**CONGESTION, CAPACITY, CARBON: PRIORITIES FOR NATIONAL INFRASTRUCTURE**
***Consultation on a National Infrastructure Assessment***
**Response from the United Kingdom Without Incineration Network (UKWIN)**
**January 2018**

## Introduction

1. The United Kingdom Without Incineration Network (UKWIN) welcomes this opportunity to take part in the National Infrastructure Commission's (NIC's) consultation on a National Infrastructure Assessment.

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.

3. Through our work we have 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. UKWIN has also engaged at local, regional and national level strategic discussions about how waste is and should be managed. This wealth of relevant experience provides us with a deep understanding of waste infrastructure issues.

4. UKWIN's submission focuses primarily on the waste management aspects set out in Section 4 ('Eliminating carbon emissions from energy and waste') of the NIC consultation document, with particular reference to:

   (a) carbon and the imperative to reduce carbon emissions; and
   (b) the need to shift the focus on waste and its management towards a circular economy mindset.

   The circular economy paradigm emphasises recycling (closed and open loop), reuse, redesign, and the reduction in consumption of resources, and views incineration as a leakage from the circular economy to be minimised. This shift to a low-carbon circular economy implies a targeted, progressive, reduction in 'residual waste' and we propose a constructive approach to achieving this.

   There is of course a close relationship between (a) and (b), and in addition to responding to question 18, UKWIN's submission draws attention to matters that might otherwise be misunderstood, overlooked or understated.

5. The NIC's waste infrastructure strategy should focus not on accommodating unsustainable practices but on supporting sustainable practices built **not on waste management** but **on resource management** principles.

6. The benefits of transitioning away from landfill and incineration towards a more circular economy are extensive, and include job creation, resource security and a host of other benefits, as summarised in UKWIN's 1-page briefing at: http://ukwin.org.uk/btb/BtB_Circular_Economy_Briefing.pdf

7. Rather than deciding how best to site new waste incinerators the NIC should work on the basis that a moratorium on new waste incineration capacity is necessary to support a circular economy, alongside noting that the removal of plastics and food waste from EfW feedstock would result in surplus EfW capacity without the need for new build.

**Carbon and the imperative to reduce carbon emissions**

8. UKWIN wholeheartedly supports the NIC in their assessment of the need to reduce the carbon footprints of waste-related activities, and we take the view that the NIC's approach to future requirements should focus closely on solutions that reduce the demand for expensive and carbon-intensive infrastructure without assuming the inevitability of maintaining current or increased waste volumes of residual, combustible, non-recyclable, waste.

9. UKWIN strongly endorses the statement at page 110 of the consultation document that: "A more 'circular' economy would see less waste produced in the first place, with more of the remainder reused or recycled. Reducing the quantity of waste is the best way to reduce costs for households and businesses, as well as limiting the environmental impact of waste". Indeed, a similar conclusion was reached by the Government Chief Scientific Adviser in the December 2017 'From Waste to Resource Productivity' report.[1]

10. Waste incinerators are very expensive to build, meaning they come with significant opportunity costs.[2] When one examines the impact of a more circular economy alongside the residual waste treatment infrastructure that is currently operational or under construction it becomes clear that the conclusion to be draw is that there will be no need for any further expensive new residual waste infrastructure such as incineration, sometimes called 'energy from waste'.[3]

11. Additional incineration capacity is not needed, does not merit being supported or underwritten by the public purse, and should be actively avoided. There is a genuine risk that exacerbating incineration overcapacity could further undermine efforts to deliver much-needed infrastructure relating to the higher tiers of the waste hierarchy, i.e. incineration acts as a barrier to a more circular economy and to CO2 emission reductions associated with the circular economy.[4]

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[1] https://www.gov.uk/government/publications/from-waste-to-resource-productivity

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221036/pb13889-incineration-municipal-waste.pdf stated in 2013 that incinerators cost £145m-£200m to build, but ENDS reported in 2017 that costs had increased and are likely to increase further - https://www.endswasteandbioenergy.com/article/1425234/brexit-pushing-efw-plant-build-costs

