Written evidence submitted in July 2017 by the United Kingdom Without Incineration Network to the London Assembly's Environment Committee

1. The United Kingdom Without Incineration Network (UKWIN) welcomes this opportunity to contribute to the Environment Committee's investigation into London's waste generation, handling and disposal.

2. UKWIN is a network of about 100 member groups, founded in 2007 to promote sustainable waste management and public participation in environmental decision-making. Our network includes many members based in and around London, and we have held 7 out of our 10 Annual General Meetings in London.

3. UKWIN is a third-sector body involved in promoting waste reduction and sustainable waste management. Our objects are: (a) The conservation, protection and improvement for the benefit of the public of the (physical and natural) environment by promoting sustainable waste management and influencing public policy and practice accordingly; and (b) The education of the public in waste management options, and the promotion of economic, social and environmental benefits arising from protecting the environment and reducing pollution.

Question 1: What are the issues and challenges in seeking to reduce the costs and environmental impacts of London's waste and how it is handled?

4. One of the challenges when it comes to promoting reuse is that residents and businesses may be unaware of the opportunities on offer and/or there may be barriers to accessing those opportunities. Part of the solution would be to ensure that householders and businesses are given ready access to reuse services, for example at Household Waste Recycling Centres and at dedicated 'Reuse Parks' (also known as 'Resource Recovery Parks').

5. In relation to increasing recycling rates in London, one of the challenges faced is the current situation whereby London has not been granted the power to introduce Pay-As-You-Throw schemes. Such schemes are used throughout Europe and elsewhere as an effective way to help encourage and reward waste reduction as well as increasing recycling rates, and indeed recyclate quality. Evidence of the successful scheme in Flanders is set out in UKWIN's response to Question 3, below.

6. London should lobby for the right to introduce Pay-As-You-Throw schemes, including the ability to operate a differential charging scheme for waste management so that those who waste less pay less.

7. The claim at page 8 of the Call for Evidence Scoping Paper that: "…When the energy released by incineration is recovered for use (as it is at least to some extent for all of London's waste), it partly qualifies as a renewable energy source, and so may qualify for incentives" should be treated with caution for several reasons, including: (a) with separate collection of food waste, increasing use of

anaerobic digestion (AD), and reductions in biodegradable waste available for use as incineration feedstock, the proportion of waste that could be described as 'renewable' under the old definition could be expected to decrease in the coming years; and (b) the old definition of 'renewable' is based on the old Renewable Energy Directive, which is in the process of being revised, and which in any case relates to European Member States; and (c) the current situation whereby the cost to society of incineration is not reflected in the price of disposal could be addressed, in whole or in part, through the introduction of an incineration tax.

8. As the UK leaves the European Union there is every possibility that the UK Government will bring incineration subsidies to an end. The UK would no longer be subject to the EU's renewable energy targets, and the UK would be free to adopt a definition of 'renewable' that makes more economic and environmental sense that the old definition used by the EU.

9. In relation to biomass-derived waste, we call attention to the Environment, Transport and Regional Affairs Committee's conclusion in 2001 that: "We do not accept that energy from waste incineration is a renewable form of energy. Even if one considers that it meets the [EU's historic] technical definition of renewable energy, it utterly fails to meet what might be called a 'common-sense' interpretation. A waste stream is only 'sustainable' in the most twisted definition of the word since sustainable waste management has as its cornerstone the minimisation of waste, and the explicit maintenance of waste streams for the purposes of incineration is in complete contradiction of this principle…There must be no subsidy to the growth of incineration…"[1]

10. We also draw attention to the October 2015 Eunomia report entitled 'The Potential Contribution of Waste Management to a Low Carbon Economy' which correctly explains that: "...to classify the biomass fraction of waste as a renewable resource is to fly in the face of everything that waste management policies should be seeking to achieve: at the very basic level, it conveys all sorts of wrong messages".[2]

11. The report also notes that: "Given that part of the rationale for developing renewable sources of energy is to address climate change, it seems counterproductive to maintain support for those which contribute to climate change. The case for supporting measures for the generation of energy from waste on the basis that waste is 'a renewable resource' makes no sense when set against the waste hierarchy. As countries improve in their prevention, reuse, and recycling, so less and less residual waste will be available. It is stretching the definition of 'renewable' beyond what is credible to argue that residual waste could be a source of 'renewable' energy".

[1] Committee Report on Delivering Sustainable Waste Management. Fifth Report of Session 2000-01, Volume I (published March 2001)

[2] Available from https://www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/

12. UKWIN agrees with the statements in the first paragraph of page 7 of the Call for Evidence Scoping Paper that food waste should be separately collected for AD. As such, alongside efforts to reduce food waste in accordance with the Food Waste Hierarchy, London should aim for separate collection of food waste across the city.

Environmental implications of waste incineration

13. When considering the issues and challenges associated with reducing the costs and environmental impacts of managing London's waste it is important to consider the adverse environmental implications of waste incineration, both on its own and alongside the positive benefits of recycling and the Circular Economy.

14. The adverse environmental implications of waste incineration include the exacerbation of climate change through the release of greenhouse gas (GHG) emissions.

15. Incineration is known to exacerbate climate change by releasing more than one tonne of CO2 for every tonne of waste burned[3], meaning that a single incineration facility can be emitting hundreds of thousands of tonnes of CO2 each and every year of operation. As a typical waste incinerator can last for 30 years or more, incinerators are responsible for a significant adverse GHG legacy.

16. According to Government statistics[4] for the year 2015/16 some 1.7 million tonnes of London's Local Authority Collected Waste (LACW) was incinerated. This equates to the direct release in 2015/16 alone of between 1.2 to nearly 3 million tonnes of CO2.

17. Electricity produced through incineration has a higher carbon intensity than the conventional use of fossil fuels, and is significantly higher than the level which most people would consider to constitute 'low carbon'.

18. By the year 2050, energy produced by waste incinerators could be more than ten times the average carbon intensity of the decarbonised electricity grid, making incineration a significant barrier to the long-term decarbonisation of the power supply and making incineration an unnecessary obstacle to a low-carbon economy.[5]

19. This is acknowledged by the Government, for example at paragraph 2.5.38 of the Government's National Policy Statement for Renewable Energy Infrastructure (EN-3) which states that: "CO2 emissions may be a significant adverse impact of biomass/waste combustion plant", and at paragraph 1.9 of the 2012 UK Bioenergy Strategy which states that: "…it is essential that bioenergy which contributes to our short and medium term targets, such as the 2020 renewable energy targets, also puts the UK in a good place for longer term decarbonisation".

