Comments on any further information and submissions received by Deadline 7

UKWIN'S D8 COMMENTS ON REP7-029

REP7-029: EN010110-002016-APPLICANT'S COMMENTS ON WRITTEN REPRESENTATIONS PART 2 – OTHER INTERESTED PARTIES

Proposed Development:
Medworth EfW CHP

Proposed Location:
Land on the Algores Way Industrial Estate to the west of Algores Way in Wisbech, Fenland, Cambridge

Applicant:
Medworth CHP Limited

Planning Inspectorate Ref:
EN010110

Registration Identification Ref:
20032985

AUGGUST 2023

United Kingdom Without Incineration Network

CONTENTS

LOCAL AND NATIONAL LEVEL OF COMBUSTIBILE FEEDSTOCK

1. The Applicant's submissions to date include various estimates of future waste arisings at local and national levels. These estimates are based on a variety of different data sources and adopt a variety of different approaches.
2. Whenever the Applicant is criticised about deficiencies in one of their estimates they appear to rebut this by responding as if they were being criticised about an aspect of a different one of their estimates.
3. The reality is that all of the Applicant's various waste arisings estimates are flawed, although in different ways. They all overstate the level of current and future combustible feedstock available for incineration.
4. As such, it may be helpful to the Examination to summarise some of the Applicant's key arisings estimates and to outline a number of the criticisms relating to the Applicant's key tables before providing examples of the Applicant either failing to respond to the criticism of their approach or responding in a manner that does not actually address the concerns raised.
5. We also highlight some of the implications of the Applicant's failure to assess the claims that have been raised by UKWIN, providing additional analysis and evidence covering some of the points with which the Applicant has refused to engage regarding the non-combustibility of 19 12 12 waste and the unsuitability of that waste stream to act as potential incinerator feedstock, especially the fraction of such waste currently sent to landfill.

Examples of critiques of the Applicant's WFAA estimates of waste arisings

Applicant D5 estimates of waste arisings & commentary interpreting those estimates	Examples of UKWIN's critique (in REP3-050, REP6-042, REP7-051 and in UKWIN's D8 Submissions)
Local HIC arising in 2021 D5 WFAA (REP5-020) Table 4.2: 'HIC arisings for the defined LoW codes 2021 (tonnes)' D5 WFAA Paragraph 4.1.7: "This data shows that within the spatial scope of this WFAA, a total of approximately (~) 9.7 million tonnes of local authority collected waste, industrial and commercial waste, which is suitable for processing at the Proposed Development was generated in 2021"	• Includes waste transfer station which gives rise to a clear and acknowledged risk of double counting. • Contains waste that is unsuitable due to treatment option. • Assumes 100% of 19 12 12 waste being landfilled is combustible when large proportion is likely to be non-combustible. • Combustible fraction includes significant quantity of recyclables. • Even without Medworth, incineration capacity in the area will be higher and so could be used to treat any genuinely residual combustible waste.

Applicant D5 estimates of waste arisings & commentary interpreting those estimates	Examples of UKWIN's critique (in REP3-050, REP6-042, REP7-051 and in UKWIN's D8 Submissions)
Local HIC waste going to landfill in 2021 D5 WFAA Table 4.4: 'HIC waste from Study Area disposed to non-hazardous landfill (tonnes)' D5 WFAA Paragraph 4.1.16 that: "The data in Table 4.4 HIC waste disposed to non-hazardous landfill (tonnes) demonstrates that of the ~9.7 million tonnes of HIC arisings (as set out in Table 4.2 HIC arisings for the defined LoW codes 2021 (tonnes)), almost 2.4 million tonnes of suitable HIC waste generated within the WPAs within the spatial scope were sent to non-hazardous landfill in 2021…"	• Assumes 100% of 19 12 12 waste being landfilled is combustible when large proportion is likely to be non-combustible. • Combustible fraction includes significant quantity of recyclables. • Even without Medworth, incineration capacity in area will be higher and so could take any genuinely residual combustible waste. • The Applicant's approach to defining their study area for local waste goes beyond their 2-hour drivetime in a contrived manner that improperly overstates the level of local waste likely to be available for use as feedstock at the Medworth EfW.
Local residual HIC if national recycling and waste reduction targets are met	• The Applicant is criticised for not providing such an assessment. • As noted in UKWIN's D8 response to the Applicant's response to the ExA's ExQ3 questions, this was not rectified in the Applicant's D7 submissions.
2030 UK Residual Waste Scenarios D5 WFAA Table 5.3: '2030 UK Residual Waste Scenarios'. D5 WFAA Paragraph 5.2.3: "As is shown above, the central/median scenario, which assumed a combined 2030 household recycling rate of 55% stated that total residual HIC waste arisings for the UK were anticipated to be 24.5 million tonnes by 2030. Using Government data that states that England is responsible for ~84% of all waste arisings (see paragraph 5.1.1 of this WFAA),	• Based on UK, not England. • Produced in November 2017 and so does not take into account latest waste data and current Government recycling and residual waste reduction targets. • Based on significant increase in waste generation that goes against UK residual waste reduction targets. • Tolvik's 'High recycling' scenario is best fit with current Government targets, but Applicant instead focuses on less compatible estimates. • Tolvik's 2017 assessment subtracted from the residual waste gap figures for feedstock of MBT, IED biomass, and Co-incineration, and so clearly the waste in

<table>
<tr><th>Applicant D5 estimates of waste arisings & commentary interpreting those estimates</th><th>Examples of UKWIN's critique (in REP3-050, REP6-042, REP7-051 and in UKWIN's D8 Submissions)</th></tr>
<tr><td>HIC arisings for England by 2030, under the central/ median scenario above, would be 20.6 million tonnes… It is considered that the 'high recycling' scenario does not accord with Government policy and as such, its realisation is regarded as highly unlikely."</td><td>Tolvik's projection was more than just waste that would either go to incineration or landfill.
The Applicant underestimates the extent to which MBT, IED biomass, and Co-incineration would reduce the quantity of waste potentially available for incineration.</td></tr>
<tr><td>National analysis of reaching residual waste reduction targets

D5 WFAA Paragraph 5.2.23: "In respect of the first bullet [The implications of achieving the EIPs interim target (2) of reducing the total mass of residual waste to a level not exceeding 25.5 million tonnes by the beginning of 2028;], using Government data which states that England is responsible for ~84% of all waste arisings (see paragraph 5.1.1 of this WFAA), interim target (2) for England would mean reducing the total mass of residual waste to a level not exceeding 21.4 million tonnes…"

D5 WFAA Paragraph 5.2.26: "Current Office for National Statistics (ONS) population predictions are that in 2043, there will be approximately 61,744,098 people in England – and at 287kg of residual waste per head, this equates to 17.7 million tonnes of residual waste…"</td><td>The Applicant is assessing the target for total residual waste, but not municipal residual waste. The municipal waste figure would provide a more appropriate starting point because a large proportion of total residual waste is non-combustible or otherwise unsuitable for incineration.
In the Applicant's local assessment and in Tolvik's 2017 national assessment some effort is made to remove non-combustible waste (although UKWIN believes they have not gone far enough for these assessments). However, for their national analysis of reaching the residual waste reduction targets the Applicant assumes 100% of residual waste (which extends well beyond household and business waste) would be combustible.
By only focusing on the 2027/28 and 2042/43 years, the Applicant fails to show the intervening years. This would not be an issue if the Applicant assumed fixed capacity, but as the Applicant assumes plants would close after 40 years (which UKWIN disputes in principle and which UKWIN shows is miscalculated in any case) by focussing on the end of the waste reduction process (2042/43) the Applicant understates the overcapacity that would be the case on the way to meeting the target (i.e. in the intervening years).</td></tr>
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6. In addition to criticising the Applicant for overstating relevant waste arisings, UKWIN has also criticised the Applicant for understating current and future capacity that would be capable of treating this waste.

Further analysis and additional evidence on combustibility of 19 12 12

7. This submission from UKWIN is accompanied by a Technical Note produced by Beyond Waste written by an experienced lead author of Waste Needs Assessments (WNAs) for numerous Local Authorities.

8. The Technical Note sets out how the approach to waste fuel availability adopted by the Medworth Applicant significantly overestimates available fuel by mistakenly including as combustible all waste classified under the EWC code 19 12 12.

