maintained, operated and decommissioned.

Further guidance on the application of BAT can be found in the PPC Practical Guide.

The European Commission will publish BAT Conclusions which must be implemented within four years of publication unless a site specific derogation is granted. This applies to plants described in Annex 1 to the IED and would be in addition to any requirement specified in Chapter IV of IED. There is no firm timetable for the publication of BAT Conclusions.

It is possible that, regardless of the above, more stringent emission limit values than those detailed in Chapter IV or BAT Conclusions may be required for certain installations, for example to comply with national or local air quality standards and/or objectives.

4.2.1.1 Technology Choice

While the 2014 guidelines do not indicate a preference for any particular technology, PPC permit applications must fully justify the choice of techniques to be applied.

The IED defines an emerging technique for an industrial activity as one that, if commercially developed, could provide a higher general level of protection of the environment or at least the same level of protection of the environment and higher cost savings than existing best available techniques. SEPA is required to have regard to any guidance that the European Commission provides on emerging techniques.

Some new proposals for waste thermal treatment plant may be considered to be an emerging technique and SEPA welcomes innovation and developments which could give better overall protection and improvement to the environment. Nevertheless, any application for a permit must still fulfill the requirements of the regulations and the IED.

Where a proposed technique already exists elsewhere it is essential that the application contains sufficient information on that technique's environmental performance to allow SEPA to come to a conclusion on granting a permit.

Where an emerging technique is proposed and is not already operational elsewhere any application must contain sufficient theoretical, engineering or other assessments to demonstrate that compliance with the relevant standards can be achieved.

Further, SEPA will seek environmental performance data of an emerging technique before agreeing to the development of further plants or inclusion of such techniques at other plants.

4.2.1.2 Monitoring

The monitoring of plants has also to be in accordance with BAT and as a minimum in accordance with an accredited method meeting as a minimum BS EN ISO/IEC 17025 & CEN/TS 15675 (personnel and laboratories) and BS EN 15267-3 (monitoring equipment). Annex VI to the IED sets the ELVs and monitoring frequencies for a range of parameters. These are the same as under the previous Waste Incineration Directive.

Continuous Emissions Monitoring must be carried out by the operator. This equipment is required to be operational and recording all of the time that waste is being treated. Environmental permits have detailed conditions relating to calibration of the equipment and how data is collected and presented to demonstrate compliance with emission limit values ELVs.

Periodic Monitoring must be undertaken by the operator. This is for all substances with an ELV and is normally undertaken twice per year. Some plants are required to monitor monthly during the first year of operation. Information gained through this type of monitoring is used to check the calibration of CEMS as well as compliance with permit ELVs.

Periodic monitoring will also be undertaken by SEPA using either own scientific staff or by retaining our own contractors. Our own staff have appropriate qualifications and our systems are accredited to UK and international quality standards.

Permits will also require environmental monitoring (as opposed to monitoring of emissions from a chimney) through the collection of ambient atmospheric samples or more commonly soil samples to check for levels of pollutants in the vicinity of a plant. Environmental sampling will be required before operations begin to provide a baseline.

The monitoring of emissions to air of dioxins & furans and heavy metals requires samples of the flue gas to be extracted onto a capture medium and sent to an accredited laboratory for analysis. Unfortunately, this type of monitoring does not provide an immediate result and therefore does not provide “real time” monitoring. For dioxins, sampling is carried out under strict operating conditions for a minimum of a 6 hour period at least twice per year. The length of time required to collect a sample for analysis reflects the very small quantities that may be present and is a significant technical barrier to the use of continuous measurement techniques.

SEPA would welcome the use of accurate and cost effective continuous emission monitoring for heavy metals and dioxins but at this time such systems are still experimental and in the development phase.

Some semi continuous sampling systems have been used to varying degrees of success. Such systems collect a sample over a period of a few weeks rather than 6 hours. The capture medium is then sent to a laboratory for analysis. The result provided is still not “real time” but may provide an indication of overall plant emission performance over a longer period than the standard test.

We are aware that the Industrial Emissions Directive states that the European Commission will set a date from which continuous measurement of emissions to air of heavy metals and dioxins are to be carried out. As soon as robust measurement techniques are available within the Union it is anticipated that the Commission will set the date.

4.2.2 Heat Plans and Standards to be applied in Energy Efficiency

Regulation 29 of the PPC Regulations requires SEPA to ensure that any permit authorising the incineration or co-incineration of waste contains “conditions necessary to ensure the recovery of energy takes place with a high level of energy efficiency”. SEPA considers that compliance with the targets specified in **Annex 1** to these guidelines is required to meet this statutory requirement.

To confirm compliance with the 2014 guidelines, SEPA strongly recommends that this information is supplied in the form of a robust and credible heat and power plan at the planning stage. 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.

The heat and power plan should be submitted as part of the planning application so that SEPA can determine whether any application for an environmental licence could be granted, the suitability of the location and recommend any planning conditions regarding layout or design of the proposed facility considered necessary. SEPA will advise in its response to the planning authority whether the proposed plan will be sufficient to enable SEPA to consent the facility.

Existing waste thermal treatment plants, i.e. plants already with planning consent, and those under construction prior to the publication of the 2009 Guidelines, have already submitted a heat and power plan to demonstrate how progress towards the targets is being achieved.

With respect to the standards to be applied, SEPA will, unless specified differently elsewhere in these guidelines, have regard to the Quality Assurance for Combined Heat and Power (CHPQA) standard, as an appropriate approach to establishing the required energy efficiency for facilities. For clarity and unless specified differently elsewhere in these guidelines, in having regard to the CHPQA standard, SEPA will use as far as possible the terminology, definitions of, and methods used in that standard.

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

SEPA expects that new waste thermal treatment plants achieve a minimum level of energy recovery. 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 only, electricity and heat, heat only or as exported fuel (energy) equivalent on commissioning.

Subsequently, a robust and credible heat and power plan must thereafter demonstrate how the relevant QI or the Indicative Efficiency equal to or in excess of those indicated in Table 1 of **Annex 1** will be achieved within the shortest practicable time.

Guidance on how to set relevant energy boundaries is provided in **Annex 3**. Examples of how energy recovery efficiencies should be calculated are provided in **Annex 4**.

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.

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.

Any PPC Part A permit for the operation of a thermal treatment plant will include conditions as required by Regulation 29 of the PPC 2012 Regulations (or equivalent in the PPC 2000 Regulations). These will require a heat plan to be maintained, implemented and reviewed on an annual basis. SEPA has a duty to ensure compliance in the event that these conditions are not met.