[3] See http://ukwin.org.uk/btb/BtB_Incineration_Overcapacity.pdf and http://www.eunomia.co.uk/reports-tools/residual-waste-infrastructure-review-12th-issue/ and http://tolvik.com/wp-content/uploads/UK-EfW-Statistics-2016-report-Tolvik-June-2017.pdf

[4] See http://ukwin.org.uk/btb/BtB_Incineration_Overcapacity.pdf and http://ukwin.org.uk/btb/BtB_How_to_Increase_Recycling.pdf and https://www.gov.uk/government/publications/from-waste-to-resource-productivity-food-waste and http://ukwin.org.uk/files/pdf/July_2017_UKWIN_London_Assembly_Waste_Management_Submission.pdf

12. There is therefore an imperative for the NIC to support measures to prevent the construction of new waste incineration capacity and to limit the use of existing incinerators to treating only 'genuinely residual' waste, e.g. through pre-sorting requirements, an incineration tax, and measures to improve source separation for households and businesses.[5] Restricting incinerator feedstock to only genuinely residual material would free-up treatment capacity at existing incinerators.

13. UKWIN takes issue with the basis on which the consultation document (e.g. at page 108) claims that there has been a 73% reduction in carbon emissions from waste since 1990, and for similar reasons we disagree with basis for the waste sector being assigned a 5% greenhouse gas (GHG) emissions figure (also cited on page 108).

14. The 73% figure derives from Table 3 (lines 127 – 133) of BEIS' 'Final UK greenhouse gas emissions national statistics 1990-2015'.[6] BEIS' Table 3 figures are illusory with respect to the contribution from energy from waste (EfW) because, under IPCC guidelines, the carbon emissions from energy from waste plants (incinerators) are not accounted for under the 'waste' category.[7] The emissions listed under the 'waste' category include incineration without energy recovery and 'open burning', but exclude EfW.

15. BEIS has confirmed that the UK's CO2e emissions associated with fossil carbon from EfW in 2015 amounted to 3.3 million tonnes[8], as reported under the 'Energy sector' category, but even the 3.3 million tonne CO2e figure does not include the significant quantity of CO2e emitted by EfW plants attributed to the burning of biogenic material (such as food waste, wood, paper and cardboard).

16. Based on an assumption, as used by Defra, that half of all direct emissions from incinerators derive from biogenic sources, it would be reasonable to estimate the direct emissions from incineration to have been around 6.6 million tonnes of CO2e in 2015. As the quantity of waste incinerated has increased since 2015 it is therefore reasonable to assume that the current figure for CO2e emitted directly through EfW is well above 8 million tonnes.

17. Some of the biogenic emissions are accounted for under the 'Agriculture, Forestry, and Other Land Use' (AFOLU) category, as detailed below. Other adverse climate change effects of incineration are also omitted from both the 3.3 million and the 6.6 million figure (and indeed from the 'waste sector' category), such as the carbon cost of having to extract virgin material due to the destruction of those resources through incineration.

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[5] See http://ukwin.org.uk/2016/11/17/ukwin-welcomes-eac-treasury-report-and-calls-for-residual-waste-tax/ and http://ukwin.org.uk/2014/09/12/circular-economy-report-calls-for-incineration-tax-consideration/

[6] https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2015

[7] See: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_5_Ch5_IOB.pdf

[8] http://www.parliament.uk/business/publications/written-questions-answers-statements/written-question/Commons/2017-11-22/115103/

18. As such, quite apart from issues such as short-term gains coming at the expense of long-term harm caused by investing in incineration, the true reduction in CO2e emissions arising from waste management has been substantially less than 73%, and we are concerned that if these carbon accounting errors are replicated in assessing future waste infrastructure options then this could result in high-carbon options being unwittingly preferred over lower-carbon solutions based on a false premise regarding actual relative net climate change impacts.

19. UKWIN notes, for example, the NIC consultation document statement at page 111 that: "Burning degradable waste such as food and (natural) textiles reduces greenhouse gas emissions, since the carbon dioxide produced is less harmful than methane which is emitted if this is landfilled" fails to consider the wider picture.