9. As the Technical Note explains in some detail, "...the principle that not all 19 12 12 is suited to incineration is accepted by the sector and therefore should not all be counted in the Medworth Fuel Availability Assessment".

10. The Note goes on to conclude that "an estimate of 50% of 19 12 12 coded waste being combustible is far more realistic than the approach taken in the Medworth Fuel Availability Assessment".

11. As noted above and elsewhere in UKWIN's evidence, Tolvik's 2017 forecast of UK residual waste for 2030 acknowledges the principle that not all 19 12 12 is combustible, and UKWIN's primary critique of the Medworth Applicant's use of the Tolvik figures relates to other matters.

12. However, in REP7-051 UKWIN noted that: "More recent analysis, e.g. that undertaken for the Kent WNA, indicates that an even lower proportion of the 19 12 12 waste currently going to landfill is combustible".

13. The Beyond Waste analysis provided alongside UKWIN's Deadline 8 submissions draws on the evidence already set out in the Kent WNA referred to by UKWIN.

14. Beyond Waste's analysis supports UKWIN's evidence that even less 19 12 12 is likely to be combustible than Tolvik assumed in their 2017 forecast.

15. The Beyond Waste analysis shows that the historic Tolvik forecast may be out of date with respect to more than just its failure to account for residual waste reduction targets and provides further evidence that the Applicant's assumptions, for example in D5 WFAA Tables 4.2 and 4.4, that 100% of 19 12 12 is combustible contributes to the Applicant's WFAA significantly and improperly overstating relevant residual waste arisings.

16. UKWIN's REP7-051 paragraph 38 ('Unsuitable waste in applicant REP5-020 Table 4.2 HIC 2021 arisings table'), and paragraph 77, and the final table (on electronic page 25 of REP7-051) provide a revised figure of 492,956 tonnes of 'Total ['in scope'] Tolvik non-combustible [19 12 12 waste]'.

17. UKWIN notes at REP7-051 paragraph 77 how: "If 70% of this 19 12 12 were considered combustible, rather than 100%, then this would reduce the 1,643,187 tonne figure by 30%, i.e. by 492,956 tonnes, which in turn would reduce the total figure [for relevant landfilled waste from the Applicant's WFAA Study Area in 2021] to around 1.88Mt".

18. It follows that if 50% is assumed to be combustible, rather than either 70% or 100%, then this would reduce the Applicant's 1,643,187 tonne 19 12 12 figure by 50%, i.e. by around 821,594 tonnes, which in turn would reduce the total figure for relevant landfilled waste from the Applicant's WFAA Study Area in 2021 from the Applicant's claimed circa 2.37Mt figure (set out in Table 4.4 and paragraph 4.1.6 of REP5-020, where the Applicant rounded it up to 2.4Mt) to only around 1.55Mt.

19. Furthermore, the Beyond Waste Technical Note states that only c. 40% of landfilled 19 12 12 might be combustible, as follows:

    "I note that Tolvik also considers 19 12 12 waste to not all [be] combustible. They assume 70% is, but don't evidence this. I do note that the general pressure of landfill tax is forcing more waste through mechanical processing plants so more fines might be produced particularly as they are only subject to the lower rate of tax, and this might explain the discrepancy with the historic Tolvik analysis. The key point is the principle that not all 19 12 12 is suited to incineration is accepted by the sector and therefore should not all be counted in the Medworth Fuel Availability Assessment. The evidence above supports a position that a value of c40% may be most accurate, and would consider 50% to be a generous estimate".

20. If only 40% of the Applicant's in-scope local landfilled 19 12 12 is considered combustible, this would reduce the Applicant's Table 4.4 figure from 2.37Mt to just 1.39Mt (i.e. by using only 40% of the 1,643,187 figure for 19 12 12).

21. As previously stated, the majority of the landfilled combustible waste that arose in 2021 can be expected to be the target for reduction, reuse and recycling and/or be treated at existing incineration capacity, including that which has come online during or after 2021.

22. As such, evidence that less combustible waste will be available than assumed by the Applicant increases the likelihood and extent of the Medworth plant creating and exacerbating incineration overcapacity at a local and/or national levels.

23. Furthermore, as previously noted, nearly half of the landfilled waste relied upon by the Medworth Applicant originates from Essex and so is only included in the Applicant's WFAA due to the Applicant's inconsistent and unjustified deviations from their 2-hour drivetime assumption.

24. While in many cases the difference in position between UKWIN and the Applicant is already established, and so there is little value in providing further comment, there are a few instances where the Applicant makes new arguments that merit rebuttal.

Definition of EfW plants 'in development'

25. The Applicant's response to UKWIN's consideration of local and national EfW capacity considered to be 'in development' (paragraphs 33-47 of REP6-042) starts on electronic page 57 of REP7-029.

26. In REP6-042 paragraphs 33-47 UKWIN noted that the Applicant did not assess EfW capacity that benefits from planning permission and that is currently in active development but that has yet to enter construction, and noted that this is at odds with the draft EN-3 requirement that "Applicants should set out the extent to which the generating station and capacity proposed is compatible with, and supports long-term recycling targets, taking into account existing residual waste treatment capacity and that already **in development**". (**emphasis added**)

27. In support of UKWIN's position that the scope of 'EfW projects that are already in development' goes beyond those that are under construction UKWIN noted how the North Lincolnshire EfW NSIP Applicant's waste fuel availability assessment included EfW projects considered to be in development even where those projects had yet to reach financial close ("a final investment decision") let alone enter construction.

28. In their REP7-029 response the Medworth Applicant neither disputed nor responded to this precedent set by the North Lincolnshire NSIP Applicant.

29. In REP6-042 paragraphs 33-47 UKWIN also noted how "UKWIN's approach to interpreting the phrase 'in development' is more conservative than the approach taken by Tolvik in their May 2022 UK EfW Statistics report".

30. REP6-042 elaborated upon this in paragraphs 90-92, setting out how the Applicant's adopted approach "…is wholly out of step with the Government's emerging requirement to consider all EfW capacity that is 'in development'".

31. In response, the Medworth Applicant did not dispute that UKWIN's interpretation was a narrower definition of the term 'in development' that the interpretation used by Tolvik for their May 2022 UK EfW Statistics report.

32. However, the Medworth Applicant did try to muddy the water by misrepresenting the true reason why Tolvik chose to omit capacity that is in development from their May 2023 UK EfW Statistics report.

33. A significant difference between Tolvik's May 2022 and May 2023 UK EfW Statistics reports is in the level of detail contained within the respective reports and not with any change in definition of the term 'in development' on the part of Tolvik.

34. Setting the covers and glossaries aside, Tolvik's May 2022 UK EfW Statistics report comprises 19 pages of content, whereas Tolvik's May 2023 UK EfW Statistics report is comprised of only 11 pages of content.

35. Both editions of Tolvik's UK EfW Statistics report include projected UK EfW capacity based on capacity currently operational or under construction, while the more detailed May 2022 report also includes an assessment of additional EfW capacity – which sets out EfW capacity historically and currently in development.

36. While there has been no change in Tolvik's methodology, the Medworth Applicant pretends that this diminution in detail represents a change in Tolvik's definition of EfW capacity 'in development'.

37. However, a reading of the two reports (a copy of each accompanies this submission) reveals that is simply not the case.

38. Internal page 1 of Tolvik's May 2023 report includes a clear explanation of Tolvik's general approach to reducing the level of detail in their latest report (which, like their previous UK EfW Statistics reports, is freely available), inviting those interested in a more detailed report to pay a modest fee for Tolvik's bespoke analysis.

39. This disproves the Medworth Applicant's implied significance read into Tolvik words as per the Applicant's REP7-029 statement (on electronic page 57) that: "…the May 2023 version of the Tolvik report **does not** report on capacity that is either consented and unbuilt or in the planning system". (**emphasis in the original**)

40. Similarly, a comparison of the two UK EfW Statistics reports makes it clear that the Medworth Applicant was wrong to go on to state that: "Instead, the Tolvik 2023 report provides a view on the level of capacity that will be available by 2027 (based upon existing and committed projects)."