There are several scenarios in which the Heat and Power Plan may fail. SEPA will take into account the credibility of the plan and the circumstances, in each case,

before identifying what action to take. For example, if a Heat and Power Plan, which was deemed credible at the application stage, fails due to external factors such as the withdrawal or delay of a proposed 3rd party heat user or prevailing economic conditions, SEPA will work with the Operator to develop a revised plan. This would include the necessary time needed to formulate and implement the revised plan. However, for example, if a Heat and Power Plan is not revisited due to a deliberate lack of action by an Operator, SEPA will initiate enforcement action to ensure compliance with the permit. It is therefore critical that any Heat and Power Plan submitted is credible, achievable and actively pursued.

4.2.3 Material Recycling

In addition to implementing the provisions of Chapter IV of the IED and requiring high thermal efficiency, Regulation 29 of the PPC Regulations carries two key provisions relating to material recycling. To be clear, this section does not apply to the Anaerobic Digestion of separately collected biowastes.

4.2.3.1 Ban on Energy Recovery from Separately Collected Fractions

In response to concerns from householders and businesses that materials separated for recycling such as paper and plastic will be redirected to incineration, the regulation provides a ban on such activity. SEPA will ensure that Permits contain conditions such that “on or after 1st January 2014 no separately collected waste capable of being recycled is incinerated or co-incinerated”. This applies to the key materials listed; metal, plastic, paper, glass, card, cardboard whether collected by single stream or co-mingled. Separately collected food waste also must not be incinerated or co-incinerated.

The ban applies only in so far as the material is “capable of being recycled”. This provides a degree of flexibility with respect to practical or economic limitations on recycling. For example, subject to agreement with SEPA, energy recovery may be permitted in the following circumstances.

- Rejects or ‘fines’ from sorting co-mingled recyclate at Material Recovery Facilities. Zero Waste Scotland estimate that 10% of inputs to such facilities is contamination from households and businesses.
- Recyclate which is grossly contaminated and can not find a market.
- Material with no prospect of being recycled due to severe and/or prolonged market downturn/collapse.

4.2.3.2 Recyclate Recovery from Mixed Municipal Waste

Regulation 29 also requires SEPA to ensure that Permits for the incineration or co-incineration of mixed municipal waste contain conditions sufficient to ensure “where practicable that no waste including non-ferrous metals or hard plastics is incinerated or co-incinerated”. This is in addition to the ban on energy recovery from source segregated recyclables.

As set out in the Zero Waste Plan, this regulatory requirement is part of a suite of actions introduced by the Scottish Government to ensure that energy from waste is only used to recover value from materials that cannot offer greater economic and environmental benefits through reuse or recycling. This provision establishes a safeguard for non-ferrous metals and plastics (PET & HDPE).

To be clear, the regulation does not centre on defining the composition of residual waste that can be incinerated on either a weight or proportion basis but instead on determining what steps are 'practicable' in service of the objective.

'Practicable' is not to be confused with 'practical' and is narrower than 'physically possible'. The definition of 'practicable' is more closely aligned to 'feasible' and a balance between the value of material recovered and the costs of the measures necessary to recover it must be struck.

There are a number of steps that can be taken to ensure valuable materials remain in circulation, rather than going to energy from waste, including maximising the performance of source segregation systems and extraction from residual waste.

Where a strong source segregated service is in place, the costs of residual treatment maybe grossly disproportionate to the value of the recovered material rendering such treatment impracticable from an economic point of view. Further, the quality of material, especially plastic, extracted from residual waste is likely to be lower, and therefore less marketable, than when segregated at source.

It is therefore important to assess the waste management system as a whole before deciding what steps are 'practicable' at the source segregation and residual stages in each case.

Household Waste

With respect to household waste, the availability of and participation in recycling services is highly variable which leads to similarly variable Local Authority recycling rates. To be clear, nothing in this section affects the Zero Waste Plan targets for household waste. It is up to individual Local Authorities to decide how best to reach 60% recycling by 2020 in their own area.

Where a Local Authority is committed to securing high capture rates for the target materials on a source segregated basis, it is open to them to provide evidence that further residual waste treatment steps are not practicable.

To demonstrate this, a Local Authority must show that;

1. all practicable steps are being taken to capture the materials at the source segregation stage, and
2. the costs of treating residual waste are grossly disproportionate to the value of the material recovered.

As a minimum, SEPA expects evidence that a strong segregated collection service is in place. There must be evidence of full service coverage for cans, tins, foil, aerosols, PET and HDPE bottles and an ongoing commitment to activities aimed at raising participation rates.

SEPA considers that it will be difficult to demonstrate that all practicable steps are being taken at the source segregation stage where participation rates are low or there is a heavy reliance on bring facilities. Evidence of service coverage and a commitment to raising participation is the clear priority.

If the source segregation test is passed then an assessment can be made of whether the costs of further treating residual waste are grossly disproportionate to the value of the material recovered. Local authorities may wish to include evidence of residual

waste composition and/or the likely material yields from further treatment in their cost benefit analysis of that treatment.

The respective costs and benefits may be different for metals and plastics. SEPA understands that metals can be recovered economically via a number of processes, and is a normal part of fuel conditioning for a number of technology types.

SEPA also recognises that it may not be practicable for some very small facilities (e.g. <25,000 tonnes per annum) serving remote communities to invest in this type of treatment.

Commercial Waste

The Waste (Scotland) Regulations 2012 place a requirement on all Scottish businesses, regardless of size to take all reasonable steps to segregate metal, plastic, glass paper and card for recycling. SEPA considers that with good implementation of this measure, secondary sorting of residual municipal waste from commercial and industrial sources may not be necessary to ensure compliance with this provision. SEPA will therefore not actively require secondary sorting of residual municipal wastes from commercial and industrial sources.

Residual Waste Treatment

Where it is determined that secondary treatment of residual waste is 'practicable', such treatment can either take place at the thermal treatment plant as part of the fuel preparation stage or off-site from a supply chain of mixed waste treatment plants. Where treatment takes place off-site, waste acceptance procedures must be robust enough to satisfy SEPA that any feedstock has been sufficiently treated.

Where secondary sorting does take place the process design must consider the input material and how it is first introduced into the plant through to the final outcomes.

A significant issue for recyclate recovery is the mixed nature of the materials in residual waste and, specifically, the high content of organic material. The recovery process must ensure that the organic fraction does not become a major contaminant.

SEPA would expect that bag splitters, rather than shredders, are used at the start of the process. Shredding is likely to spread the organic matter more evenly through the mix, increasing contamination and making recovery of target materials for recycling more difficult. SEPA would then expect the remaining fraction or fractions to be processed through a combination of techniques to yield a range of final end products but, as a minimum, PET, HDPE and metals. Where metals can be recovered from the final residues that may be permitted as an alternative.

For such facilities, Permit applications should contain at least the following information;

- Details of the tonnages of different waste streams accepted for processing.
- Details of all processing stages, including schematic diagram.
- Estimates of the weights of recyclables removed at the plant.
- Results of any waste analysis verifying the above information.