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[3] According to page 5 of the Environment Agency's "Pollution inventory reporting – incineration activities guidance note Environmental Permitting (England and Wales) Regulations 2010 Regulation 60(1)", Version 4 December 2012 available from:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296988/LIT_7757_9e97eb.pdf
"Between 0.7 and 1.7 tonnes of CO2 is generated per tonne of MSW [Municipal Solid Waste] combusted".

[4] ENV18 - Local authority collected waste: annual results tables, available from:
https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables

[5] http://www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/

20. Page 8 of the Call for Evidence Scoping Paper states that: "…The greenhouse emissions [from waste incineration] may be below those from a combination of landfilling the waste and generating the same energy by other means…"

21. As set out above, generating the same energy by means other than incineration will be increasingly decarbonised, making energy generated by incineration increasingly worse than the marginal electricity mix.

22. Whilst of course reduction, re-use, recycling and composting are best, for residual material that is not recycled or composted it is not necessarily the case that incineration is better than landfill in relation to relative net GHG emissions.

23. UKWIN notes the explanation in the Government's EfW Guide that: "Fossil based residual wastes, e.g. plastics that cannot be recycled, do not decompose in the same way as biogenic material in landfill. For these waste streams conventional energy from waste will almost always deliver a negative carbon balance compared to landfill…"[6]

24. Comparing incinerating waste with sending that same waste untreated to landfill does not provide a valid comparison because best practice is for waste to be appropriately bio-stabilised prior to landfill to reduce GHG emissions.

25. Highlighting the relative impacts of incineration and of sending waste to Mechanical Biological Treatment (MBT) prior to landfill, DEFRA's Waste Economics Team noted that: "MBT-landfill provides the best emissions performance in terms of the treatment/disposal of residual waste. It essentially involves landfilling somewhat stabilised wastes with some material recovery. The magnitude of the environmental impact depends on the extent to which the waste is stabilised".[7]

26. Even when waste is sent directly to landfill (without appropriate pre-treatment), there are various factors that are sometimes overlooked in modelling exercises in terms of the carbon sequestration effects of landfilling waste.

27. As noted in the Government's aforementioned EfW Guide: "…considering the landfill route, all the fossil carbon stays in the ground and doesn't break down. The fossil carbon is sequestered, as is potentially up to half of the biogenic carbon depending on the exact conditions in the landfill".

28. The impacts of biogenic carbon releases being avoided, sequestered or delayed in landfill compared to being immediately released as the result of incineration is erroneously omitted from some assessments of relative net emissions, and these omissions improperly favour incineration in such assessments.

[6] DEFRA's "Energy from waste: A guide to the debate", February 2014 (revised edition), available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284612/pb14130-energy-waste-201402.pdf

[7] DEFRA's " The Economics of Waste and Waste Policy", June 2011, available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69500/pb13548-economic-principles-wr110613.pdf

29. These issues are covered in more detail in the following studies: 'The Potential Contribution of Waste Management to a Low Carbon Economy' (Eunomia, October 2015)[8], 'A carbon based modelling approach - WR1910' (DEFRA, February 2014)[9], and 'Assessment of the Options to Improve the Management of Bio-waste in the European Union: Annex F: Environmental Assumptions' (ARCADIS/Eunomia, February 2010).[10]

30. Whilst in general terms UKWIN agrees with the statement at page 8 of Call for Evidence Scoping Paper that: "…Both of these disposal options [incineration and landfill] destroy or lose materials and produce pollutant emissions such as carbon dioxide, so they are low in the waste hierarchy…", UKWIN notes that: (a) plastics in landfill can be subject to landfill mining in the future, when it becomes economic to recycle that plastic[11]; and, as noted above, (b) when plastics and other non-biodegradable waste is landfilled the effect is to sequestrate the carbon, in stark contrast to incineration where carbon is immediately released into the atmosphere; and (c) bio-stabilisation prior to landfill can reduce emission of biogenic material, rendering such material less volatile.

31. Furthermore, by impeding waste reduction, reuse, recycling and composting (including AD) incinerating waste can result in significantly higher levels of GHG emissions than would have arisen had the waste been dealt with sustainably.

32. In 2014 the Environment, Food and Rural Affairs Committee (EFRACOM) noted that: "UKWIN told us that recycling is harmed by incineration for various reasons, including the presence of incineration capacity and government subsidies for incineration discouraging investment in recycling, the long-term lock-in of money and feedstock to existing and proposed incineration capacity, and the fact that the true costs of incineration are not reflected in the price of treatment. UKWIN also provided us with data showing an apparent correlation between high rates of incineration and low rates of recycling".[12]

33. EFRACOM also noted that: "When we [EFRACOM] asked the Minister how the Government ensures that only genuinely residual waste is sent to incinerators, he told us that the key pressure is gate fees - i.e. the charge that must be paid to dispose of waste in an incineration facility. However, we are concerned about the effectiveness of this singular mechanism following evidence we received about 'put or pay contracts' and negative impacts on recycling rates".

[8] https://www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/

[9] http://randd.defra.gov.uk/Document.aspx?Document=11918_WR1910Energyrecoveryforresidualwaste-Acarbonbasedmodellingapporach.pdf

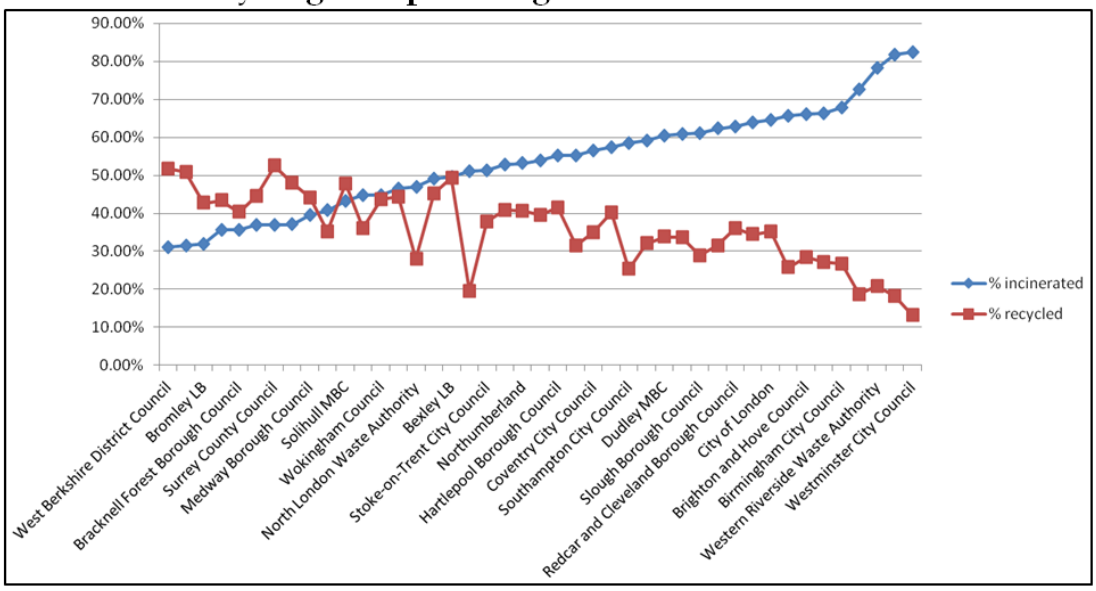
[10] http://ec.europa.eu/environment/waste/compost/pdf/ia_biowaste%20-%20ANNEX%20F%20-%20environmental%20assumptions.pdf