41. As noted above, an assessment based on capacity currently operational or under construction is included as a graph in both Tolvik reports, and is not included only in the latter report 'instead' of (i.e. as a replacement for) the additional (more detailed) capacity analysis.

42. Tolvik's May 2022 report displays this graph as 'Figure 32: Projected UK EfW Operational Capacity', describing it as having been "Based on EfWs which were operational and in construction as at December 2021".

43. Tolvik's May 2023 report provides the equivalent graph as 'Figure 17: Projected EfW Operational Capacity and Residual Waste', describing it as having been "Based on EfWs which were operational or in construction as at December 2022".

44. In both cases the graphs are entitled 'Projected EfW Operational Capacity'.

45. As such, rather than the May 2023 report doing something different 'instead', the May 2023 report carries out the same analysis of existing capacity whilst omitting the additional (more detailed) analysis of capacity in development found in the May 2022 edition.

46. At paragraph 5.1.24 of their D5 WFAA [REP5-020] the Applicant similarly relied on the fact that Tolvik did not report on either 'consented and unbuilt' capacity or on capacity 'in the planning system' in their May 2023 report, stating: "Importantly, it is noted that the May 2023 version of the Tolvik report does not report on capacity that is either consented and unbuilt or in the planning system. Instead, the Tolvik 2023 report provides a view on the level of capacity that will be available by 2027 (based upon existing and committed projects). In this regard, this WFAA has considered it appropriate and more robust to draw upon the more certain Tolvik 2023 definition of capacity when evaluating compliance with the provisions of the emerging NPS EN-3 i.e. that which is operational or under construction".

47. For the same reasons set out above, the Applicant misrepresents the 2023 Tolvik report regarding the true basis for this 'important' element of the Applicant's flawed attempt to justify their inadequate approach to assessing waste fuel availability.

48. Indeed, the May 2023 Tolvik report does not provide any definition of EfW capacity 'in development' because Tolvik's 2023 report is less detailed than its 2022 predecessor.

49. As such, the Applicant has made an important mistake that undermines the credibility of their Waste Fuel Availability Assessment.

50. As previously noted by UKWIN, while UKWIN's analysis shows that there would be overcapacity even without any of the capacity in development coming forward, it should be considered significant that UKWN's analysis showed that overcapacity would be even worse at local and national levels if even a small proportion of the in development EfW capacity were to be built.

Lincolnshire Waste Needs Assessment from June 2021

51. In Paragraphs 93 – 100 of REP6-042 UKWIN noted that the Applicant cites Lincolnshire's February 2021 review but not the June 2021 updated Waste Needs Assessment (WNA) despite the fact the June update provides evidence that there is forecast to be significant incineration overcapacity in Lincolnshire even before the 1.2 million tonnes of new Boston capacity is taken into account.

52. The Applicant's REP7-029 response claims, on internal pages 67-68, that they did not include analysis of Lincolnshire's June 2021 updated document because "the status of this report in the context of the emerging waste Local Plan is unknown", but this argument simply does not stand up to scrutiny.

53. The stage of the Plan-making process in Lincolnshire is relevant to the weight to be given to documents that are produced (and indeed to the question about whether the Applicant's Medworth facility would result in pre-determination by undermining the Council's principle of net self-sufficiency).

54. However, even though the stage of the documents is relevant to the weight to be given, the June 2021 document is clearly a *material* document containing relevant evidence and so ought to have been considered as part of the Medworth Applicant's WFAA.

55. Furthermore, in addition to being a document produced as an integral part of Lincolnshire's Local Plan process the document constitutes a waste fuel availability analysis in its own right and therefore can be judged on its merits, not simply for how it could inform Lincolnshire's Plan but also for how it could inform the Medworth NSIP Examination's assessment of whether the proposed Medworth EfW facility might end up creating / exacerbating overcapacity at a local or national level.

56. Other than its lack of formal adoption, it is notable that the Applicant has found no fault with the content of the June 2021 report itself and has not provided any direct challenge to the conclusion UKWIN highlighted from Table 20 of that report which estimates a surplus of Energy Recovery (EfW) Capacity for Lincolnshire that increases from an overcapacity of 119,500 tonnes in 2025 to an overcapacity of 182,500 tonnes by 2040.

57. The Medworth Applicant claims in their REP7-029 response that "The status of the subsequent consultant's report on local waste needs has not been included in the WFAA as the status of this report in the context of the emerging waste Local Plan is unknown…" is, however, quite revealing.

58. The Applicant's *post-hoc* justification for nor considering the document also serves as an admission from the Applicant that they were aware of the June 2021 report when they were producing their June 2023 WFAA for D5 but made a deliberate decision not to include the relevant evidence.

59. However, the Applicant’s D5 WFAA does not include any indication that such a highly material report was considered and deliberately excluded.

60. The fact that the Applicant appears to have knowingly omitted reference in their analysis of local plans to a document that is unhelpful to their case, of which they were aware was commissioned by a council in the Local Study Area for a WNA that forms part of their plan-making process, further undermines confidence in the fairness, robustness and transparency of the Applicant’s D5 WFAA analysis.

REP7-029: TABLES 2.2 & 2.3 – LACK OF SUBSTANCE

61. The Applicant's comments on UKWIN's Deadline 6 representations largely fail to provide responses of substance to UKWIN's submissions.

62. In numerous instances the Applicant does not respond in any meaningful detail, instead pointing to their historic submissions accompanied by a statement to the effect that they prefer their own assessment to UKWIN's.

63. Such an approach does not constitute a genuine rebuttal, and as such UKWIN's evidence, including UKWIN's detailed criticisms of the Applicant's WFAA and climate change claims, should be treated as having been largely uncontested by the Applicant.

64. Similarly, the Applicant frequently states that they have addressed matters in earlier responses, but then when one turns to these historic responses it is apparent that the Applicant did not directly address the matter in question.

65. As such, UKWIN's detailed, reasoned, and evidenced submissions should be considered not to have any meaningful rebuttal from the Applicant, and UKWIN's criticisms of the Applicant's submissions should not be considered to have had any meaningful denial, and the Applicant's mistakes and deficiencies identified by UKWIN should not be considered to have been rectified.

66. In their REP7-029 Tables 2.2 and 2.3 the Applicant uses phrases such as: "The Applicant disagrees with the IPs assertions, approach and conclusions and refer to the response at IP06" and "The Applicant disagrees with the IPs assertions and conclusions and refer to the response at IP06".

67. Such vacuous statements should be read as confirmation from the Applicant that they have no meaningful rebuttal but are loathe to admit this as it would harm their case.

Examples of the Applicant failing to rebut UKWIN's D6 Assessment of the Impact of Residual Waste Reduction Targets

68. The Applicant's REP7-029 response to the results of UKWIN's assessment of local waste fuel availability (paragraphs 14-19 of REP6-042), starting at electronic page 50 of REP7-029, says little more than the opening sentence that "The Applicant strongly disagrees with the assumptions and conclusions in UKWIN's analysis".

69. Despite the strength of their disagreement the Applicant fails to identify any matters that are in dispute, opting instead to copy and paste their D5 WFAA [REP5-020] conclusions.

70. While UKWIN has provided the Examination with detailed and evidence-based critiques of the Applicant's REP5-020 WFAA the Applicant provides no reasons to doubt the conclusions of UKWIN's analysis.

71. Despite being given the opportunity to poke holes in UKWIN's arguments, the Applicant fails to find fault with UKWIN's REP6-042 paragraph 15 conclusion that:

    - "…the proposed Medworth EfW plant would create and/or exacerbate local EfW overcapacity even if it is assumed that no local waste ends up going to produce Sustainable Aviation Fuel (SAF) or to fuel coincineration plants such as cement kilns".

72. Similarly, in response to the results of UKWIN's assessment of national waste fuel availability (paragraphs 20-32 of REP6-042), the Applicant provides no rationale for example to support their 'strong disagreement' with UKWIN's observations that:

    - "The data indicates that even if no new incinerators enter construction in England there will be significant EfW overcapacity. While the level of this overcapacity is higher if account is made of Waste-to-SAF capacity (assuming 90% availability of the capacity funded as part of the UK Government's Advanced Fuels Fund) and/or if the use of co-incineration such as cement kilns is considered there would still be EfW overcapacity".
    - "…changes in waste composition through reduced plastic in the residual waste stream and/or through plastics being removed prior to incineration could increase the effective capacity of existing incinerators and significantly exacerbate the level of EfW overcapacity".
    - "…[assuming] closures [of EfW plants after 40-45 years of operation] would not impact on the conclusions".