5.0 R1 Energy Efficiency Formula

The European Waste Framework Directive (2008/98/EC) introduced a 5 step Waste Hierarchy. Driving waste management up the waste hierarchy is central to the development of sustainable waste management in Scotland and the ambition of a Zero Waste society.

Figure 3: Waste Hierarchy



The Directive allows municipal waste incinerators (MWI) to be classified as "recovery" operations provided they achieve a defined threshold of energy efficiency.

Whether or not the energy efficiency threshold is achieved is worked out by using the R1 Energy Efficiency formula included in the Directive. SEPA decides if a MWI qualifies for recovery status.

There is no formal requirement for MWI to achieve R1 status or have their performance assessed against the R1 formula in the PPC Regulation for plants in Scotland. It is important to note that R1 status is separate from compliance with Regulation 29 as implemented by these guidelines.

Therefore the R1 formula is only relevant for those MWI wishing to qualify as a recovery operation. An operator may choose to gain R1 status in order to, for example, import waste from out with the UK for incineration under the Transfrontier Shipment of Waste regime or claim recovery of Automotive Shredder Residues for the purpose of the ELV Directive targets.

The European Commission's guidelines provide detailed guidance on how to interpret and apply the R1 Energy Efficiency formula. The formula calculates the energy efficiency of the Municipal Waste Incinerator and expresses it as a factor. It calculates the total energy produced by the plant as a proportion of the energy of the fuel (both traditional fuels and waste) incinerated in the plant. The output of the R1 formula is not the same as power plant efficiency which is typically expressed as a percentage.

In demonstrating R1 status SEPA have adopted the same approach as described in the Environment Agency's Briefing Note on Qualifying for R1 status using the R1 energy efficiency formula published on April 2012

MWI operating at or above the stipulated thresholds can be classified as recovery operations for the purposes of the waste hierarchy. The threshold for plants which commenced operation prior to the end of 2008 is 0.6 and for plants which commenced operation thereafter is 0.65.

6.0 Public Consultation and Information

6.1 Permitting Consultation

We want to make the best decision when we issue an environmental permit. As a result, we consult widely with organisations and members of the public, inviting them to make any comments and ask any questions they may have about the details in the application. Once we have determined the application, we will issue a draft decision and consult the public involved before we issue our final decision.

We will make public as much of any application as possible on our website. Some parts of the application may not be available for practical reasons (such as large diagrams); however, you can view a hard copy in the local SEPA Registry Office. The draft Permit and Decision Document will also be provided on the website for consultation prior to final issue.

Where further information is sought to supplement an application, through a Schedule 4 Notice, SEPA may have regard to any further relevant public representation made as a consequence of new information being submitted.

As part of our efforts to provide information to the public in a transparent manner, SEPA will host a dedicated webpage for each energy from waste plant in Scotland. This webpage will provide Permits and Variation Notices, Decision Documents, Compliance Assessment Scores, Annual Compliance Reports and, where necessary, regular Site Status Reports. This action will improve public access to information on emissions and operational compliance.

6.2 Voluntary Industry Steps

Many operators elsewhere in the EU take a very pro-active approach to providing information to local communities. This includes the display of Continuous Emission Monitoring data in near real-time on either electronic signage boards outside the facility or on operator websites. SEPA considers this step to be an action the industry could take to improve transparency.

Further, while the Commission has not yet a date to confirm a date for a requirement to (semi) continuously monitor dioxins and furans (Ref paragraph 4.2.1 above), SEPA considers that the use of this technology (as used in some other member states such as Belgium) is desirable to inform both the regulator and the public over the emissions performance.

In particular, SEPA considers that those plants with highly variable process operating conditions, or with regular start ups and shut downs such as batch systems should install and operate such monitoring systems. If installed they would be used to estimate mass releases and not used for compliance assessment against Directive Emission Limit Values as they would not correspond to each other. SEPA considers this step is an action that operators of relevant plant could take to improve transparency.

Annex 1: Energy Recovery Efficiency Targets

A. Applications

SEPA expects applications for planning permission and/or a Part A PPC permit to provide evidence of compliance with these guidelines over three key phases;

1) Initial operation,
2) Implementation of the heat plan, and
3) Achievement of a required threshold.

This Annex describes what is required at each stage.

A1. Initial operation

Applicants should demonstrate that on Cessation of Commissioning[a]:

- Where thermal treatment plants initially generate power, power and heat, heat only or a fuel then the demonstration should show that the equivalent energy recovery efficiency will be **at least 20%** (on a gross CV basis). The power efficiency shall be estimated and calculated in accordance with the examples given in Annex 4.

- Where a thermal treatment plant initially generates power and heat together, the relevant Quality Index (QI) value or the corresponding Indicative Efficiency for that type of plant and fuel type must be estimated and supplied.

- The boundaries used for calculating energy efficiencies must be set using the method described in Annex 3. These may differ from any installation boundary and should 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 (i.e. power only), 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.

The CHPQA takes account of electricity output at the generator terminals, i.e. this assumes that all electricity is exported. In calculating the overall power efficiency as required above, SEPA takes the view that the total energy input including electrical load to allow waste to be thermally treated must be taken into account. This is different to the CHPQA method. Therefore, in addition to electrical input when the plant is not generating, all electricity used in the thermal treatment process must also

[a] Cessation of Commissioning means that point when a plant has been commissioned and is thermally treating waste. SEPA would expect that commissioning should take no longer, on average, than 6 months. Where necessary SEPA will insert a Cessation of Commissioning date in the permit.

be accounted for as energy input in the same way fuel as energy input is used. Examples are provided in Annex 4

Further, the targets are based on “gross” calorific values. Several applications have used “net” values which will overestimate the level of efficiency of energy recovered. Care must be taken to ensure that when calculating efficiencies that the correct basis is used consistently throughout the calculation.

Where the Permitted Installation includes a fuel preparation stage, the energy used will not be counted as a parasitic load. Such preparation may include Materials Recovery Facility to extract materials for recycling and/or a drying stage. The system boundary diagrams clearly show fuel preparation outside the CHPQA boundary.

A2. Implementation of a heat and power plan

The Heat and Power Plan must show how, within a period of seven years from cessation of commissioning, further energy can be recovered over and above the initial operational energy recovery. Specifically, the Heat and Power Plan should provide details of how the applicant proposes to **achieve the relevant QI value or Indicative Efficiency** specified in the table below and should give an indication of anticipated progress 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 2 below.

Table 1: Heat and power plan targets

	Any technology	
	≤70,000 tonnes / yr	>70,000 tonnes / yr
QI value	85	93
Indicative Efficiency	30%	35%

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 and as a minimum meet or exceed the equivalent level specified in Table 1 above.