20. For example, even aside from alternative comparators such as sending food waste to anaerobic digestion or bio-stabilising waste prior to landfill to significantly reduce methane emissions, the statement overlooks the fact that even when sending untreated waste directly to landfill one has to take account of both the biogenic carbon sequestration of perhaps 50% of the biodegradable material in landfill and the fact that by law some of the methane will go to a landfill gas capture scheme to generate electricity.

21. As noted in the evidence-based recommendations of Eunomia's 2015 report entitled 'The Potential Contribution of Waste Management to a Low Carbon Economy': "All lifecycle studies engaged in comparative assessments of waste treatments should incorporate CO2 emissions from non-fossil sources in their comparative assessment" and: "Recognising the uncertainty associated with the way in which emissions from the AFOLU (agriculture, forestry and other land use) Sector are accounted for, inventories should include emissions of biogenic CO2 from incineration (and biomass power plants) until such time as the accounting methods have across countries been assessed in terms of the adequacy of the treatment of this matter".[9]

22. Eunomia's report also explains that: "In comparative assessments between waste management processes, it cannot be considered valid to ignore biogenic CO2 emissions if the different processes deal with biogenic CO2 in different ways…"

23. The 'discounting' of biogenic carbon emissions is not only inconsistent with IPCC guidelines but ignores the fact that avoided – or captured – biogenic carbon emissions contribute to an overall reduction, or at least a reduced increase, in carbon levels in the atmosphere. The need to account correctly for carbon emissions from waste processes applies equally to landfill.

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

24. The issue of properly accounting for biogenic carbon sequestration is also covered in Defra's 'Energy recovery for residual waste: A carbon based modelling approach' report which states: "…the model assumes that not all of the biogenic material decomposes in landfill but it is all converted to CO2 in energy from waste. Landfill therefore acts as a partial carbon sink for the biogenic carbon".[10]

25. Another relevant issue highlighted in the Defra carbon based modelling document is that: "…[for assessments of CO2 offset from energy generation] we should use the marginal energy mix which represents the carbon intensity of generating an additional kW of electricity…as renewable energy and nuclear make a greater contribution to the marginal energy mix this will change and the result will be a significant drop in the carbon intensity of the marginal energy mix".

26. Defra's February 2014 Energy from Waste Guide noted: "When conducting more detailed assessments the energy offset should be calculated in line with DECC guidance using the appropriate marginal energy factor". Taking this into account, electricity generated by waste incinerators is becoming increasingly worse in climate change terms (relative to the increasingly decarbonised energy supply), and incineration's adverse climate change impact needs to be taken into account in relation to planning future infrastructure.[11]

27. UKWIN does not agree with the suggestion made on page 17 of the NIC consultation document that: "…energy from waste infrastructure has provided a more sustainable alternative to high-carbon forms of generation such as coal-fired power stations…"

28. Energy generated through the incineration of waste is both high carbon and unsustainable. Electricity produced through incineration has a higher carbon intensity than the conventional use of fossil fuels (including Combined Cycle Gas Turbines), and is significantly higher than the level most people would consider to constitute 'low carbon'. The high carbon intensity of energy produced via EfW is considered in more detail below in relation to UKWIN's comments on the EfW assumptions in Table 4.1 (NIC consultation document, p. 120).

29. Waste incineration is known to exacerbate climate change by releasing more than one tonne of CO2 for every tonne of waste burned[12], 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.

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[10] http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=19019

[11] https://www.gov.uk/government/publications/energy-from-waste-a-guide-to-the-debate

[12] 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".

30. 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 long-term decarbonisation of the power supply and making incineration an unnecessary obstacle to a low-carbon economy.[13] As the Government's National Policy Statement for Renewable Energy Infrastructure (EN-3) states: "CO2 emissions may be a significant adverse impact of biomass / waste combustion plant".