73. The Applicant does not identify any material errors in UKWIN's data, or UKWIN's methodology or UKWIN's characterisation of those findings.

74. The Applicant has different views to UKWIN with respect to how much SAF and coincineration capacity to take into account and whether or not to assume that plants would close after 40+ years of operation.

75. Given that the Applicant has not disproved UKWIN's claims that adopting the Applicant's assumptions in these respects does not impact on the conclusions of UKWIN's local and national assessment that the addition of the proposed Medworth capacity would result in creating or exacerbating incineration overcapacity, it is hard to see why the Applicant is claiming to disagree with UKWIN's findings other than that they do not like the result.

Examples of the Applicant failing to rebut UKWIN's comments on the Applicant's D5 WFAA

76. In response to UKWIN's approach to accounting for UK Government residual waste reduction targets being met at local and national levels (paragraphs 56-64 of REP6-042), the Applicant provides no grounds of disagreement for example with UKWIN's observations that:

    - "Many of the issues we identified with respect to the Applicant's failure to account for the UK Government's residual waste reduction targets being met at local and national levels, which are set out on electronic pages 23-31 of REP3-050 have not been adequately resolved by the Applicant's D5 WFAA".
    - "For the reasons set out elsewhere by UKWIN, we disagree with the 21.4Mtpa estimate because it includes non-combustible and non-suitable waste…"
    - "UKWIN's ISH7 submissions set out how the Applicant's D5 WFAA footnote 13 figure of 3.2Mtpa for facilities that could close is misleading".

77. It is hard, for example, to credit the Applicant as genuinely denying the incontrovertible fact that they double counted the Edmonton capacity in their estimate of the impact of how much capacity would close were incinerators to close after 40 years of operation, or to credit the Applicant as genuinely denying the inescapable conclusion that by using (i.e. subtracting) the permitted capacity rather than the Tolvik 88-90% fraction of that capacity they overstated the impact on available capacity of a small number of incinerators closing by 2042.

78. However, rather than engaging with UKWN's well argued comments the Applicant is simply saying that "The Applicant strongly disagrees with UKWIN's position" and pointing back to the very same D5 WFAA that was the object of many of the critiques that the Applicant has failed to rebut.

79. Given that the Applicant has chosen not to update their WFAA to address criticisms raised by UKWIN (and other Interested Parties) it is pointless for the Applicant to refer back to their uncorrected D5 WFAA as a response to our claims.

Examples of the Applicant failing to rebut UKWIN's Technical Annex

80. UKWIN's Technical Annex sets out the approach to assessing '2-hour local capacity' (REP6-042 paragraphs 160-176 and 177-178) which supports UKWIN's D6 Assessment of the Impact of Residual Waste Reduction Targets and UKWIN's critique of the D5 WFAA.

81. While the Applicant "disagrees with the approach, assertions and conclusions that are made" (REP7-029, internal page 80) they provide no basis for disagreeing with UKWIN's observations that:

- "Overall the approach adopted by UKWIN results in a rather generous definition of a 2-hour drive time, as the slight loss of land in the south of the Applicant's D5 WFAA Study Area that falls within the purple 2-hour boundary (in the northern extremes of Essex and Hertfordshire) is more than offset by the inclusion of larger areas of land to the north and east (including the whole of Lincolnshire, Norfolk, and Suffolk) where significant proportions of these counties fall outside the purple 2-hour boundary".
- "This approach is far more reasonable in terms of representing local waste than the Applicant's method of including 100% of all areas within, and in some cases beyond, the East of England region even where only a tiny portion of those areas falls within the 2-hour boundary (including Luton which is entirely outside and beyond the purple 2-hour boundary, which appears to have been included just to 'complete the set' of councils within the East of England region)".

82. It is presumably not the case that the Applicant is disagreeing with the principle of being guided by a 2-hour drivetime, as that is a principle upon which the Applicant is relying for their own WFAA.

83. With respect to their D5 WFAA the Applicant (in REP7-029, internal page 80) states: "Due to the fluid nature of waste contracts and movements around the country, the 2-hour drive time has been used as an indicator (and not a limiter) to inform which WPAs should be included within the Study Area for the WFAA".

84. However, the Applicant provides no reason why it would not be valid to assume – as UKWIN has done – that waste arising and treatment capacity is equivalent to that which is within a 2-hour drivetime of Medworth, and the Applicant has not suggested any alternative drivetime if a 2-hour drivetime is not to be used as the basis for the assessment, nor any alternative method for determining a proportion of an area to use for assessing arisings and treatment capacity where some of that area falls outside the 2-hour drivetime.

85. It goes without saying that the 2-hour drivetime is indicative but given that fluid contracts can just as easily result in the non-availability of waste or capacity within the 2-hour zone as encourage waste to be imported from outside of it, the Applicant provides no logical reason why UKWIN's approach to assuming waste arising and treatment capacity equivalent to that which occurs within a 2-hour drivetime is inappropriate.

86. And indeed, the Applicant does not provide any reason why UKWIN's approach is inappropriate in this regard, simply stating that they prefer their own contrived and self-serving methodology.

87. Given UKWIN has also provided a national analysis to show the impact of ignoring the 2-hour drivetime, we have already addressed the concern that focussing only on local waste would fail to consider the wider waste context.

88. As such, it is unclear why the Applicant is disagreeing with UKWIN's assumptions and conclusions other than because it does not like the results.

Applicant's failure to rebut any of the points made by UKWIN in REP6-043 within the Applicant's REP7-029 Table 2.3 response

89. Nearly all the Applicant's responses to UKWIN's REP6-043 evidence do not go beyond repeating the vacuous statement that: "The Applicant disagrees with the IPs assertions, approach and conclusions and refer to the response at IP06".

90. The Applicant's response at IP06 is a response to comments made by Dr U Waverly who has no relationship with UKWIN.

91. The Applicant's IP06 response provides a number of high level fob-offs on various topics but does not directly respond to the detailed points made by UKWIN.

92. Indeed, many of the points made in REP6-043 by UKWIN that are included in Table 2.3 are criticising the D5 WFAA upon which the relevant portion of the Applicant's IP06 response relies.

93. It is nonsensical for the Applicant to suggest that their responses to the D6 points raised by UKWIN can be found within the D5 WFAA, as the D5 WFAA preceded, and provides the primary focus for, UKWIN's D6 criticisms.

94. The whole reason UKWIN criticised the D5 WFAA was because the D5 WFAA contained numerous errors, omissions and inadequacies. Given that the Applicant has not revised their WFAA, they cannot simply point to their D5 WFAA as a substitute for a genuine reply that addresses UKWIN's detailed and fully articulated criticisms that arise from that D5 WFAA.

95. Furthermore, UKWIN's REP6-043 evidence includes many quotes from the ExA's transcript of ISH7. If the Applicant is genuinely disagreeing with all of the IP's assertions, then that would imply that they were disputing the ExA's transcript, which we presume they were not intending to dispute.

96. UKWIN attended ISH 7 and consulted the recordings and can confirm our position that the transcripts set out in our REP6-043 evidence provide a fair reflection of the ISH's proceedings.

97. As such, it appears that the Applicant does not actually disagree with everything that UKWIN stated in REP6-043 but instead simply would rather not admit the conclusions arrived at regarding the weakness of their case and, having failed to find genuine reasons to disagree, have instead opted to offer an implausible blanket denial of reality that should not be taken seriously.

Lack of response to UKWIN having noted the Applicant's improper reliance on assuming that 100% of residual waste is combustible in their national analysis of the impact of meeting residual waste reduction targets

98. At REP6-042 paragraphs 190 – 207 UKWIN set out, within the context of meeting the Government's residual waste reduction targets, why our approach to assessing the level of relevant future waste arisings is appropriate.