Where a thermal treatment plant only provides heat or a fuel then SEPA would expect that the energy recovery indicative efficiency should be estimated and calculated and as a minimum meet or exceed the equivalent level specified in Table 1 above.

Annex 2: Heat and Power Plan Requirements

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. These guidelines 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 or as a fuel (energy equivalent). References in these guidelines to heat and power should also be taken to include alternate energy generation means as well such as biogas production for export to the national gas grid system.

The following information provides the outline format for the heat and power plan that applicants should provide with their planning and Part A PPC permit 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 is made after an application for planning permission (i.e. 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 cessation of commissioning 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 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 or Indicative Efficiencies to be achieved by 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.

1.2.1 Detail of grid connections for electrical power export, if appropriate, showing evidence from Ofgem (the electricity and gas regulator) or the network operator 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.

- Electrical and heat energy (in MWh and GJ) to be used within the facility including for example losses due to soot blowing, pollution abatement equipments, etc
- 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, e.g. 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 or support from the Renewable Heat Incentive if appropriate.

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 QI values or Indicative Efficiency for each year of the heat and power plan and the final QI or Indicative Efficiency that will be achieved by the plan or as energy recovery expressed as an indicative 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, e.g. potential development partners and any other developments that may be interested in using waste heat from the facility etc.

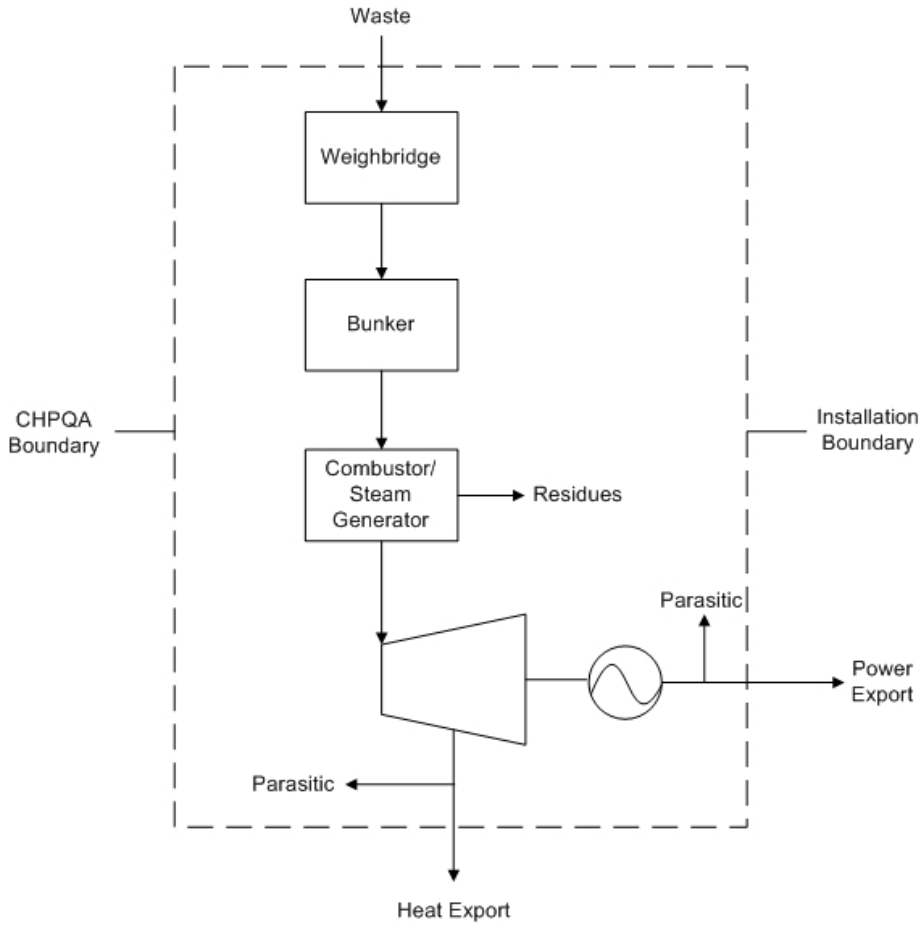
Annex 3: System Boundaries

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. Developers should agree all boundaries with SEPA as early as possible.

1. Boundaries for Conventional Energy from Waste Technologies and Gasification & Pyrolysis with Syngas combusted directly in a Boiler

For conventional moving grate or fluidised bed technologies and gasification or pyrolysis where the syngas is combusted directly in a boiler, 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:



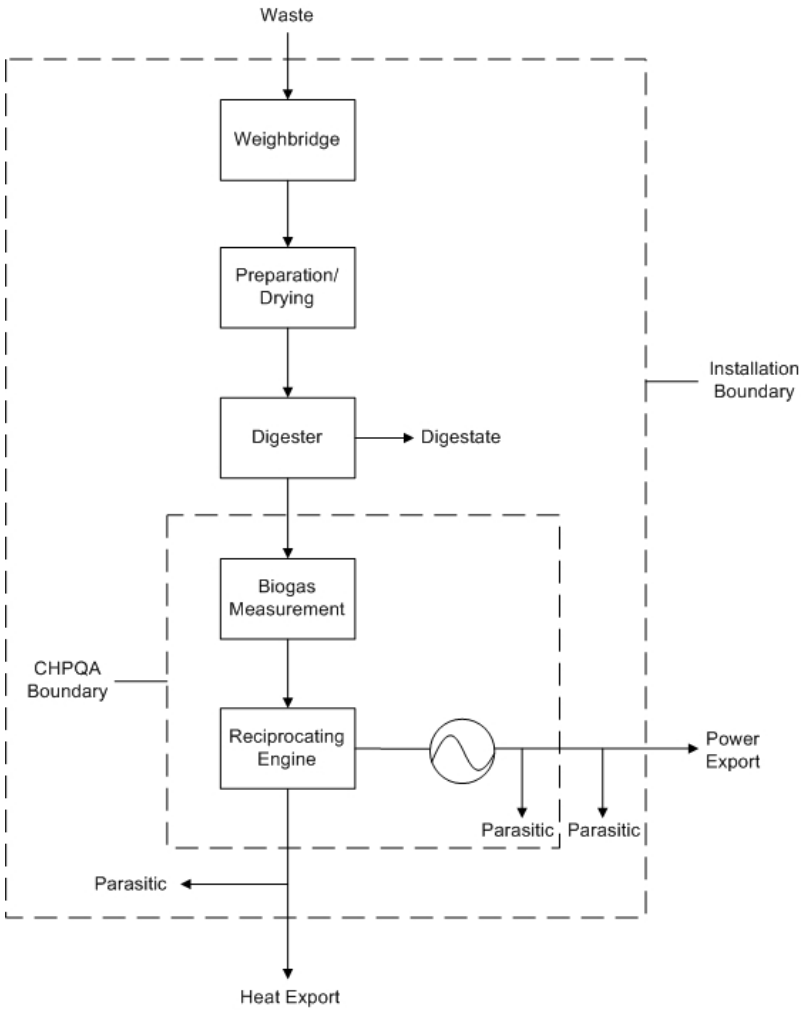
2. Boundaries for Technologies producing Biogas or SynGas for combustion in Gas Engines or Turbines

Where new thermal treatment technologies producing a biogas or clean syngas, such as anaerobic digestion or plasma gasification are used, there are alternate possibilities for the consideration of CHPQA/energy system boundaries.