31. Electricity generation efficiency is inevitably low because of steam cycle limitations at the temperatures considered practicable in EfW incineration plants. This means that CO2e per unit of power delivered is relatively high and will inevitably exceed that of the grid source it is deemed to replace.

32. Except for the fact that some of its feedstock is transported by barges, Cory's Riverside Resource Recovery Facility is a fairly typical modern large-scale electricity-only Energy from Waste combustion plant (incinerator).

33. We looked into the GHG impact of the Cory incinerator to inform the London Assembly's investigation into Energy from Waste in London. As demonstrated in our analysis, when corrected Cory's own carbon report demonstrates that GHG emissions from the Riverside incinerator are significantly higher (between 6.7m and 10.5m tonnes higher over 30 years) than emissions from sending same waste directly to landfill.[14]

34. The European Environment Agency's (EEA's) diagram of the circular economy clearly shows that incineration is a leakage from the circular economy to be 'minimised'[15]. As a report from the EEA put 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".[16]

35. With this in mind, it is worth noting that, as set out in UKWIN's aforementioned evaluation of the Cory facility, Cory's own analysis of their waste composition indicates that they are burning significant quantities of recyclate and compostable material, and so there is a potentially significant carbon saving opportunity cost in sending that recyclable / compostable material to the Riverside incinerator.

36. This is not unique. South Gloucestershire Council commissioned analysis into their residual waste, which found:

    - *"A total of 52 percent of the contents of the average black bin could have been recycled in 2014-15 through the existing kerbside recycling service.*

[13] http://www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy/
[14] http://ukwin.org.uk/files/pdf/UKWIN_December_2017_Cory_Riverside_Carbon_Critiques.pdf
[15] http://www.eea.europa.eu/media/infographics/circular-economy/view
[16] http://www.eea.europa.eu/publications/circular-economy-in-europe

- *"A further 10.1 percent could have been recycled through the Sort It recycling centres.*
- *"In 2014-15 the council spent over £3m disposing of this recyclable material in the residual waste stream. The majority of this was processed into material used for energy production*".[17]

37. The aforementioned recyclability surveys are based on what could have been recycled at the time. As we move towards the circular economy the recyclability of products will increase and technologies to sort, recycle and reprocess a wider range of materials will improve.

38. It should also be noted that despite the significant CO2 emissions associated with waste incineration, such facilities are not included in the EU Emissions Trading Scheme, and as has been acknowledged by Defra, the cost to society of the release of CO2 from incineration is not reflected in the price of treatment.[18]

39. UKWIN agrees with the statement at page 111 of the consultation document that: "…burning plastics in 'energy from waste' facilities increases greenhouse gas emissions, since plastics are carbon based. Sequestrating waste plastics, where recycling is not an option, could reduce emissions compared to incineration…"

40. The plastic element of the feedstock is comprised almost entirely of packaging material. Incineration relies on such packaging material for feedstock. This, in itself, goes far to demonstrate the extent to which incinerators demand recyclable, high carbon, materials, thereby limiting opportunities for plastics recycling.

41. Resource Minister Thérèse Coffey has said: "My hon. Friend the Member for Rugby referred to energy from waste. I caution against some of what he said. In environmental terms, it is generally better to bury plastic than to burn it".[19]

42. Defra's aforementioned Energy from Waste Guide explains how: "Fossil based residual wastes, e.g. plastics and synthetic rubbers 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".

43. The Science Advisory Council's Waste Sub-group noted that: "…Although landfilling tends to be regarded as inherently bad and to be avoided, there is evidence that in some instances…landfill may be the least environmentally, economically or technically unsuitable option. Landfill can also be a way of storing materials that have a potential future value, and other countries already recognise the value of landfill mining".[20]

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[17] http://edocs.southglos.gov.uk/wastestrategyevidence/pages/waste-composition-kerbside/
[18] https://www.gov.uk/government/publications/the-economics-of-waste-and-waste-policy
[19] https://hansard.parliament.uk/commons/2017-01-23/debates/590623BD-398C-4586-A693-FCC1DB5EA444/Non-RecyclableAndNon-CompostablePackaging
[20] http://webarchive.nationalarchives.gov.uk/20130702173345/http:/www.defra.gov.uk/sac/files/sac-waste-subgroup-finalreport-june-20111.pdf

**Comments on Table 4.1 EfW assumptions (NIC consultation document, p. 120)**

*Carbon intensity (GCO2e/KWh)*

44. The carbon intensity of waste incineration is significantly higher than 233-257 gCO2e/KWh, more than twice as high if one ignores biogenic carbon, and as much as six times higher if biogenic carbon emissions are taken into account.