99. Paragraphs 190 – 207 also help explain how the Applicant's D5 WFAA's national assessment undertaken to evaluate the impact of meeting the Government's residual waste reduction targets is remiss in failing to account for the fact that much of the national residual waste would not be suitable for incineration based on the Applicant's own admissions made with respect to their local assessment.

100. For example, paragraph 190-207 of REP6-042 include the statements that:

- "Estimates for [residual] municipal waste [rather than total residual waste] are a better fit for the feedstock that incinerators are expected to treat. Even if a quantity of non-municipal waste is treated at incinerators, this could be expected to be exceeded by the quantity of municipal waste that would be treated at biomass plants or that would be unavailable for incineration due to being non-combustible or too small to be compatible with the moving grates used by incinerators."

- "…a large quantity of 19 12 12, which is generally categorised as part of the municipal waste stream, is material that is deemed unsuitable for incineration either due to its low calorific value or to it being so fine as to not being compatible with use at a moving grate incineration. Or, to put it another way, in some processes the material deemed suitable for incineration ended up being coded as 19 12 10 (or as waste wood), and the remaining waste which is deemed unsuitable for combustion at EfW plants is coded as 19 12 12.

  It therefore makes sense that 19 12 12 includes a high proportion of material that ends up in landfill due it not being considered suitable for combustion.

> Given the potential non-suitability of incineration for some of the municipal stream, it is considered that using 90% of the municipal waste target, as UKWIN has done, is more likely to underestimate than overestimate the amount of residual waste available for incineration”

101. The Applicant’s response on internal pages 85 and 86 of REP7-029 fails to find any fault with the points made by UKWIN, but the fact that they do not find any material fault with UKWIN’s overcapacity evidence is obfuscated by the Applicant’s reference to irrelevant comments and matters.

102. The Applicant states in their REP7-029 response (on electronic pages 85-86) that: "Regarding the IP's assertion that the Applicant has failed taken account that not all residual waste at the national level would be suitable for management at the Proposed Development - see the response above relating to paragraphs 56-64 of the IP's submission".

103. However, if one reviews the Applicant’s comments on those paragraphs one can see that they do not address UKWIN’s REP6-042 concerns regarding the Applicant’s national analysis of halving waste.

104. The Applicant’s comments on REP6-042 paragraphs 56-64 in turn state: "Furthermore, in respect of the contention that the 21.4 million tonnes per annum estimate includes non-suitable waste, the Applicant has addressed this point in detail in the above response to Comments on the Applicant's updated local analysis Paras 49 - 55 of the IP's submission".

105. However, the Applicant’s comments on REP6-042 paragraphs 49-55 does not respond to UKWIN’s criticism that the national analysis of meeting the residual waste reduction targets improperly assumes that 100% of residual waste is combustible.

106. This is not surprising because paragraphs 49-55 are in UKWIN’s REP6-042 submission appear under the sub-heading ‘Comments on the Applicant’s updated **local** analysis’. (**emphasis added**)

107. As such, if one follows the Applicant down their rabbit hole of references to responses to other aspects of their D5 WFAA, one simply reaches a dead end where the concerns raised in paragraphs 190 – 207 of REP6-042 are not addressed at all, let alone addressed in any meaningful detail.

108. UKWIN also covered the issue of the combustibility of national feedstock in REP6-043 paragraphs 11-17 which focuses on the inadequacy of the Applicant’s response to ISH7 Action Point 1 with respect to national waste combustibility to which the Applicant responds (or fails to respond) on internal page 92 of REP7-029.

109. REP6-043 paragraphs 11-17 sets out that: “UKWIN noted how the Applicant limits itself to certain waste types for its local analysis, in recognition of the fact that some residual Household, Industrial, and Commercial (HIC) ‘will not be suitable for use as a fuel source at the Proposed Development e.g., rubble and soils’ and to ‘avoid an over-estimation of available fuel’…It appears however that the Applicant failed to apply this logic to their national analysis with respect to the impact of meeting the residual waste reduction targets”.

110. That section concludes as follows: “This evidence makes clear why the Applicant is wrong to use the entire residual waste figure from the EIP, without taking account of the fact that some of this will, in the words of the Applicant, ‘not be suitable for use as a fuel source’”.

111. Despite this section of UKWIN’s REP6-043 evidence showing that the Applicant’s national analysis for meeting residual waste reduction targets made a fatal error in comparing combustion capacity against all residual waste rather than just combustible residual waste, the Applicant’s response on internal page 92 of REP7-029 is simply that: “The Applicant disagrees with the IPs assertions, approach and conclusions and refer to the response at IP06”.

112. Unsurprisingly, nothing in IP06 directly rebuts the issues raised by UKWIN.

CONCLUSION AND IMPLICATIONS

113. As set out above, it would be safe to conclude that the Applicant has not provided any evidence that disproves UKWIN’s evidence that the Applicant’s local and national Waste Fuel Availability Assessments are fundamentally flawed for a variety of reasons and that their conclusions are therefore not robust.

114. Given the numerous uncorrected failings of the Applicant’s D5 WFAA we ask that it be given little weight, and that instead the decision be made based on the evidence regarding local and national overcapacity provided by UKWIN in REP6-042 and in its various other submissions, especially in light of the Applicant’s failure to find any material shortcomings regarding UKWIN’s transparent and evidence-based methodology, assumptions and conclusions.

Beyond Waste Technical Note

Introduction

I have produced this note to assist the Examination Authority of the DCO into the Medworth EfW CHP proposal (EN010110). I confirm that I am acting independently and in my professional capacity and the contents of this note are true and correct to the best of my belief. It is structured as follows:

1. Credentials
2. Purpose of this Note
3. Context
4. Methodology
5. Findings
6. Analysis
7. Sense Checking Findings
8. Conclusion

1. Credentials

My name is Alan Potter. I am a Fellow of the Institute of Waste Management, a Chartered Environmentalist and a member of the United Kingdom Environmental Law Association. I have produced numerous Waste Needs Assessments (WNAs) for various authorities including the following:

- Cheshire West & Chester Council (2023)
- Gloucestershire County Council (2023)
- Cumbria County Council (2022)
- Lincolnshire County Council (2021)
- Cheshire East Council (2017, 2019 Refresh & 2023),
- Essex County Council (2016),
- North East Lincolnshire Council (2015),
- Medway Council (2019 and 2021 Refresh)
- Kent County Council (2015 & 2017 and 2022 Refresh),
- Surrey County Council (2014 & 2022 Refresh)
- Oxfordshire County Council (2013/4 & 2016),
- East & West Sussex County Councils (2012).

I sit on the Defra waste data steering group and have advised Defra on the update of its Commercial & Industrial Waste methodology which includes consideration of 191212 residues. I was also lead author of Kent County Council's evidence to the Kemsley DCO inquiry in which the Fuel Availability Assessment was a key point of contention. The Secretary of State found against the need to build an additional EfW plant in that case, partly based on the lack of a proven need case.

2. Purpose of this Note

The Applicant has produced an updated Fuel Availability Assessment and I note that it uses the term HIC as a shorthand for combustible waste. However closer examination of the waste codes included under this Basic Waste Categorisation shows it captures a very wide range of waste, a significant amount of which would not be classed as suitable for incineration. This paper particularly deals with waste classified under the EWC code 19 12 12. I consider this approach significantly over estimates the available fuel and this paper sets out why in my professional opinion this is the case. I first set out an explanation of the nature of 19 12 12 waste and then present a worked example to illustrate my point.

3. Context

The WNAs that I am lead author of, assess the management requirement for different waste types projected to arise over a particular plan period within a particular Waste Planning Authority's area. They form part of the underpinning evidence base to plans that relate to waste that undergo public examination and scrutiny by independent planning inspectors. These may be dedicated Waste Local Plans, combined Minerals & Waste Local Plans and waste policies that form part of a Local Plan, where the plan making authority is a unitary authority.

In producing Waste Needs Assessments it is necessary to determine how much waste arise in the Plan area to which the WNA relates. The principal streams set out in Government Planning Practice Guidance are as follows:

1. Local Authority Collected Waste. (LACW)
2. Commercial & Industrial Waste (C&I)
3. Construction, Demolition & Excavation Waste. (C, D & E)

In addition to the above as required by Government Planning Practice Guidance, the management requirements for hazardous waste, low level radioactive waste, wastewater and agricultural waste arising within the particular Plan area are also considered along with any other waste that may arise locally that may have specific management needs. However this note specifically relates to the generation of baselines for C&I waste and C,D & E waste..