[11] See paragraph 3.5.1 of the Science Advisory Council Waste sub-group (SAC-Waste) Final Report. SAC-Waste/Defra, 14 June 2011. Available from: http://www.defra.gov.uk/sac/files/sac-waste-subgroup-finalreport-june-20111.pdf

[12] https://www.publications.parliament.uk/pa/cm201415/cmselect/cmenvfru/241/24107.htm

34. UKWIN's evidence for EFRACOM[13] included the following graph and table:

LACW recycling rates plotted against incineration rates (2012/13)



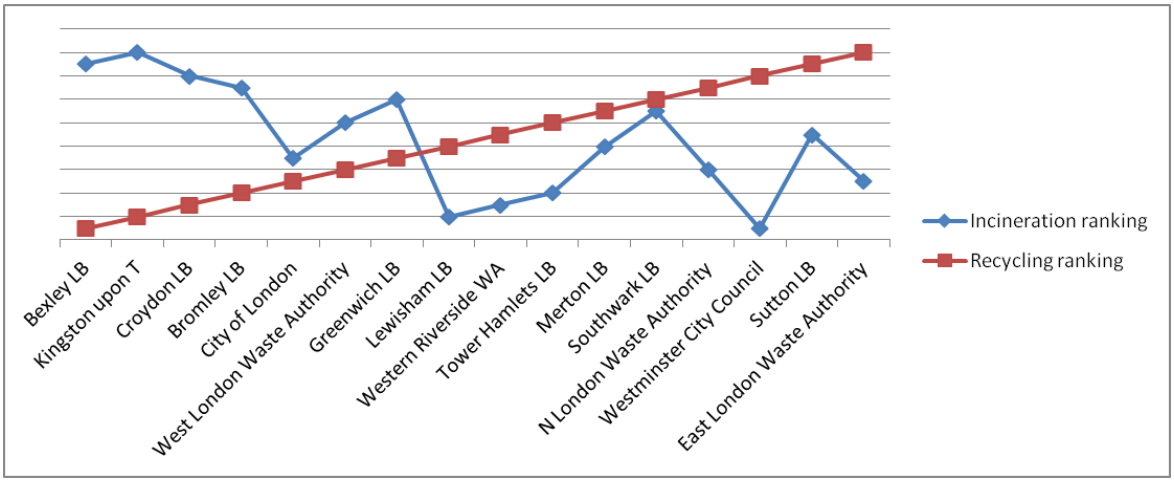
Authority LACW incineration and recycling rates / rankings (2012/13)

Authority	Incineration rate ranking (of 123)	Recycling rate ranking (of 123)	% incinerated	% recycled
Westminster City Council	1	123	82.46%	13.15%
Council of the Isles of Scilly	2	122	81.71%	18.29%
Western Riverside Waste Authority	3	119	78.17%	20.86%
Lewisham LB	4	121	72.65%	18.75%
Birmingham City Council	5	115	67.79%	26.73%
Sheffield City Council	6	114	66.26%	27.24%
Brighton and Hove Council	7	112	66.07%	28.37%
Portsmouth City Council	8	117	65.63%	25.75%
City of London	9	99	64.61%	35.20%
Stockton-on-Tees Borough Council	10	101	63.90%	34.44%
Redcar and Cleveland Borough Council	11	93	62.79%	36.03%
Middlesbrough Borough Council	12	107	62.29%	31.54%
Slough Borough Council	13	111	61.12%	28.96%
Kirklees MBC	14	104	60.86%	33.74%
Dudley MBC	15	103	60.39%	33.79%
North East Lincolnshire Council	16	106	59.13%	32.04%
Southampton City Council	17	118	58.59%	25.30%
Greenwich LB	18	74	57.42%	40.26%
Coventry City Council	19	100	56.47%	34.90%
Nottingham City Council	20	108	55.25%	31.52%

35. For the purpose of this submission to the London Assembly's Environment Committee, UKWIN has carried out a fresh analysis focusing on the ranking of rates of incineration and rates of landfill (1 being the #1 for % recycled/incinerated) for London Unitary and Disposal authorities in 2015/16. The results of this analysis are provided overleaf:

[13] http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environment-food-and-rural-affairs-committee/waste-management-in-england/written/9294.pdf

LACW recycling ranking plotted against incineration ranking for London (2015/16)



36. The chart above is based on ranking. The authority with the highest rates of recycling (red) and incineration (blue) are shown as highest on the chart.

37. As can be seen from the above graph the lowest-recycling authorities (on the left-hand side) are some of the highest-incineration authorities, whereas the highest-recycling authorities (on the right-hand side) generally incinerate the least.

38. As such, the latest waste management data available for London shows that there is an inverse correlation between incineration and recycling.

39. For example, as shown in the table below, the four areas with the highest rates of incineration have the lowest rates of recycling:

LACW incineration and recycling rates for the highest four incinerating London authorities (2015/16)

Authority	Incineration Rate	Recycling Rate
Bexley LB	82.43%	15.51%
Kingston upon Thames	82.74%	16.60%
Croydon LB	80.27%	19.08%
Bromley LB	74.36%	21.25%

40. It is important that London Authorities do not lock themselves into paying for the availability of incineration capacity that would not be used in the event that residual waste arisings were successfully reduced, and that they do not leave themselves vulnerable by relying on economic analysis that assumes long-term incineration will be cheaper than short-term landfill, given that current subsidies for incineration are coming to an end and that in the future incineration could be taxed to reflect the environmental harm associated with waste incineration.

41. The cheapest and most reliable way to avoid the costs associated with waste disposal is to invest in the top tiers of the Waste Hierarchy, and London Authorities that have locked themselves into long-term incineration commitments should immediately investigate how to extricate themselves from what could prove to be very expensive stranded assets.

42. Such a move away from inflexible long-term waste contracts would be consistent with decisions made by Local Authorities elsewhere in the UK, for example Thurrock[14], Sheffield[15], Greater Manchester[16], Peterborough[17], Kings Lynn[18] and the Scottish Borders[19]. In other areas contracts were amended to avoid new incineration capacity, such as in Nottinghamshire[20] and Coventry[21].