CHPQA Guidance note 44 sets the boundary for systems that use reciprocating gas engines or gas turbines at the biogas or syngas fuel input to the engine or turbine. Therefore, for the purposes of the 2014 guidelines the method for setting the CHPQA/energy boundary in these circumstances should be as below and as shown in Example 5 in Annex 4.

Note gasification/pyrolysis plants or similar that generate a syngas for immediate combustion in a boiler to raise steam for electrical and/or heat generation should set the energy boundary based on the example in Para 3.1 of this Annex.

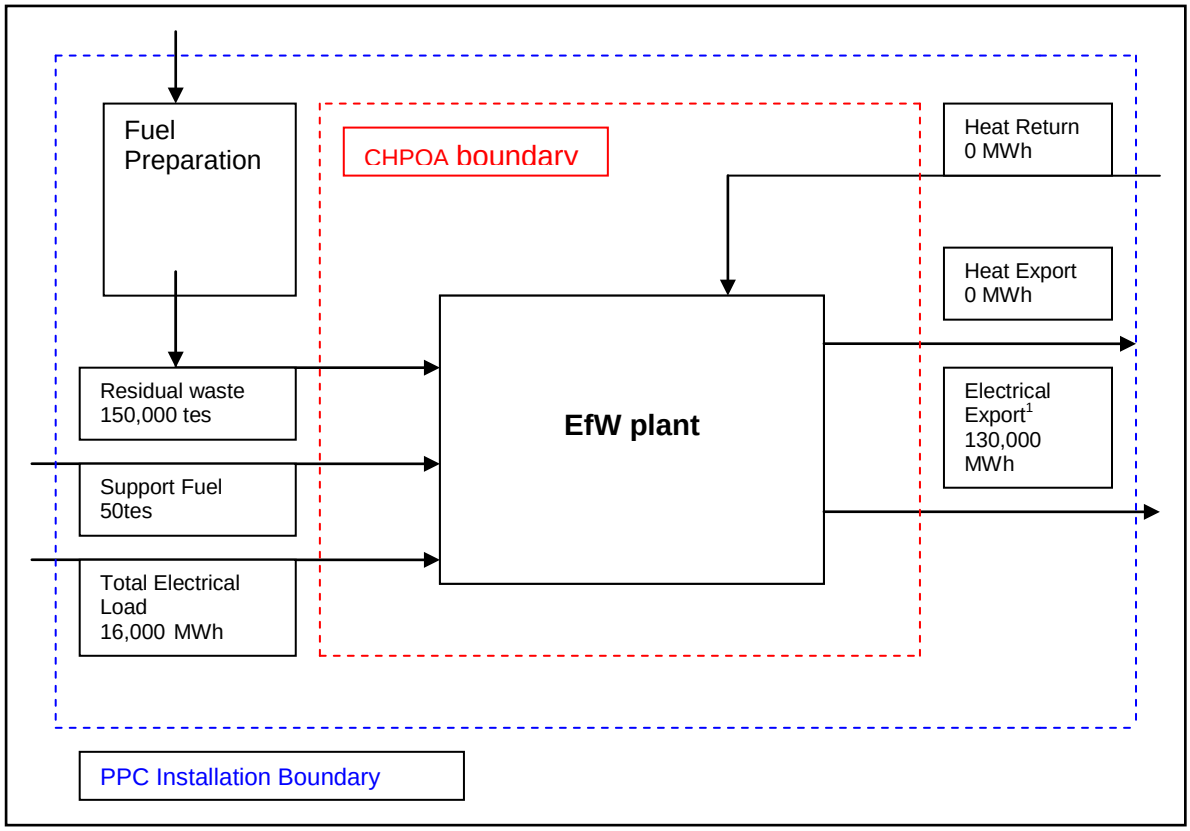
Simplified installation/CHPQA boundaries for an Anaerobic Digestion plant:



Annex 4: Example Heat and Power Calculations

Example 1: Energy from waste plant supplying electricity only (start up mode)

150,000 tonnes per annum residual waste.



1. As measured at generator terminals and all assumed exported.

Energy Inputs (annual basis)

Residual Waste	150,000 tes		
Gross Calorific Value	12.5 MJ kg^{-1}		
Energy input	(150000 x 10^3 x 12.5 x 10^{-3})/3.6	=	520,833 MWh
Support Fuel	50 tes		
Gross Calorific Value	43 MJ m-3		
Energy input	(50 x 10^3 x 43 x 10^{-3})/3.6	=	597 MWh
Total Electrical Power	16,000 MWh		16,000 MWh
Return Heat from Users	0 MWh		0 MWh
Total Energy Input (based on Gross CV)			**537430 MWh**