45. When waste is incinerated the carbon (C) in the waste is combined with oxygen (O) to make carbon dioxide (CO2) which is then released into the atmosphere. As we know the differences in mass between carbon (12g/mol) and carbon dioxide (44g/mol) we can calculate how much CO2 will be released so long as we know how much waste will be burned and what proportion of that waste is carbon.

46. For the Riverside incinerator the operator, Cory, states that they treat 700,138 tonnes of waste with a total carbon percentage of 27% (equivalent to just over 189,037 tonnes C).[21] Converting the 189,037 tonnes C to CO2 results in total direct emissions of 693,137 tonnes of CO2 per year (189,037 X 44/12).

47. Based on the operator's assumed fossil carbon percentage of around 46% (of the total C) the facility would release around 317,914 tonnes of fossil CO2 (which is stated in Cory's report) and 375,223 tonnes of biogenic CO2 per year (which is not mentioned in Cory's report, but is derived by subtracting the fossil CO2 from the total CO2).

48. According to Cory, their Riverside incineration facility exports 515,166 MWh of electricity a year.

49. This means that the carbon intensity of the electricity exported by the Riverside incineration facility (based on direct emissions divided by electricity exported) is **1,345 grams of CO2e/KWh** (i.e. 693,137 tonnes CO2 / 515,166 MWh).

50. Even if one were to consider only the fossil carbon, completely 'discounting' the biogenic CO2 released, then the carbon intensity figure for Cory's Riverside incineration facility would still be **more than 600g CO2e/KWh**.

51. These figures for fossil CO2 and biogenic CO2 carbon intensities are in line with previous estimates of average or typical incinerator emissions from Eunomia and the UK Government, and other examples, and are conservative when compared to many other examples.[22]

52. Actual estimates of the very high rate of direct CO2 emissions from waste incinerators contrast sharply with the range of **233-257 gCO2e/KWh** contained within the NIC consultation document's Table 4.1 on page 120.

[21] http://www.coryenergy.com/wp-content/uploads/2017/05/Cory-Carbon-Report.pdf Table 9

[22] See https://friendsoftheearth.uk/sites/default/files/downloads/changing_climate.pdf Table 1 and https://publications.parliament.uk/pa/cm201011/cmhansrd/cm110117/text/110117w0001.htm#1101173000926

53. A report produced by Eunomia for Friends of the Earth in 2006 includes an estimated total direct biogenic and CO2 emissions to be **1,645g CO2e/KWh** for electricity-only incinerators and **1,086g CO2e/KWh** for CHP incinerators.[23]

54. In 2011 the then Minister of State for Climate Change stated that, based on the available data, fossil CO2 emissions from incineration was at an intensity of **540g CO2e/KWh** in 2008.[24] If this equated to half of the total direct CO2e emissions then this would imply a total carbon intensity for incineration of **1,080g CO2e/KWh** in 2008.

55. Fossil CO2e emitted per unit of energy exported was calculated for the Bilsthorpe Energy Centre planning inquiry, which focussed on a proposed gasification-type incineration facility (also known as 'Advanced Thermal Treatment'). At the planning inquiry an expert witness for the applicant confirmed that if carbon intensity were calculated by dividing the direct fossil GHG emissions from the proposed Bilsthorpe gasification facility by the power exported that, based on the expert's own 'average' scenario and his choice of marginal emissions factor, the electricity that would be exported by the facility would have a fossil carbon intensity of **903g CO2e/KWh**, implying an even higher total carbon intensity when taking biogenic carbon emissions into account.[25]

Maximum future annual output (TWh)

56. It is unclear which technologies are included within the 10-21 TWh figure for maximum future annual EfW output.

57. The term "EfW" could apply to some or all of the following technologies: mixed waste incineration (including both conventional and gasification/pyrolysis); biomass using waste wood; anaerobic digestion of food waste and/or sewage sludge; cement kilns using waste (including refuse derived fuels) as feedstock; and landfill gas capture.