While data relating to LACW is readily available, because local authorities report on the management of arisings to central Government on a regular basis via an online data portal Wastedataflow, data for C&I and C,D & E waste is not so. Therefore it is necessary to consider in depth the data that is available. This data is primarily sourced from returns submitted by operators of permitted waste management sites to the Environment Agency. These report inputs and outputs by EWC code for each site, normally on a quarterly basis. For inputs, the origin of waste is reported, and for outputs destination and fate are reported. The returns are collated in a national dataset known as the Waste Data Interrogator (WDI).

4. Methodology

Dealing with Double Counting

As part of the exercise to generate a baseline value for C&I waste and C,D & E waste it is necessary to consider inputs and outputs to intermediate waste management facilities such as Waste Transfer Stations and Waste Treatment Facilities and attempt to trace the origin of waste that goes through these to their final destinations/fates. This ensures that double counting of waste does not occur, as otherwise waste going into such sites will also be recorded at the 'next step' site also reporting through the WDI. In undertaking this task a particularly problematic waste is the waste reported under Chapter 19 of the European Waste Catalogue as these are identified as waste arising from the mechanical treatment of waste, and hence lose their original identity when they leave the intermediate management facility for onward management at a 'next step' facility. The process flow is illustrated in Figure 1 below.

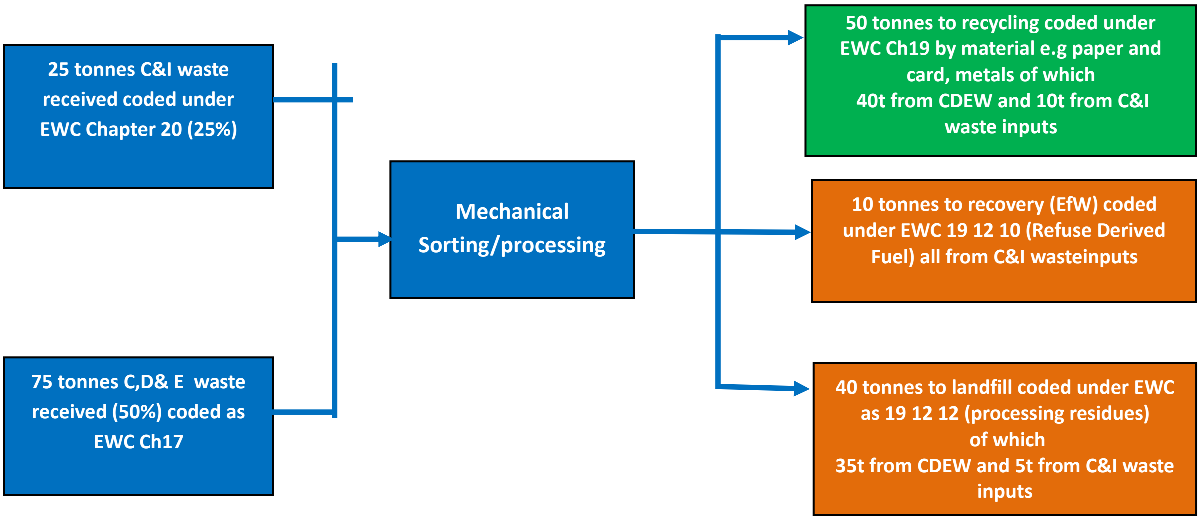

Figure 1: Schematic of Flows and Mass Balance of Intermediate waste sites

Facts Underpinning the findings of this Note

It is important to note that:

1. 19 12 12 waste can only by definition come into existence following mechanical processing of waste. The EWC description being "*other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11**", where 19 12 11* is the mirror code for the hazardous version of the same.

2. There is a parallel EWC code for refuse derived fuel 19 12 10, which covers the output of waste processing facilities that is suitable for use as a fuel in incineration plants such as that proposed at Medworth and co-incineration plants such as cement kilns.

3. C,D & E waste represents the majority of waste produced nationally(62% by weight); and can be expected to represent the majority of waste produced within a Plan area. Where this is mixed skip waste coded either under EWC 17 09 04 or at times 20 03 02 where a skip has been supplied to a householder, this skip waste will be subject to processing primarily to reduce the landfill tax liability associated with its disposal. Since the landfill tax was introduced, virtually all skip waste collectors will process the waste to some degree generating 191212 in the process. The same cannot be said to be true of C&I waste which may still be landfilled directly, although some treatment ought to have occurred at source to comply with the Landfill Directive. Also if you are going to the trouble of mechanically processing C&I waste you would normally look to convert it to RDF classified under EWC code 19 12 10 if the feedstock is suitable for combustion.

4. The processing of mixed skip waste generates residues of low combustibility after removal of wood and cardboard in sorting. These are normally referred to as trommel fines. There is a specific provision under the HMRC landfill tax regime to allow the disposal of these residues to landfill under the inactive waste classification if they meet a loss on ignition test. That is to say they have to prove they are not combustible to qualify. This by definition means they would be unsuitable for incineration. The landfill tax applies two rates, standard rate for active waste which currently stands at £102.10/tonne and inactive which currently stands at £3.25/tonne.

5. By way of illustration of the gross generalisation applied in the Medworth Fuel Availability Assessment I include an extract of recently issued environmental permit in Appendix 1. This relates to the excavation of previously deposited dredgings to extract secondary aggregate. The processing residues would fall under EWC code 191212.

Given the above, a critical determinant in establishing what if any proportion of 19 12 12 currently landfilled may be suitable for diversion to incineration is the proportion of the input to processing sites accounted for by C&I waste as opposed to C,D & E waste, LACW already being accounted for via Wastedataflow.

5. Findings

The quantity of 19 12 12 that may arise from C&I waste depends on the profile of inputs to these type of facility within each Plan area. What we can say is that a proportion will arise from C,D & E waste and given C,D & E waste is the dominant arising due to its weight a greater tonnage of C,D & E waste will be processed in real terms, and the corresponding amount of 191212 waste produced can be expected to be greater. If these residues were accepted at a non-hazardous waste landfill they can be expected to have met the HMRC Loss on Ignition Test and should therefore not be counted as combustible.

By way of illustration I've looked at the published Kent WNA dated November 2022 [1] of which I was lead author, and have arrived at an estimate of the proportion of 191212 attributed to C,D & E waste(and C&I waste by inference) in Kent. I have reproduced the relevant Tables I have used for the C,D & E waste component. I have no reason to believe that the profile of origin of 19 12 12 waste arising from waste transfer and waste treatment facilities in other Plan areas would be substantially different.

Table 6: Permitted Waste Transfer Sites within Kent managing Non-hazardous C, D & E Waste from Kent and producing Chapter 19 waste (Step 3bi)

Site Name + Operator	Shortfall (tonnes)	Ch 19 (tonnes)	% C, D & E Waste from Kent	Make Up (tonnes)
4. Port Richborough Business Park, ½ Skips Ltd	2,293	998	100%	998
Oare Creek Recycling Centre, East Kent Recycling	19,401	8,380	100%	8,380
Pelican 3 Wastenot Recycling, Sheerness Recycling Ltd	8,051	1,380	100%	1,380
Plot 15 Manor Business Park, Crossways Recycling Ltd	690	98	19%	18
Richborough Hall Waste Transfer & Recycling Centre, Thanet Waste Services Ltd	32,185	29,802	100%	29,802
Richborough Park, Thanet Waste Services Ltd	106,476	21,239	100%	21,239
Site 'b' North Farm Lane, We Load & Go Waste Management Ltd	3,864	2,693	95%	2,546
			Total	**64,364**

This gives a total 'Chapter 19 makeup' at transfer sites within Kent of 64,364 tonnes.

The value arrived at compares with the total net production of 191212 waste (after deduction of inputs) from Kent Waste Transfer sites of 99,784 tonnes. This gives a % of 191212 waste output arising from C,D & E waste inputs arising from Kent as 64,364/99,784 = **65%.** It should be noted that the value would be somewhat higher if all C,D & E waste inputs were to be counted (and not just limited to C,D, & E waste from Kent) but I have limited myself to published data for transparency's sake.