Energy Outputs

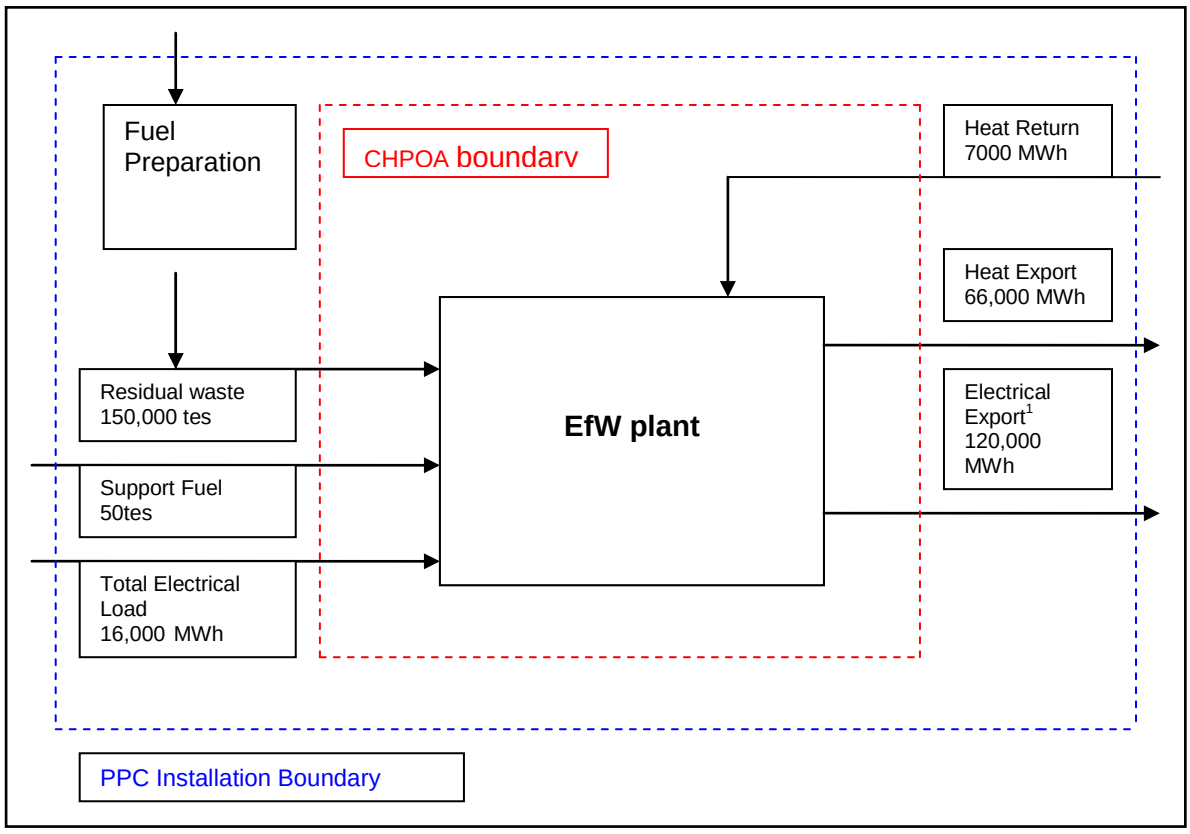
Power Efficiency ($\eta_{power)}$	=	Electrical Power provided to external users / Total Energy Input		
η_{power}	=	130000 x 100% / 537430	=	**24.2%**
Heat Efficiency (η_{Heat})	=	Heat Energy provided to External Users / Total Energy Input		
η_{Heat}	=	0 x 100% / 537430	=	**0%**
Overall Indicative Efficiency	=	Total Energy exported / Total Energy Input		
$\eta_{overall}$	=	(130000 + 0) x 100% / 537430	=	**24.2%**

CHPQA Index Not calculated in electricity only mode

In this case the EfW plant meets start up requirement of having a useful recovered energy efficiency > 20%.

Example 2: Energy from waste plant supplying electricity and heat (average load)

150,000 tonnes per annum residual waste



1. As measured at generator terminals and all assumed exported.

Energy Inputs (annual basis)

Residual Waste	150,000 tes		
Gross Calorific Value	12.5 MJ kg^{-1}		
Energy input	(150000 x 10^{3} x 12.5 x 10^{-3})/3.6	=	520,833 MWh
Support Fuel	50 tes		
Gross Calorific Value	43 MJ m-3		
Energy input	(50 x 10^{3} x 43 x 10^{-3})/3.6	=	597 MWh
Total Electrical Power	16,000 MWh		16,000 MWh
Return Heat from Users	7,000 MWh		7000 MWh
Total Energy Input (based on Gross CV)			**544430 MWh**

Energy Outputs

Power Efficiency (η_{power})	=	Electrical Power provided to external users / Total Energy Input		
η_{power}	=	120000 x 100% / 544430	=	**22.0%**
Heat Efficiency (η_{Heat})	=	Heat Energy provided to External Users / Total Energy Input		
η_{Heat}	=	66,000 x 100% / 544430	=	**12.1%**
Overall Indicative Efficiency	=	Total Energy exported / Total Energy Input		
$\eta_{overall}$	=	(120000 + 66000) x 100% / 544430	=	**34.2%**

CHPQA Index

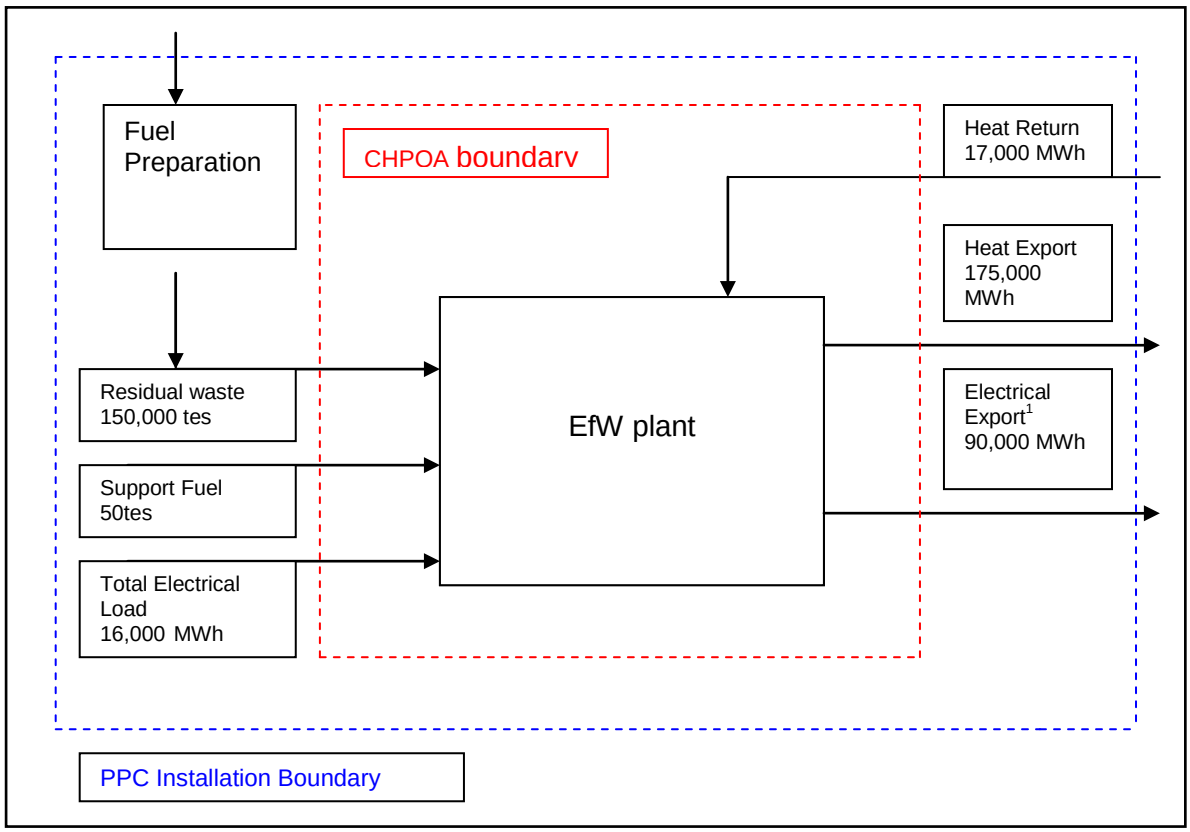
X x η_{power} + **Y** x η_{Heat} = 370 x 0.22 + 140 x 0.121 **= 98.3**

X = 370 and Y = 140 for solid waste <25MWe (CHPQA Guidance Note 44).