43. Some existing incineration capacity is associated with artificially low marginal costs because the majority of the true costs are not allocated to a per-tonne gate fee. This is due, for example, to the presence of externalities (as is recognised by DEFRA in respect of the cost to society of GHGs produced when burning plastics not being reflected in the price of disposal[22]), Government subsidies, and because once incineration capacity is paid for (or is committed to being paid for) then the amount charged per tonne is artificially lowered (e.g. as part of a put-or-pay clause).

44. In essence, this means that, for both household waste and business waste, the 'incentives hierarchy' does not always currently match the waste management hierarchy, and therefore environmentally harmful activities are improperly encouraged. It is UKWIN's experience that this has impeded recycling across England.

45. Stoke-on-Trent City Council, for example, faced the prospect of a £645,000 fine resulting from a failure to meet minimum contracted waste tonnage levels at their local incinerator.[23]

46. Regarding the Allington incinerator contract, the Kent Messenger reported that: "…what was initially seen as a cash-saving opportunity has quickly turned into a money pit, as the council is forced to send increasingly valuable recyclable material to the incinerator in order to meet its annual quota".[24]

47. As we move towards a circular economy, incineration infrastructure once considered to be assets will increasingly be seen as liabilities. Such relics of a linear economy become what is known as 'stranded assets', and the money invested in such redundant infrastructure could be described as 'wasted capital'.

[14] http://www.echo-news.co.uk/news/4844416.Council_takes_action_over_bins_farce/
[15] http://www.letsrecycle.com/news/latest-news/sheffield-councillors-vote-to-end-35-year-veolia-contract/
[16] http://www.thetimes.co.uk/article/3bn-pfi-waste-deal-heads-for-scrapheap-szxfgqt58
[17] http://www.letsrecycle.com/news/latest-news/peterborough-proposes-mutual-end-to-23-year-amey-contract/
[18] http://www.letsrecycle.com/news/latest-news/west-norfolk-terminates-waste-treatment-deal/
[19] http://resource.co/article/scottish-borders-council-terminates-new-earth-waste-contract-9865
[20] http://www.letsrecycle.com/news/latest-news/nottinghamshire-looks-at-waste-treatment-options/
[21] http://ukwin.org.uk/2010/03/27/coventry-incinerator-pfi-project-to-be-transformed-out-of-existence/
[22] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69500/pb13548-economic-principles-wr110613.pdf
[23] http://www.letsrecycle.com/news/latest-news/stoke-faces-bill-for-sending-less-waste-to-efw/
[24] http://www.kentonline.co.uk/kent/news/kents-waste-contract-could-be-m-a42292

48. In January 2017 the European Commission noted in relation to incineration that: "Previous experience in some Member States shows the risk of stranded assets is real" and advised that: "When planning future investments on waste-to-energy capacity, it is essential that Member States take into consideration the risk of stranded assets".[25]

49. This advice should be heeded in relation to waste investments within London.

50. To the extent that incineration lock-in comes at the expense of recycling, incineration has significant adverse environmental implications, not just in terms of the loss of financial resources that could have been invested in the circular economy / the top tiers of the waste hierarchy, but also in relation to relative net GHG impacts.

51. Using DEFRA data from the carbon analysis for thermal treatment[26] and the Scottish metric data for recycling[27] UKWIN calculates the following results:

    Plastics

    Generating 1 MWh of electricity by thermal treatment of 0.568 tonnes of plastic incurs **0.671 tonnes** of additional CO2 emissions as compared to recycling the same 0.568 tonnes plastic.

    This figure is derived as follows:

    a. Generation of 1MWh through thermal treatment of plastics requires 0.568 tonnes of plastic, and is accompanied by the release of 1.08 tonnes CO2.

    b. This compares unfavourably to 0.365 tonnes CO2 for 1MWh generated by a Combined Cycle Gas Turbine (CCGT) plant.

    c. Net CO2 emissions from gasification of plastics compared to generating the same 1 MWh of electricity via CCGT are therefore **0.715** tonnes CO2/MWh.

    d. Plastics recycling gives rise to carbon dioxide savings (compared to thermal treatment, including gasification) of 0.566 tonnes CO2/tonne plastic.

    e. Thermal treatment of 1 tonne of plastic at 25% efficiency will result in emissions of 1.90 tonnes CO2 to produce 1.76 MWh of electricity.

    f. Recycling 0.568 tonnes of plastic will save 0.322 tonnes of CO2, while the equivalent CCGT generation will incur 0.365 tonnes CO2. Net emissions can therefore be said to equate to **0.044** tonnes CO2/MWh.

    g. 0.715 tonnes – 0.044 tonnes = 0.671 additional tonnes of CO2 released.

[25] http://ec.europa.eu/environment/waste/waste-to-energy.pdf and http://resource.co/article/european-commission-warns-incineration-could-hamper-circular-economy-11632

[26] 'Energy recovery for residual waste – A carbon based modelling approach' available from: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=19019

[27] 'The Scottish Carbon Metric A national carbon indicator for waste 2013 update to the Technical Report' available from: http://www.zerowastescotland.org.uk/sites/default/files/2013%20Carbon%20Metric%20-%20Technical%20Report.pdf

Paper and card

Generating 1 MWh of electricity by thermal treatment of 1.143 tonnes of paper and card incurs **1.5 tonnes** of additional CO2 emissions as compared to recycling the same 1.143 tonnes paper and card.

This figure is derived as follows:

a. Carbon dioxide savings associated with recycling paper and card are 0.778 tonnes CO2/tonne paper and card (as per the Scottish Metric).

b. Thermal treatment of 1 tonne of paper and card at 25% efficiency will give 0.875 MWh for 1.173 tonnes CO2 if biogenic CO2 is included.[28]

c. The generation of 1MWh through thermal treatment of paper and card requires 1.143 tonnes paper and card and gives rise to emissions of 1.341 Tonnes CO2/MWh, while theoretically saving 0.365 tonnes CO2/MWh from CCGT, resulting in net emissions from thermal treatment of paper and card of 0.976 tonnes CO2/MWh.

d. Recycling 1.143 tonnes paper and card will save 0.889 tonnes CO2, whereas the equivalent CCGT generation will result in emissions of 0.365 tonnes of CO2, meaning a net emissions saving of 0.524 tonnes CO2/MWh from recycling paper and card when compared to generating the same energy via CCGT.

52. Generating 1 MWh of electricity through the thermal treatment of 1.143 tonnes of paper and card incurs net additional CO2 emissions of 0.976 tonnes + 0.524 tonnes = 1.50 additional tonnes of CO2 released.

53. The issue of adverse implications of lock-in is also relevant, albeit in a different context, to district heating schemes, as residents may find themselves unable to opt out of a high-cost and high-carbon heating system that comes as part of their property (which may have no space or opportunity for an independent boiler).