58. Sometimes the term "EfW" is used as a euphemism for waste incineration with energy recovery. If this is the intended meaning of the term "EfW" within Table 4.1, then UKWIN is alarmed by the NIC's assumption that there could be as much as a fourfold increase in waste incineration capacity.

59. As noted above, the UK already has more waste incineration capacity existing and under construction than we have genuinely residual waste to burn, and a significant increase in waste incineration capacity could only come at the expense of efforts to manage waste at the top tiers of the waste hierarchy. Greatly increasing incineration capacity is not consistent with long-term policy objectives.

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[23] https://friendsoftheearth.uk/sites/default/files/downloads/changing_climate.pdf

[24] https://publications.parliament.uk/pa/cm201011/cmhansrd/cm110117/text/110117w0001.htm#1101173000926

[25] http://www.nottinghamshire.gov.uk/media/110334/document-ip25-ukwin-carbon-intensity-spreadsheet-30-oct-2015.pdf

Cost in 2016 and 2025 (£/MWh)

60. In relation to the cost of incineration, UKWIN draws attention to our earlier comments about the environmental externalities associated with incineration and how this means that the environmental harm caused by incinerators is not currently reflected in the cost of incineration.

61. It would be helpful if, for the purpose of calculating the cost of incineration, the NIC carried out sensitivity analysis of the figures in Table 4.1 to take account of a £50-£100/tonne incineration tax that is imposed to internalise some of these environmental externalities.

Load factor (%)

62. It should be noted that, based on their existing poor track record, gasification and pyrolysis plants can be expected to display a significantly lower load factor when compared with conventional incinerators, not least because gasification/pyrolysis plants struggle to export any electricity.[26]

63. Promoters of gasification and pyrolysis schemes, sometimes collectively called "Advanced Thermal Treatment" schemes, regularly make bold claims about the technological, environmental and financial performance of their proposed facilities with a mixed waste feedstock. In reality, where such configurations have been attempted they have either failed to live up to these claims or operators remain suspiciously quiet about reporting actual performance.

64. Because companies do not like to talk about their failures it is often hard to find out what went wrong. For example, Air Products remain tight-lipped about the serious high-profile problems they encountered at Tees Valley.

65. Would-be operators frequently point to existing and emerging demonstrator plants, declaring that they are proposing the same in an attempt to make their proposal sound deliverable, but as soon as the plants they cite start to fail (e.g. Isle of Wight, Dargavel, Avonmouth, Tees Valley) these companies suddenly try to explain how their proposal could not be more dissimilar to the failed projects from which they had previously tried to draw credibility.

66. Gasification and pyrolysis constitute some of the riskiest technologies in the waste industry and are synonymous with bankruptcies, failures and broken promises. This perception is well deserved, with the lack of examples of success starkly contrasting with a litany of failures.

67. Some examples of gasification failures are documented in UKWIN's briefing at: http://ukwin.org.uk/fail and further examples are given by GAIA at: http://www.no-burn.org/gasification-pyrolysis-risk-analysis/

[26] http://ukwin.org.uk/fail

68. Further technical information about why gasification is unsuitable for treating a mixed waste feedstock is set out below and in UKWIN's submission to the 2016 BEIS' call for evidence on fuelled and geothermal technologies in the Contracts for Difference scheme, and this submission is available from: http://ukwin.org.uk/files/pdf/December_2016_UKWIN_CfD_Submission.pdf

**Response to question 18**

69. The supporting text for question 18 states: "Waste can be a valuable fuel for the difficult-to-decarbonise sectors. New and established technologies could make a contribution to the heat and transport sectors" and question 18 asks: "How should the residual waste stream be separated and sorted amongst anaerobic digestion, energy from waste facilities and alternatives to maximise the benefits to society and minimise the environmental costs?"