[1] available to download from https://letstalk.kent.gov.uk/kent-minerals-and-waste-local-plan

Table 7: Permitted Waste Treatment Sites within Kent managing Non- hazardous C, D & E Waste from Kent and producing Chapter 19 waste (Step 3bii)

Site Name and Operator	Shortfall (tonnes)	Ch 19 (tonnes)	% C, D & E Waste from Kent	Make Up (tonnes)
Ashford Transfer Station, Greenbox Recycling Kent Ltd	39,037	13,560	100%	13,560
Boarded House Farm, Steven Reginald Westley	645	1,043	99%	642
Callington Court Farm, Moores Turf & Topsoil Ltd	8,581	10,150	90%	7,762
Longfield Farm, Scrapco Metal Recycling Ltd	13,290	408	90%	369
Manor Way MRF, Sheerness Recycling Ltd	19,270	1,000	24%	242
Milton Pipes MRF, Sheerness Recycling Ltd	67,750	5,140	100%	5,140
Land Off North Farm Lane, Omni Recycling Ltd	24,118	8,548	100%	8,548
Land at Sanderson Way, Sheerness Recycling Ltd	26,470	2,040	95%	1,932
Tilmanstone Works, Ovenden Tipper Services Ltd	26,362	8,497	100%	8,497
Total				**46,691**

This compares with the total net production of 191212 waste (after deduction of inputs) from Kent Transfer sites of 98,798 tonnes. This gives a % of 191212 waste output arising from C,D & E waste inputs arising from Kent as 46,691/99,798 **= 47%.** Again it should be noted that the value would be somewhat higher if all C,D & E waste inputs were to be counted regardless of origin.

6. Analysis

Bringing the above values together that gives a total % of **56%** of inputs to Kent transfer and treatment sites from C,D & E waste arising from Kent. Given the low combustibility of C,D & E waste, after removal of wood and cardboard in sorting, this waste would not be suitable for incineration, and would continue to be landfilled regardless. This leaves 44% of 19 12 12 waste outputs, which after deducting C,D & E waste arising from outside Kent might leave 40% as potentially arising from C&I waste and therefore potentially suitable for incineration.

I note that Tolvik also considers 1912 12 waste to not all combustible. They assume 70% is, but don't evidence this. I do note that the general pressure of landfill tax is forcing more waste through mechanical processing plants so more fines might be produced particularly as they are only subject to the lower rate of tax, and this might explain the discrepancy with the historic Tolvik analysis. The key point is the principle that not all 19 12 12 is suited to incineration is accepted by the sector and therefore should not all be counted in the Medworth Fuel Availability Assessment. The evidence above supports a position that a value of c40% may be most accurate, and would consider 50% to be a generous estimate.

7. Sense Checking Findings

Analysis of Fate of 191212 waste managed in Kent

A value of no more than half is supported by examination of WDI data for 19 12 12 waste managed in Kent in 2021 as reported through the WDI 2021 as displayed in Table 1 below. This shows that only 25% was managed through incineration. If only inputs of 19 12 12 coded waste going to management routes that correspond to final fate is considered, this increases to 50%. This is in a situation where Energy from Waste capacity is in such plentiful supply that the Secretary of State adjudged that an additional plant was not required, and would have been injurious to the local Plan strategy. This shows that the provision of EfW capacity does not mean 19 12 12 waste can be expected to be diverted from landfill.

Table 1: Fate of 191212 coded waste managed in Kent in 2021 (tonnes)

Source: WDI 2021

	Management Method	Tonnes Received	% Grand Total	% Final Fate
Final Fate	Incineration	134,317	25%	50%
	Landfill	130,980	25%	50%
	On/In Land	7,040	1%	0.5%
Intermediate	Transfer	173,008	32%	
	Treatment	87,819	16%	
	Grand Total	**533,164**		

Analysis of Profile of inputs to Kent EfW Plants

To complete the analysis using the Kent example, I have also considered the profile of inputs to the Energy from Waste plants operating in Kent and found that 19 12 12 coded waste only represented 13% of the total inputs with the majority of inputs being coded under Chapter 20 in 2021. The data is displayed in Table 2 below.

Table 2: Profile of inputs to Kent EfW plants in 2021 (tonnes)

Source: WDI 2021

Input EWC code	Tonnes Received	% Grand Total
03 03 07	1,506	0.1%
19 12 04	1,314	0.1%
19 12 10	120,986	11.8%
19 12 12	134,317	13.1%
20 01 01	2,130	0.2%
20 01 08	4,984	0.5%
20 03 01	761,954	74.1%
20 03 03	1,189	0.1%
Grand Total	**1,028,380**	

Even when considering the coding of inputs to the Kemsley EfW Plant upon which the Secretary of State recently adjudicated alone, which is operating in a merchant capacity mode that the proposed Medworth Facility would be following, 191212 coded waste only represented 24% of the total inputs as shown in Table 3 below.

Table 3: Profile of inputs to Kemsley EfW plants in 2021 (tonnes)

Input EWC code	Tonnes Received	% Grand Total
03 03 07	1,506	0%
19 12 04	1,314	0%
19 12 10	119,875	23%
19 12 12	125,805	24%
20 03 01	278,529	53%
Grand Total	**527,029**	

8. Conclusion

The above shows that an estimate of 50% of 191212 coded waste being combustible is far more realistic than the approach taken in the Medworth Fuel Availability Assessment.

Alan Potter FCIWM. CEnv, UKELA

15 August 2023

Appendix 1: Extract of Environmental Permit demonstrating that EWC code 19 12 12 being applied to inert waste processing residues being deposited in a non-hazardous waste landfill.

Silt Lagoons at Rainham and Wennington Marshes Permit number EPR/FB3701XY

Introductory note

This introductory note does not form a part of the notice

Under the Environmental Permitting (England & Wales) Regulations 2016 (schedule 5, part 1, paragraph 19) a variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit.

Schedule 1 of the notice specifies the conditions that have been varied and schedule 2 comprises a consolidated permit which reflects the variations being made. Only the variations specified in schedule 1 are subject to a right of appeal.

Variation – EPR/FB3701XY/V004

The variation is for the excavation of previously deposited waste for processing by washing, screening and crushing. In addition to this, selected waste imported to the site will be directed to the waste treatment area for processing by washing, screening and crushing. The primary objective of the processing is to produce secondary aggregate with the residues deposited at the site and the secondary aggregate sold off site.

There are no proposals to change the overall quantity of waste or the extent of the permit boundary. It is anticipated that:

- up to 500,000 tonnes per annum (tpa) of excavated and imported wastes will be processed at the site;
- approximately 350,000 tpa of secondary aggregates will be generated from the waste processing operations; and
- approximately 150,000 tpa of residues will be deposited in the landfill either as disposal or as recovery.

The Operator also intends to import and stockpile up to 50,000 tpa of chalk and clay rich materials for export off site for reuse.

Two new EWC codes (19 12 09 and 19 12 12) have been added to tables S2.1 and S2.2 of the permit to allow for the deposition of residues from the on-site treatment operations

The rest of the permit remains the same and is described as follows.

Variation – EPR/FB3701XY/V003

A variation to increase the annual waste input rate specified in table S1.5 of the permit from 350,000 tonnes to 750,000 tonnes. Waste code 19 02 03 added to the tables S2.1 and S2.2 of the permit to allow for the deposition of dewatered tunnel arisings from the Thames Tideway project or similar projects, arisings which have not required dewatering will continue to be deposited as 17 05 04.

A pre-operational condition added to table S1.4 of the permit to ensure an appropriate stability action plan and procedure is in place prior to the increase in the annual waste input rate taking effect.

Variation – EPR/FB3701XY/V002

The variation permits the operator to continue to infill the lagoons with dredgings and accept inert wastes. The operator will restore the site in accordance with the approved restoration plan that details that:-

• approximately 3.35 million m3 of materials will be imported to the site (delivered either by road or river including pumped to shore from the jetty);

The Waste and Bioenergy Experts

UK Energy from Waste Statistics – 2021

May 2022

INTRODUCTION

Tolvik's eighth annual report on the UK Energy from Waste ("EfW") sector brings together data, primarily the Annual Performance Reports ("APR") submitted by operators to their respective regulator into a single, readily accessible document. We are very grateful to the continued co-operation from all concerned in releasing this information on a timely basis and their assistance in filling any gaps in the information which arise.