54. Page 8 of the Call for Evidence Scoping Paper describes how: "Different forms of energy recovery also have different energy yields and other environmental implications. More energy can be recovered if, after generating electricity, the waste heat is also taken via heat networks to warm properties in the area".

[28] Note that thermal treatment of 1 tonne of paper and card at 25% efficiency will give 0.875 MWh with 'zero' CO2 emissions if biogenic CO2 is asymmetrically ignored, but would still be worse than recycling. If one asymmetrically ignores biogenic CO2 then the generation of 1MWh requires 1.143 tonnes paper and card, while recycling 1.143 tonnes paper and card would save 0.889 tonnes of CO2. The equivalent CCGT generation would emit 0.365 tonnes of CO2. Factoring this in, UKWIN calacultes a net emission of 0.524 tonnes of CO2. So, if one asymmetrically ignores biogenic carbon then the 1 MWh generated by thermal treatment of 1.143 tonnes of paper and card results in 'zero' CO2 emissions and saves 0.365 tonnes of CO2 relative to CCGT, whereas recycling the same 0.568 tonnes of paper and card results in savings of 0.524 tonnes of CO2. Thermal Treatment results in an additional 0.159 tonnes of CO2 per MWh even if one ignores the direct CO2 emissions of the thermal treatment. Arguments against 'discounting' (asymmetrically ignoring) biogenic carbon are set out in Eunomia's 'The Potential Contribution of Waste Management to a Low Carbon Economy' and in the Defra-commissioned 'Energy recovery for residual waste – A carbon based modelling approach'.

55. Without heat capture incineration plants are woefully inefficient in terms of the proportion of the energy content of the waste that is exported to the grid, with typically only 15-27% overall thermal efficiency[29], with some facilities operating at as little as <10% thermal efficiency, and that is before one gets into the consideration of the 'embedded energy' that is wasted when one considers that burning an item will require new resources to be extracted, etc.

56. That said, a poorly operated heating scheme has the potential to exacerbate rather than reduce the environmental concerns relating to incineration schemes and has the potential to worsen rather than relieve fuel poverty.

57. As such, caution should be taken when deciding whether or not to make the significant capital investment into heating schemes they rely wholly or largely on waste incineration, and ensuring that such schemes are properly designed and associated contracts are appropriately structured (e.g. in relation to risk allocations, etc.).

58. As the average lifetime of a house is typically longer than that of an incineration plant, one relevant consideration is the source of heat after the incineration plant has been decommissioned.

59. It is possible that, in the longer term, houses developed as part of a heating schemes will be heated by sources of heat that could be associated with significantly higher carbon impacts when compared to the average fuel mix due to the decarbonisation of the electricity supply discussed above.

60. Similarly, if an incinerator's lifetime is extended in order to keep a heating scheme going, as could happen in relation to the proposed Sutton Decentralised Energy Network (SDEN) which is associated with the Beddington Lane incinerator, then this also raises issues in relation to the adverse environmental impact of continued use of the incinerator, especially as by the time of a potential refurbishment the incinerator would have a significantly higher carbon intensity than the decarbonised energy mix.

61. In relation to fuel poverty, there is the potential that using a heating scheme would be more expensive than alternatives, which would be exacerbated were insulation levels to be diminished as a result of the availability of heat from the scheme. The liability could rest with residents, which could result in higher bills.

62. Addressing issues arising from residents' experiences in Lambeth, the April 2017 'Not Fit for Purpose' report explains that: "Ruth London and FPA [Fuel Poverty Action] have been actively supporting MFN [Myatts Field North] and OQ [Oval Quarter] residents over the past year to seek redress over the district heating due to clear evidence that it has created or worsened fuel poverty for many households".[30]

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[29] Paragraph 74 of the Efw Guide, available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284612/pb14130-energy-waste-201402.pdf

[30] 'Not Fit for Purpose: Residents' Experiences of E.ON's District Heating System on the Myatts Field North (MFN) Estate and Oval Quarter (OQ) development in Lambeth, London' by Dr Stuart Hodkinson (School of Geography, University of Leeds) and Ruth London (Fuel Poverty Action - FPA), available from: http://bit.ly/2qi9vjs

63. As the BBC reported on 30th April 2017: "district heating is currently largely unregulated".[31] This is resonant with the article published in The Guardian newspaper in February 2017, entitled: "Energy customers locked into a costly scheme who have no right to switch".[32]

64. Operating in combined heat and power (CHP) mode generally results in lower electricity generation, and to avoid a net reduction in energy export one needs a significant heat load. However, because the UK typically only requires significant heating during the winter months, unlike Northern European countries where CHP schemes are more prevalent, even large CHP schemes in the UK can result in much of the heat not being used.

65. Given the significant adverse environmental impacts of incineration, with or without CHP, the prospect of this being addressed, in whole or in part, through the introduction of an incineration tax should be treated as a realistic prospect that should be taken into account when considering the urgency of promoting investment in reduction, reuse, composting and recycling alongside the avoidance of incinerator lock-in and over-capacity.

66. Indeed, UKWIN calls upon the London assembly to lobby Central government for an incineration tax that would be coupled with a commitment to use any funds raised to help promote the highest tiers of the Waste Hierarchy.

67. According to the HMRC, the total cash receipts for Landfill Tax in 2015/16 was £919m[33]. This is well below Landfill Tax revenue from previous years, which exceeded £1bn for each calendar year from 2010 - 2014.

68. While the quantity of waste sent to landfill has been decreasing, the quantity of waste sent for incineration has been increasing.

69. The introduction of an Incineration Tax (or a Residual Waste Tax) would help to restore at least some of the Treasury income lost as the result of diversion of waste from landfill to incineration, while simultaneously making it more economic to invest in recycling infrastructure as a means of avoiding both landfill and incineration.

70. According to the Report of the Environmental Audit Committee, published on 17th November 2016: "The landfill tax is…a 'blunt instrument' and is not sufficiently nuanced to drive continued increases in recycling rates".[34]

71. An Incineration Tax would be entirely consistent with the path set out in the Government's 2011 Waste Review regarding how the Government: "will provide the necessary framework to address market failures and deliver the most sustainable solutions".

72. The introduction of an Incineration Tax would help address the existing market failures that currently harm resource security, impede the efficient management of waste, and hamper efforts to achieve resource productivity.