70. As noted above and detailed further below, gasification and pyrolysis do not offer viable options for the management of mixed waste. As such, this class of technologies should be excluded from any serious consideration of the range of technologies available to manage waste.

71. Indeed, UKWIN disagrees with the statement made on page 121 of the NIC's consultation document that gasification of mixed waste offers any realistic "potential to provide bio hydrogen or biomethane, which could be deployed as an electricity, heat or transport fuel source".

72. Residual waste is not a suitable source of quality gas for conversion into hydrogen or methane. The syngas produced via gasification and pyrolysis contains too much tar. Waste gasification and pyrolysis plants have a very unhappy track record. Gasification and pyrolysis cannot per se recover energy more effectively than waste incineration, and in the energy from waste context have provided a litany of failures.[27]

73. High profile gasification and pyrolysis failures in Tees Valley and elsewhere indicate that attempts to devise a continuous flow system based around gasification and/or pyrolysis appear to have foundered because of difficulties in ensuring the exclusion of air alongside other factors.

74. Fundamental issues with using mixed waste as a feedstock for gasification and pyrolysis include the relatively uncontrolled source of feedstock meaning that it contains both undesirable elements within the feedstock and an undesirable variation in composition, which means that one can neither reliably predict nor control how the feedstock will behave when gasified or pyrolised.[28]

[27] See: http://ukwin.org.uk/fail and http://www.no-burn.org/gasification-pyrolysis-risk-analysis/
[28] http://resource.co/article/advanced-conversion-technologies-heated-debate-11503

75. As noted in Defra's Energy from Waste Guide, using Advanced Conversion Technologies to produce transport fuel is "technically difficult, relatively unproven at commercial scale, and some of the generated energy is used to power the process, reducing the overall benefits".

76. In our estimation, the environmental impact associated with producing the syngas would far outweigh any gains from using the syngas as a substitute fuel. Using gasification and pyrolysis to convert mixed waste into transport fuels is a folly, being neither environmentally desirable nor technically feasible.

77. The high energy requirements of preparing waste for gasification ('bio-drying' and processing to regularise the size, moisture content, oxygen content, etc of the feedstock), the high energy requirements of syngas cleaning, and the need for significant quantities of fossil-based start-up and support fuels for gasification mean that, even if gasification could be made to work, using gasification to produce to produce electricity, heat or transport fuels would increase overall CO2 emissions.

78. Anaerobic digestion (AD), followed by composting, are the Government's preferred means for treating unavoidable food waste. The reasons for these preferences are set out in Defra's 'Applying the waste hierarchy: evidence summary'.[29]

79. In order to treat such waste via AD the food waste needs to be separately collected, and UKWIN would support England in following the examples of other parts of the UK by introducing the mandatory separate collection of food waste from households and businesses. Such an approach would make better use of food waste and would free up incineration capacity for waste that is less-readily compostable / recyclable.

80. As there is no need for new waste incineration capacity (see above) there is no value in considering where to site new incinerators, nor is there value in considering how new waste incinerators could be part of CHP schemes.

81. In relation to existing incinerators, there is a danger in investing more money in such facilities when we have yet to properly consider which incinerators will need to be shut down first as part of an incineration exit strategy tied to the transition to a more circular economy.

82. In terms of investment, there is great potential for improving existing sorting facilities (MRFs) and building new MRFs that use advanced technology sorting equipment to help maximise the quantity of recyclates that can be accepted, while reducing the amount that is discarded as contamination, and producing higher quality recyclate for reprocessing.