In this case the EfW plant meets the Heat Plan target by having a CHPQA Index (QI) > 93 even though the indicative efficiency is slightly below that specified.

Example 3: Energy from waste plant supplying electricity and heat (peak heat load)

150,000 tonnes per annum residual waste



1. As measured at generator terminals and all assumed exported.

Energy Inputs (annual basis)

Residual Waste	150,000 tes		
Gross Calorific Value	12.5 MJ kg^{-1}		
Energy input	(150000 x 10^{3} x 12.5 x 10^{-3})/3.6	=	520,833 MWh
Support Fuel	50 tes		
Gross Calorific Value	43 MJ m-3		
Energy input	(50 x 10^{3} x 43 x 10^{-3})/3.6	=	597 MWh
Total Electrical Power	16,000 MWh		16,000 MWh
Return Heat from Users	17,000 MWh		17,000 MWh
Total Energy Input (based on Gross CV)			**554,430 MWh**

Energy Outputs

Power Efficiency (η_{power})	=	Electrical Power provided to external users / Total Energy Input		
η_{power}	=	90000 x 100% / 554430	=	**16.2%**
Heat Efficiency (η_{Heat})	=	Heat Energy provided to External Users / Total Energy Input		
η_{Heat}	=	175,000 x 100% / 554430	=	**31.6%**
Overall Indicative Efficiency	=	Total Energy exported / Total Energy Input		
$\eta_{overall}$	=	(90000 + 175000) x 100% / 554430	=	**47.8%**

CHPQA Index

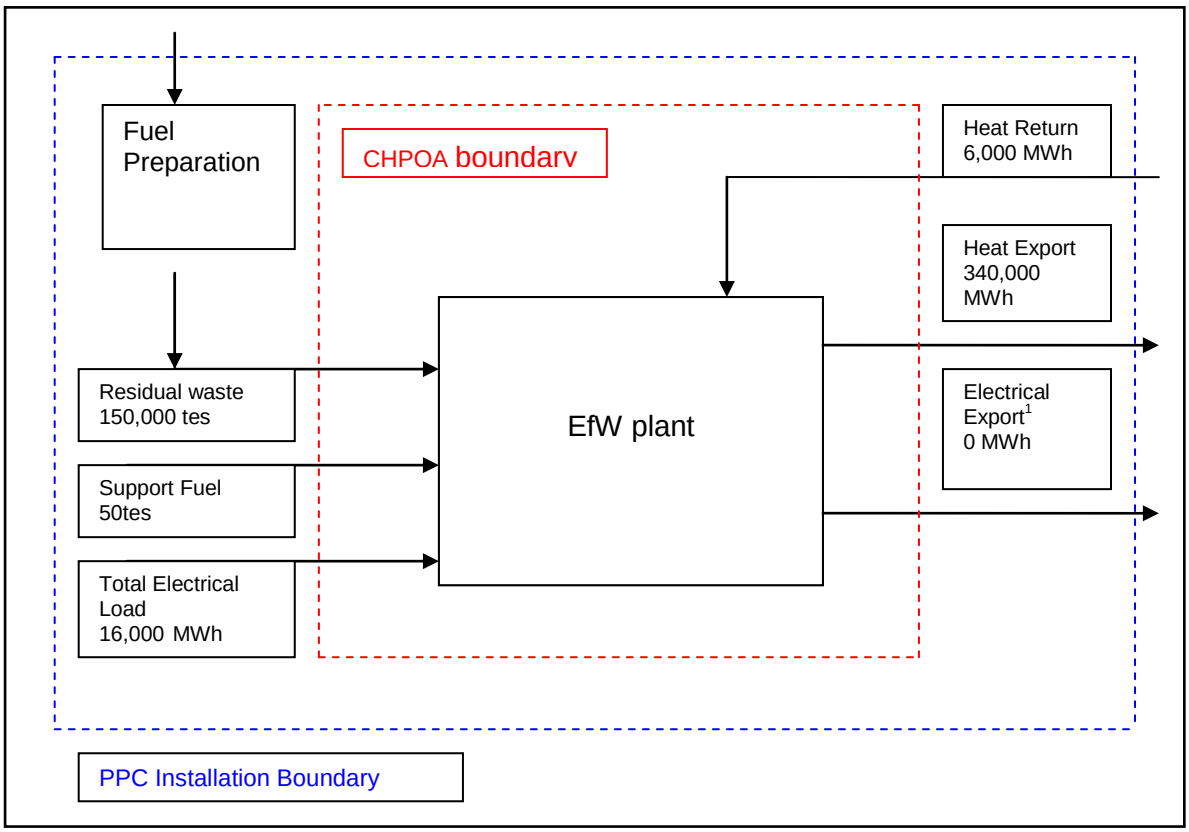
X x η_{power} + **Y** x η_{Heat} = 370 x 0.162 + 140 x 0.316 **= 104**

X = 370 and Y = 140 for solid waste <25MWe (CHPQA Guidance Note 44).

Even though the electrical power efficiency has dropped below 20% in this case the EfW plant meets the Heat & Power Plan targets by having both a CHPQA Index (QI) > 93 and the indicative efficiency > 35%.

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

150,000 tonnes per annum residual waste



1. As measured at generator terminals and all assumed exported.

Energy Inputs (annual basis)

Residual Waste	150,000 tes		
Gross Calorific Value	12.5 MJ kg^{-1}		
Energy input	(150000 x 10^{3} x 12.5 x 10^{-3})/3.6	=	520,833 MWh
Support Fuel	50 tes		
Gross Calorific Value	43 MJ m-3		
Energy input	(50 x 10^{3} x 43 x 10^{-3})/3.6	=	597 MWh
Total Electrical Power	16,000 MWh		16,000 MWh
Return Heat from Users	6,000 MWh		6,000 MWh
Total Energy Input (based on Gross CV)			**543,430 MWh**