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[31] 'Green heating system accused of causing fuel poverty', by Nicola Dowling and Adrian Goldberg, available from: http://www.bbc.co.uk/news/business-39736010

[32] Available from: https://www.theguardian.com/money/2017/feb/05/district-heating-fuel-bill-regulation

[33] https://www.uktradeinfo.com/Statistics/Tax%20and%20Duty%20Bulletins/lft1016.xls

[34] https://www.publications.parliament.uk/pa/cm201617/cmselect/cmenvaud/181/181.pdf

73. As is recorded in the 2011 Review of Waste Policies Impact Assessment (Paragraphs 10 and 12): “Failing to price in the environmental cost and benefit of generating waste leads to inefficient production and consumption patterns, and excess waste being produced...Without government intervention, waste treatment options with better environmental performance may be penalised relative to treatments with poorer performance. Accounting for the environmental impact requires that the costs of various treatment options and levels of the hierarchy fully reflect the costs to society of each option. For example, government intervention such as the landfill tax raises the cost of sending waste to landfill, reflecting the environmental externality of disposing waste in this way. However, it does not reflect the relative scale of the environmental impact of treatment and disposal methods further up the hierarchy; for example, the externality associated with incineration…”[35]

Incineration and the Circular Economy

74. Incineration has not place in the closed loop, circular economy towards which we should be working.

75. UKWIN is an enthusiastic advocate for the circular economy, i.e. a 'recycling society' where waste is brought down to an absolute minimum and where there is preservation of material and nutrients for as long as possible through re-use, closed-loop recycling, composting and product re-design.

76. It is widely recognised that thermal treatment (including gasification and pyrolysis, as well as conventional incineration) is a leakage from this circular economy to be minimised, and so the Government should not support gasification and pyrolysis of waste in the name of promoting the circular economy.

77. For example, the European Environment Agency's (EEA's) diagram of the circular economy (see overleaf) clearly shows that incineration (which includes gasification and pyrolysis as per the Industrial Emissions Directive) is a leakage from the circular economy to be 'minimised'.

78. As the EEA's 2016 report, entitled 'Circular economy in Europe: Developing the knowledge base', puts it: "One of the central pillars of a circular economy is feeding materials back into the economy and avoiding waste being sent to landfill or incinerated, thereby capturing the value of the materials as far as possible and reducing losses."[36]

79. 'Energy recovery' is similarly depicted as a leakage to be minimised in the portrayal of the Circular Economy used by the Ellen MacArthur Foundation and the World Economic Forum.[37]

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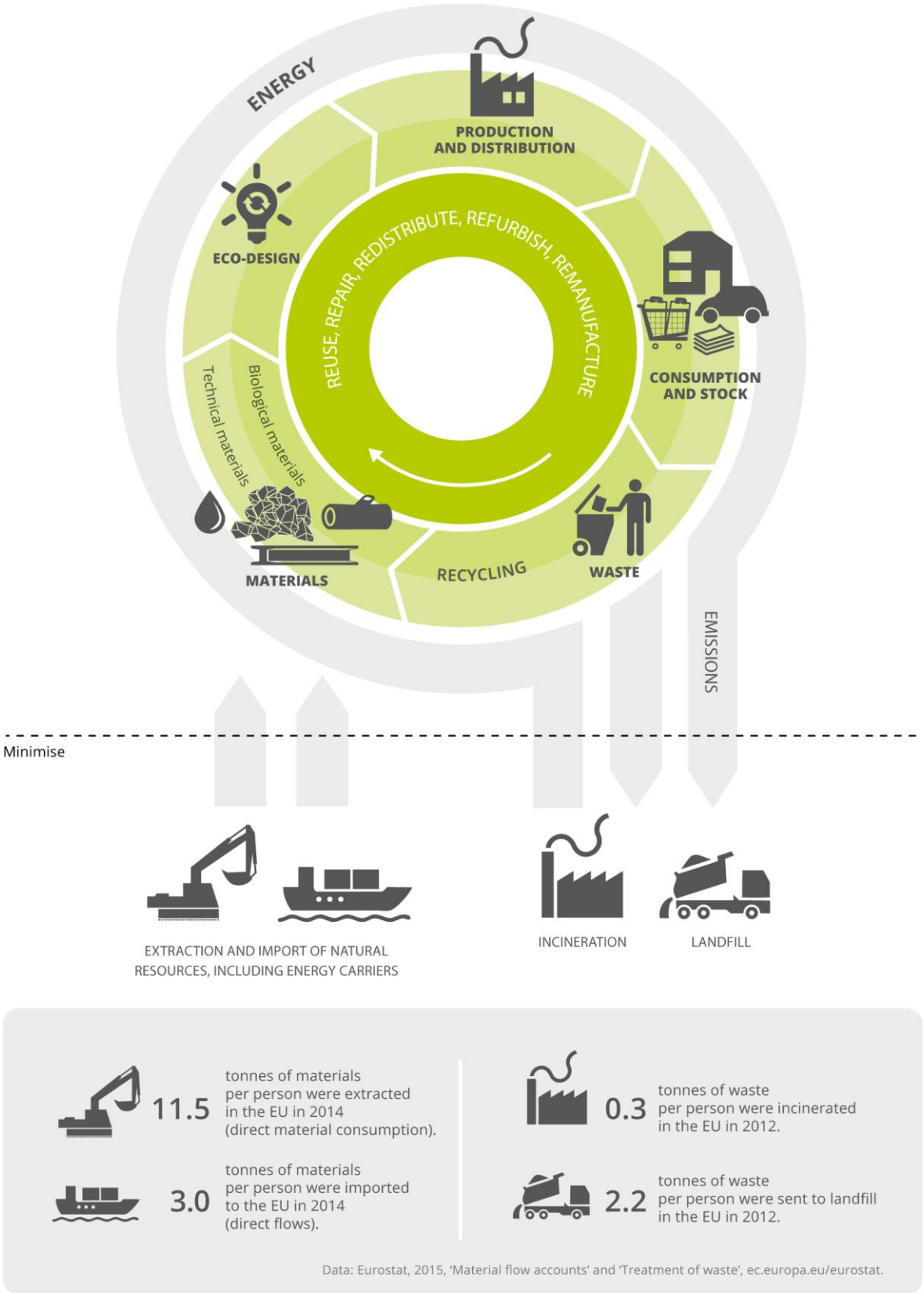
35 http://webarchive.nationalarchives.gov.uk/20130402151656/http://archive.defra.gov.uk/environment/waste/documents/ia-review-waste-policy.pdf

36 Circular economy in Europe – Developing the knowledge base. European Environment Agency, January 2016. Section 3.6, Page 29. Available from: http://www.eea.europa.eu/publications/circular-economy-in-europe

37 'Towards the circular economy: Accelerating the scale-up across global supply chains', World Economic Foundation (prepared in collaboration with the Ellen MacArthur Foundation and McKinsey & Company) January 2014, available from: http://reports.weforum.org/toward-the-circular-economy-accelerating-the-scale-up-across-global-supply-chains/view/from-linear-to-circular-accelerating-a-proven-concept/#fig2

EUROPEAN ENVIRONMENT AGENCY'S CIRCULAR ECONOMY DIAGRAM



Source: http://www.eea.europa.eu/media/infographics/circular-economy/view

80. Whilst the image used by the Ellen MacArthur Foundation and the World Economic Forum refers to 'energy recovery', it is worth noting that in practice many gasification and pyrolysis facilities would operate so inefficiently that they would fail to meet the R1 threshold and thus would be classified as 'disposal' within the context of the 5-tier European Waste Hierarchy.