[29] https://www.gov.uk/government/publications/applying-the-waste-hierarchy-evidence-summary

83. There are significant opportunities for Local Authorities to improve their recycling rates within the existing system. as set out in UKWIN 1-page briefing on this subject[30], councils can:

    (a) Provide a weekly food waste collection for composting or anaerobic digestion;

    (b) Ensure waste contracts reward reductions in residual waste by avoiding or exiting long-term waste incineration contracts;

    (c) Invest in waste education to save money that would otherwise be spent on disposal;

    (d) Introduce a re-use scheme for local bring sites (HWRCs);

    (e) Promote re-use networks such as Freegle and Freecycle, including to those seeking bulky waste collection;

    (f) Enhance commitment to green procurement and give preference to buying items that can be (or that have been) recycled;

    (g) Provide a free garden waste service for grass cuttings and hedge trimmings; and

    (h) Introduce kerbside glass collection.

84. Additionally, the Government could do more to support councils to minimise the residual waste stream through both regulatory and fiscal measures. For example, Central Government financial support could be made available to increase the range of materials accepted for kerbside collection for recycling and composting (including AD).

85. Government could also provide additional funding to government agencies for the enforcement of separate collection systems for all households and businesses as promoted by the Waste Framework Directive and the emerging Circular Economy Package.

86. The mandatory source separation of food and 'green' wastes at source is essential, and although dry recyclables (paper / card, glass, cans, plastics i.e. primarily packaging wastes) can be collected commingled to some extent, the subsequent sorting requirements (and cost) would be greater had these materials never been comingled.

87. Product redesign and reduction in packaging and single-use plastics would help reduce the quantities of waste arisings, and there are a range of measures that could support such a move, including: charges/taxes/bans on single-use plastics and hard-to-recycle products; incentives to use recycled content over virgin material; and extended producer responsibility.

[30] http://ukwin.org.uk/btb/BtB_How_to_Increase_Recycling.pdf

88. As noted from the Gloucestershire example above, much of what is currently incinerated could be recycled. The wider the range of materials that are recycled everywhere, the easier it is to communicate the message that these materials should be treated as resources to be recycled and not waste to be disposed of. The fewer non-recyclable materials there are in the market the less prospect there is for confusion and contamination.

89. As should be clear from UKWIN's comments above, there is always a danger that focusing on sending waste for incineration can result in long-term lock-in that harms recycling. This 'lock-in' effect does not exist in relation to landfill due to the landfill tax and the lack of long-term contracts promising feedstock for landfill.

90. It is important to ensure that the fiscal and regulatory framework is changed to better promote recycling over incineration, and to address issues relating to 'lock-in' and externalities. Reducing the 'pull' to incineration supports the reduction in overall residual waste in the medium and long term and provides greater confidence for investment in the top tiers of the waste hierarchy.

**The importance of high quality waste data**

91. At page 117 of the NIC consultation document we read that: "Better data could help drive improvements in the efficiency and environmental impact of waste treatment…data on commercial and industrial waste is poor. There are concerns about the suitability of the current voluntary electronic documentation system. The Commission will report further on these issues".

92. UKWIN believes that the Commission has hit the nail on its head here. The Government, by making edoc reporting voluntary, lost an important opportunity. However, even a fully functioning edoc system would not provide the depth of data for businesses that Defra's WasteDataFlow system does for household and other Local Authority Collected Waste.

93. Edoc was designed to replace paper (hard copy) waste transfer notes but the system is not designed to provide a detailed analysis of waste types arising and material sent for recycling. We cannot overemphasise the extent to which the inaction by successive Governments has contributed to such an undesirable situation with potentially serious implications for waste infrastructure strategy.

94. Putting a comprehensives waste data system in place may take several years. One way to ensure that the most relevant information is available to decision-makers as quickly as possible is to undertake regular composition analysis of materials currently being landfilled or incinerated, and to promptly place the results of this analysis into the public domain.

95. For those materials being sent to either landfill or incineration that could have been recycled or composted, the focus could be on investigating the reasons why this material was not recycled or composted, e.g. lack of appropriate recycling / composting infrastructure, lack of education, etc.

96. For those materials that cannot be readily recycled, investigation should be undertaken to examine opportunities to redesign products to increase recyclability or undertake efforts to increase product lifespan, etc.