Energy Outputs

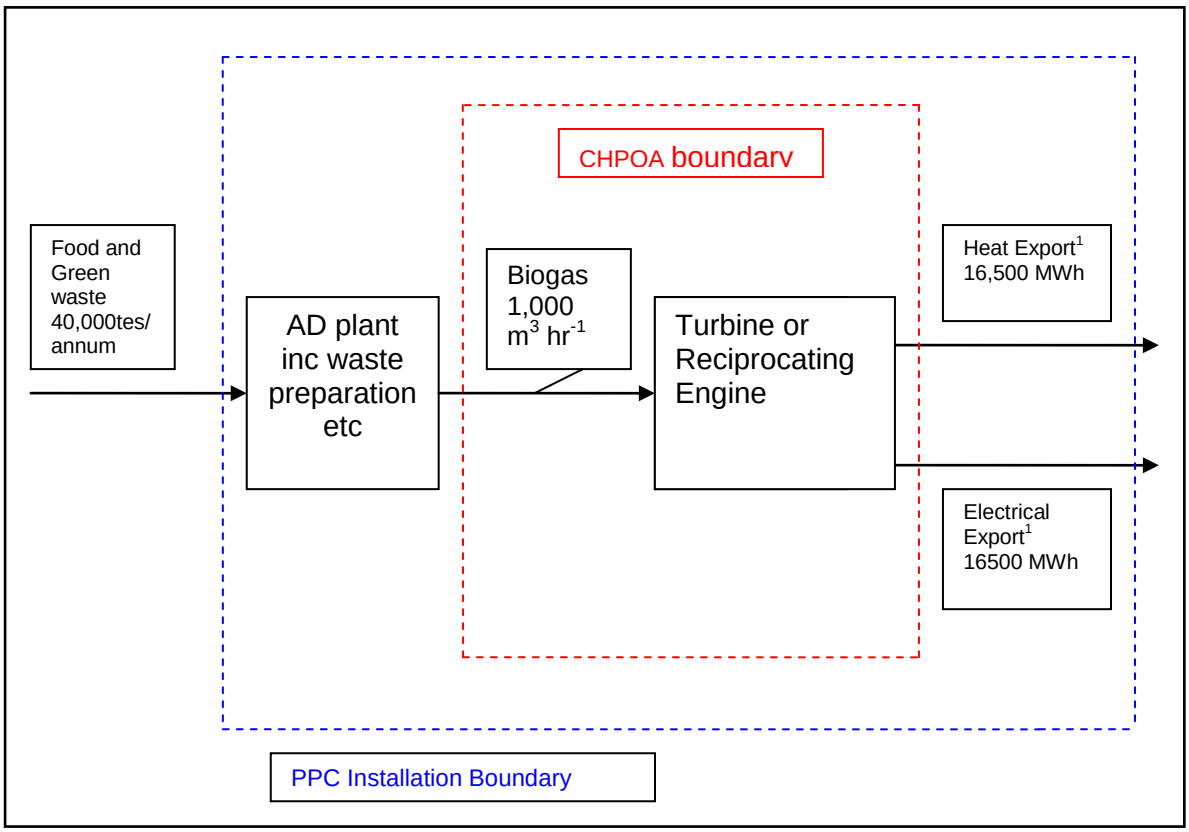
Power Efficiency (η_{power})	=	Electrical Power provided to external users / Total Energy Input		
η_{power}	=	0 x 100% / 543,430	=	**0%**
Heat Efficiency (η_{Heat})	=	Heat Energy provided to External Users / Total Energy Input		
η_{Heat}	=	340,000 x 100% / 543,430	=	**62.6%**
Overall Indicative Efficiency	=	Total Energy exported / Total Energy Input		
$\eta_{overall}$	=	(0 + 374000) x 100% / 543,430	=	**62.6%**

CHPQA Index is not calculated as the plant is not in CHP mode.

Even though the electrical power efficiency is zero in this case the EfW plant meets the Guideline's long term aspirational target of 60%

Example 5: Anaerobic Digestion plant supplying electricity and heat to a district heating scheme

40,000 tonnes per annum mixed food and green waste



2. Including any parasitic load in the AD plant.

Energy Inputs (annual basis, 8000 hours)

Biogas	1,000 m^3 hr^{-1}		
Gross Calorific Value	21.7 MJ m^{-3}		
Energy input	(8000 x 1000 x 21.7 x 10^{-3})/3.6	=	48222 MWh
Total Energy Input (based on Gross CV)			**48222 MWh**

Energy Outputs

Power Efficiency (η_{power})	=	Electrical Power provided to external users / Total Energy Input		
η_{power}	=	16500 x 100% / 48222	=	**34.2%**
Heat Efficiency (η_{Heat})	=	Heat Energy provided to External Users / Total Energy Input		
η_{Heat}	=	16500 x 100% / 48222	=	**34.2%**
Overall Indicative Efficiency	=	Total Energy exported / Total Energy Input		
$\eta_{overall}$	=	(16500 + 16500) x 100% / 48222	=	**68.4%**

CHPQA Index

X x η_{power} + **Y** x η_{Heat} = 251 x 0.342 + 120 x 0.342 **= 126.9**

X = 251 and Y = 120 for biogas generation > 1 MWe (CHPQA Guidance Note 44).

The AD plant meets the Heat Plan target by having a CHPQA Index (QI) > 85 and also meets the Guideline's long term aspiration of 60%.

Glossary

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 the basis for emission limit values designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole.
Combined heat and power (CHP)	A system which utilises waste heat from electricity production to provide hot water and space heating for neighboring buildings.
Energy from waste	The recovery of energy value from waste by burning the waste directly or by burning a fuel produced from the waste.
Feed-stock	The waste material used as fuel within the treatment plant.
Gasification	Heating organic material in a low-oxygen atmosphere at temperatures typically of 800–1400^{o}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.
IED	Industrial Emissions Directive (2010/75/EU)
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.
Oxidation of waste	Heating 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^{o}C. This produces a predominately gaseous fuel product, occasionally some liquid fuel and a solid residue.
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	The Waste Incineration Directive is a directive issued by the

Incineration Directive (WID)	European Union and relates to standards and methodologies required by Europe for the practice and technology of incineration. Since superseded by Chapter IV and Annex VI of IED.

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 Industrial Emissions 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, 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

References & Further Reading

Scottish Government - Zero Waste Plan - 2010
http://www.scotland.gov.uk/Publications/2010/06/08092645/0

EU - Industrial Emissions Directive
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:EN:PDF

Pollution Prevention and Control (Scotland) Regulations 2012
http://www.legislation.gov.uk/ssi/2012/360/contents/made

Sustainable Development Commission Scotland – Energy from Waste Potential in Scotland - 2010
http://www.scotland.gov.uk/Resource/Doc/311011/0098129.pdf

Department for Environment Food & Rural Affairs – Energy from Waste – A Guide to the Debate - 2013
http://www.defra.gov.uk/publications/files/pb13892-energy-from-waste.pdf

Health Protection Scotland – Incineration of Waste and Reported Human Health Effects
http://www.documents.hps.scot.nhs.uk/environmental/incineration-and-health/incineration-of-waste-and-reported-human-health-effects.pdf

LUPS 6 – SEPA Guidance on input to development management consultations in relation to Zero Waste Plan issues
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LUPS 11 – SEPA Guidance on the development plan process
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