81. The European Waste Hierarchy, as set out in Article 4 of the Waste Framework Directive, places inefficient incineration, including gasification and pyrolysis, at the bottom of the waste hierarchy alongside landfill, and therefore inefficient incineration would not even reach the level of being classed as a form of 'energy recovery'.

82. It should be noted that the Waste Framework Directive definitions of 'energy recovery' and 'disposal' are those which have been transposed into UK law and policy, including the Waste (England and Wales) Regulations 2011 and the National planning Policy for Waste.

83. The disposal status of inefficient incineration technologies is recognised by the Government as reflected in DEFRA's EfW Guide which notes at paragraph 52 that: "The requirement to apply the R1 formula means that lower efficiency municipal energy from waste [thermal treatment] plants are classed as disposal (D10) even if they are generating useable energy".

Environmental and cost implications of gasification and pyrolysis

84. Page 8 of the Call for Evidence Scoping Paper states that: "As well as simple incineration, there are also other energy generation technologies, such as gasification and pyrolysis, which may offer a different balance of energy generated against environmental and other costs".

85. Some proponents of gasification and pyrolysis, also known as 'advanced thermal treatment', attempt to argue that these experimental and unproven technologies can overcome some of the shortcomings associated with conventional waste incineration.

86. UKWIN's experience is that not only do these proposals fail to provide benefits over and above conventional incineration, but they are accompanied by a whole host of new problems that may be impossible ever to overcome for the treatment of a mixed waste feedstock. This submission to the London Assembly is accompanied by the November 2016 UKWIN briefing entitled "Gasification Failures in the UK: Bankruptcies and Abandonment".[38]

87. Money invested in gasification and pyrolysis is money wasted, not least because this so-called 'advanced' approach is out of step with the circular economy, even if the technology could somehow be made to work.

88. Investment should be directed instead towards improving waste sorting, education, source separation collection systems, and to other measures at the top tiers of the waste hierarchy.

[38] Available from: http://www.ukwin.org.uk/files/pdf/UKWIN_Gasification_Failures_Briefing.pdf

89. Some of the inadequacies of gasification are acknowledged within the Government's EfW Guide, which notes at paragraph 74 that: "…Steam generation from gasification is no more efficient than from incineration and due to lower operating temperatures, steam pressure and parasitic loads (i.e. energy required to run the plant) the overall process may be less efficient than conventional incineration".

90. Whatever the level of efficiency theoretically achievable by gasification and pyrolysis plants, these facilities rely for feedstock on material that could and should be recycled or composted.

91. Far from making a positive contribution to the circular economy, by competing with recycling (and indeed by competing with composting and anaerobic digestion), and by reducing resource security, incineration (including gasification and pyrolysis) act as a break on the circular economy, giving rise to serious and avoidable leakages.

92. Through our work UKWIN has been directly involved with more than 100 gasification, pyrolysis and conventional incineration schemes. We have tracked many of these from their initial public announcement to the present day. This wealth of relevant experience provides us with a deep understanding of thermal treatment proposals.

93. One of the most notable features of the gasification and pyrolysis industries is that those involved are extremely tight-lipped about their failures, making it extremely difficult for lessons to be learned when things have gone wrong.

94. For example, Waste2Tricity/Peel, who helped Air Products find the site for the Tees Valley gasification project, embarked on a project that shared some of the same core gasification technology that failed at Tees Valley. Even so, Waste2Tricity/Peel was unable to find out vital information from Air Products such as: the cause of the technology failure at Tees Valley; how Waste2Tricity's sister plant would be affected; and lessons to be learned (e.g. for design and operation).

95. As Stephen Othen, Technical Director of Ficthner and expert witness for Waste2Tricity/Peel at the Bilsthorpe Planning Inquiry, put it when discussing whether he knew what was going wrong at the 'sister plant' of the proposed gasification plant for which he was advocating: "…Air Products…have no reasons to tell us. I do not know what problems they are having…".

96. Even when given more time by the Secretary of State specifically to try and answer the question of what went wrong at Tees Valley [TV1 and TV2] and how it might affect their Bilsthorpe proposal, Waste2Tricity/Peel were unable to provide an explanation because their business partner was unwilling to be of assistance.

97. As Peel explained to the Secretary of State during the course of the Bilsthorpe planning inquiry: "We also refer the Secretary of State to Air Products' quoted position in the same article where they explicitly state they are: 'unable to go into specifics on the technology'. Thus, on the point as to why or what part of TV1 did not function, the factual position is that Air Products has never released any

details." and that "Air Products has released no specific details as to why TV1 would not work. This remains the case".[39]

98. Tees Valley benefitted from a contract for Government investment, and yet the project still failed to help advance the gasification industry.

99. Not only was the project cancelled, but no lessons were learned in the process.

100. The relatively high waste consumption and relatively poor power output associated with waste gasification and pyrolysis inevitably results in high levels of carbon intensity.

101. For example, any energy generated by Waste2Tricity/Peel's gasification plant approved for Bilsthorpe would have an average fossil carbon intensity of 0.903 tCO2eq/MWh based on the figures provided by the applicant.

102. This fossil carbon intensity is significantly higher than DECC's current Long-run Marginal Emissions Factor (MEF) for 2018 of 0.279 and the CCGT comparator of 0.349 as per Section 2.3.1 of DECC's (December 2015) 'Energy and GHG Appraisal and Evaluation: Background Documentation'.[40]

103. These figures give rise to the conclusion that energy from the gasification technology proposed for Bilsthorpe would have a significantly higher fossil carbon intensity than either the current conventional use of fossil fuel (CCGT) or the long-run marginal energy mix (MEF) as anticipated by DECC.

104. The relative inefficiency of gasification has proved to be even worse in practice than waste companies claimed when they were promoting their chosen technologies at the design, planning and permitting stages.

105. To illustrate this, UKWIN offers evidence of the claims made by prospective operators using the Energos gasification technology in both Derby and Knowsley, and contrasts these with details of the actual performance of the Energos gasification technology at the troubled (and soon to be closed) plant on the Isle of Wight.[41]

ACT design performance examples (Derby and Knowsley)

Derby - Energos
(Data extracted from planning application documentation, App. Ref. 05/09/00571)

Parameter	Design Value
Annual operating hours	8410 hours
Net annual electrical output	71,734 MWh
Net Annual Waste Input	140,000 tonnes
(Derived) Input Calorific Value	9.859457 Mj/kg (2.740929 MWh/tonne)
Annual Input Energy from waste	383,730 MWh
Other Annual input energy	10,595 MWh
Net Efficiency	**18.19%**

[39] Letter to SoS dated 5th May 2016 for PINS Ref APP/L3055/V/14/3001886
[40] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal
[41] See the article entitled " End of the line for gasification plant", available from: http://www.iwcp.co.uk/news/news/end-of-the-line-for-gasification-plant-315403.aspx

Knowsley - Energos
(Data extracted from Environmental Permit Application, Ref. EPR/ZP3339FN)

Parameter	Design value
Annual operating hours	7800
Net annual electrical output	59,080MWh
Net Annual Waste Input	96,000tonnes
Input Calorific Value	11.8 Mj/kg (3.28 MWh/ tonne)
Annual Input Energy from waste	315,000 MWh
Other Annual Input energy	6,226 MWh
Net Efficiency	**16.63%**

ACT actual performance

Isle of Wight - Energos
(Actual performance data from 2015 annual report, Permit Ref. JP3132LH)

Parameter	Actual value
Annual operating hours	6462 hours
Net annual electrical output	4,941 MWh
Net Annual Waste Input	16,983 tonnes
Input Calorific Value	12.1 Mj/kg (3.36 MWh/tonne)
Annual Input Energy from waste	57,000 MWh
Other Annual Input energy	Not recorded
Net Efficiency	**8.7%**

106. The poor performance of existing and currently planned electricity-only ACT waste to energy plants partially arises, consistent with the laws of thermodynamics, from the relatively low maximum temperatures and pressures achievable in the steam cycles.

107. The great majority of the energy in the waste is actually dissipated to the environment as heat from the condensers. It would require substantially higher pressures and temperatures, at a significantly increased capital cost, to improve upon the poor level of efficiency of such plants.

108. At present, gasification facilities are proving to be less efficient than conventional incinerators, and given the parasitic loads involved in cleaning the syngas it can be expected that gasification will always be a poor performer.

Question 3: What new or different ideas and approaches could improve the Mayor's policies? Are there examples from other parts of the country or the world?

109. Starting off, it is worth learning lessons from the waste collection offering of high-recycling areas in England, such as: South Oxfordshire District Council (recycled 67% of household waste in 2015/16)[42], North Somerset Council (recycled 59% of household waste in 2015/16)[43] and South Cambridgeshire Council (recycled 57% of household waste in 2015/16)[44].

110. Perhaps unsurprisingly, all three of these high-performing areas mentioned above operate food waste collection services and allow for a large range of recyclable materials to be collected at the kerbside.

111. Going more widely into Europe, lessons can be learned from the case studies produced by Zero Waste Europe, which are available from https://www.zerowasteeurope.eu/zw-library/case-studies/ These cover: Capannori, Argentona, Vrhnika, Contarina**,** Ljubljana, Gipuzkoa, Parma and Roubaix. These highlight the success that can be achieved with ambitious plans for pursuing the circular economy and going for Zero Waste solutions rather waste incineration.

112. Another relevant success story from which to draw inspiration is the Zero Waste village of Kamikatsu in Japan. A five minute film about their success is available from https://www.youtube.com/watch?v=eym10GGidQU

113. Pay-as-You-Throw schemes are operated successfully in many European countries. The region of Flanders in Belgium provides a useful example, and the London Assembly should review the September 2014 good practice guide at http://www.regions4recycling.eu/upload/public/Good-Practices/GP_OVAM_PAYT.pdf - the document notes that: "The Flemish government introduced for its whole region the principle of sorting at source of the MSW by the households. The question was: how could we stimulate the households to sort their waste at source? By creating appropriate financial incentives or different tariffs for the separate collection of those waste streams that can be recycled, re-used or composted, instead of ending up on the landfill site or in the incinerators. This was the practical way to implement the 'Pay As You Throw' system. The less waste you produce (that has to be landfilled or incinerated) the less you have to pay for the waste you disposed of".

114. As noted in relation to our response to Question 1 of the Call for Evidence, London could request devolved powers to introduce such a scheme.

[42] http://www.whitehorsedc.gov.uk/sites/default/files/Resident%20waste%20leaflet%202016%20-%20final.pdf
[43] http://www.somersetwaste.gov.uk/wp-content/uploads/2017/03/SWP_Service_Guide_April_2017_web_version.pdf
[44] https://www.scambs.gov.uk/sites/default/files/what_goes_in_the_bin.pdf

Question 4: How should the Mayor change policies or programmes?

115. The Mayor should put in place schemes that promote investment in waste/resource education to save money that would otherwise be spent on residual waste treatment.

116. The Mayor should vigorously oppose any plans for new incineration capacity, including gasification/pyrolysis, because incinerators are barriers to a circular economy. London should declare a moratorium on new waste incineration capacity, as this would provide a clear signal of London's preference for reduction, re-use, recycling and composting.

117. The Mayor should support separate food waste collection for anaerobic digestion/composting, whilst promoting food waste reduction efforts, alongside other tiers of the food waste hierarchy. The Mayor should do all this is lawful to prevent food waste being used as incinerator feedstock.

118. The Mayor should explore the viability of introducing re-use services at local bring sites (HWRCs) and London should promote existing re-use networks such as Freegle and Freecycle. It is important, for example, that those seeking to make use of Council bulky collection services are supported to avail themselves of reuse services where possible.

119. The Mayor should support the renegotiation (or even cancellation) of waste contracts that are out of step with the circular economy.

120. The Mayor should encourage local businesses and public bodies to enhance their commitment to green procurement, e.g. buying only what can be recycled (and buying goods with higher recycled content).

121. The Mayor's vision for London should be at least as ambitious as the Medium and Ambitious scenarios set out in the European Environment Bureau report 'Advancing Resource Efficiency in Europe' (March 2014)[45].

122. UKWIN also draws attention to the research carried out for Friends of the Earth, undertaken by URSUS consulting and published in September 2010, which found that: "For the United Kingdom, if an ambitious but achievable recycling target of 70% for municipal waste was set and achieved by 2025, then conservative estimates suggest that across the UK this could create 29,400 new direct jobs in recycling, 14,700 indirect jobs in supply chains and 7,300 induced jobs in the wider economy relative to 2006. Of these potential 51,400 total new jobs some 42,300 might be in England with an estimated 4,700 in Scotland, 2,600 in Wales and 1,800 in Northern Ireland".[46]

[45] http://www.eeb.org/EEB/?LinkServID=4E9BB68D-5056-B741-DBCCE36ABD15F02F

[46] More Jobs, Less Waste. Anna MacGillivray of URSUS consulting (primary author), September 2010. Available from: http://www.foe.co.uk/resource/reports/jobs_recycling.pdf