For consistency with previous years, the focus of this report continues to remain upon facilities in the UK generating energy solely from the combustion of Residual Waste. For the first time, however, Appendix 1 details the total tonnage of Residual Waste, in the form of Solid Recovered Fuel ("SRF"), sent to UK cement and lime kilns in 2021.

Residual Waste is defined as non-hazardous, solid, combustible mixed waste which remains after recycling activities. This definition is a little broader than that for Municipal Waste but primarily includes wastes falling within European Waste Catalogue ("EWC") 19 12 10, 19 12 12 and 20 03 01. The report continues to exclude EfW facilities in Jersey and the Isle of Man.

Aided by the standardised APR data template, the quality of data reporting continues to improve. However there remain three areas where the quality of data remains patchy – CO_2 emissions (as reported in the Pollution Inventory), Net Calorific Value and the application of the correct units in reporting the use of consumables. With the increased focus on carbon emissions, over time the first two metric are likely to become increasingly important.

Please also note, where applicable, prior year data has been updated to reflect the latest available information and to ensure consistency on a year-to-year basis. Note also that data tables may not add up to the total due to rounding.

Copies of this report can be downloaded without charge via www.tolvik.com. Third parties are entitled to freely use the contents of the report, subject to appropriately acknowledging its source.

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Front Cover Image: Rookery South EfW, fully operational in early 2022   Courtesy: Covanta Energy

1. SUMMARY OBSERVATIONS

Key Metrics

Residual Waste Processed	↑ 5.5%	Power Exported to Grid	↑ 11.2%	Average Availability	↓ 1.2%
No. of Fully Operational EfWs	53	Total Heat Exported	↑ 11.8%	Net CO_2 Impact / Tonne Input	↑ 2.1%

Figure 1: Comparison of 2021 vs 2020

Despite a second calendar year influenced by the pandemic and associated lockdowns, in 2021 the UK's EfW fleet continued to demonstrate its ongoing resilience. 14.9Mt of Residual Waste was processed in 2021, an increase of 0.8Mt on 2020, with power exports of 8.6TWh (just under 3% of UK total generation) and heat exports of 1.8TWh.

For the first time inputs of Residual Waste from Local Authorities dropped below 80%, to 77%, as Residual Commercial and Industrial ("C&I") Waste continued to be "re-shored" from export markets. In 2021 the modest tonnages of Clinical Waste accepted at UK EfWs remained largely stable. For the first time data suggests that the Net Calorific Value ("NCV") rose modestly – although only time will tell if this is part of a longer term trend.

Carbon Tax and EfW

The last 12 to 18 months have seen extensive Government consultation on waste policy in the UK – including consultations on Collections & Packaging Reform ("CPR"), Extended Producer Responsibility ("EPR"), Deposit Return Schemes ("DRS"), Plastics Tax and consultations on Environmental Targets (arising from the 2021 Environment Act) and on Landfill Tax.

However, the potentially most significant development for the UK EfW sector has been the consultation, released in March 2022, considering the extension of the UK Emissions Trading Scheme ("ETS") to EfWs from the "mid to late 2020s". This sits alongside a Government aspiration that biodegradable waste to landfill cease in 2028 and a range of developing policies and support around Carbon Capture and Storage ("CCS").

At the time of writing the details of how an extension of ETS to EfW would operate are far from clear. Assuming the proposal is implemented, for the very first time in the UK those EfWs with the lowest environmental impact (in this case in the form of carbon emissions) could be at a commercial advantage when compared with others in the market. In principle this must be a good thing.

However, in implementing such a policy, great care will be needed to ensure that the market is not distorted in unintended ways. Encouragingly, the consultation identified the need to consider the consequences of new policy on UK EfW's competition with landfill and Residual Waste exports.

There are also risks associated with over complication. Tolvik is firmly of the opinion that, at least initially, scheme design and implementation must be both clear and visible. Many EfWs have a complex network of stakeholders, including Local Authorities, waste producers (possibly including EPR schemes), waste collectors, aggregators, and funders. In the absence of clarity, there is a real risk of dispute with corresponding cash flow delays as EfW operators seek to pass back ETS related costs equitably and on a timely basis to their waste suppliers.

Care is also required to ensure policy avoids driving additional (and probably unneeded) EfW capacity in those geographies with access to future CCS solutions. This may be justifiable if the new EfW is more efficient than existing infrastructure - but it seems harder to justify if, as a consequence, Residual Waste is being transported significant distances to a CCS connected EfW for no benefit other than to potentially accelerate the exhaustion of (what may be finite) carbon storage capacity.

2. MARKET OVERVIEW

The EfWs falling within the scope of this report are listed in Appendix 1.

As at December 2021 there were 53 fully operational EfWs in the UK with three EfWs in late stage commissioning, two of which entered full operations in January 2022. During 2022 one EfW was mothballed.

The Total Permit Capacity of those EfWs which were fully operational or in late stage commissioning was 17.31Mtpa with a further 4.37Mtpa of EfW capacity either in construction or about to commence construction.

Mtpa	Fully Operational	In Late Stage Commissioning	Permit Capacity	In Construction	Total Permit Capacity
2017	11.90	0.41	12.26	3.64	15.90
2018	12.48	1.08	13.56	3.32	16.88
2019	14.65	0.66	15.31	3.10	18.41
2020	16.27	0.23	16.50	3.88	20.37
2021	16.37	0.94	17.31	4.37	21.67

Figure 2: Headline Capacity (as at December 2021)   Source: Tolvik analysis

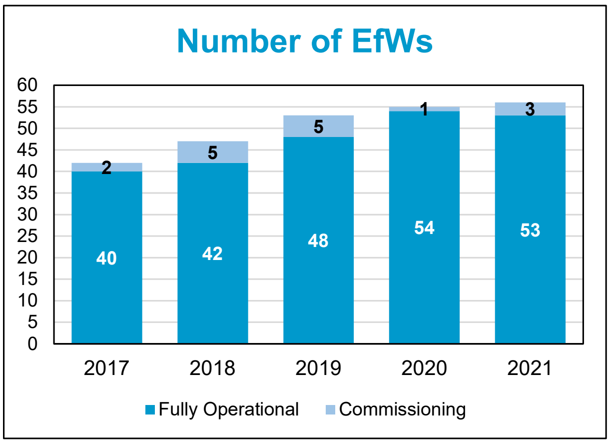


Figure 3: Number of UK EfW Facilities

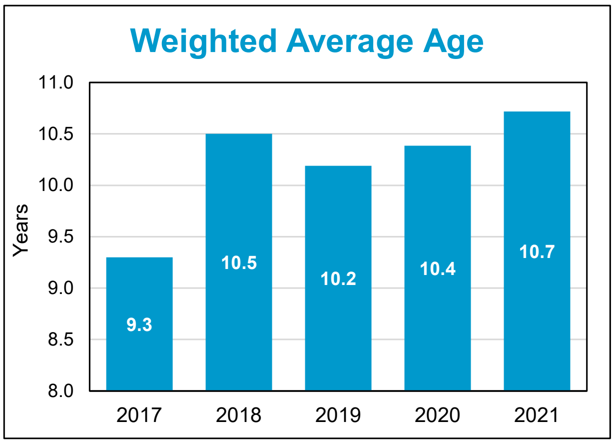


Figure 4: Weighted Average Age by Capacity (as at December 2021)   Source: Tolvik analysis

Figure 4 shows the capacity-weighted average age of UK EfWs – as can be seen over the last 4 years the average age has been maintained at 10-11 years as new EfWs have become operational at a sufficient rate to maintain the average.

In time the average age will start to rise slowly as the proportion of new EfW capacity becoming operational to existing capacity will inevitably decline.

3. WASTE INPUTS

According to data provided, in 2021 a total of 14.85Mt of Residual Waste was processed in UK EfWs, an increase of 5.5% when compared with the revised 2020 total.

Total inputs were the equivalent, for EfWs fully operational throughout 2021, to 89.0% of the Permit Capacity – broadly similar to the figure for previous years.

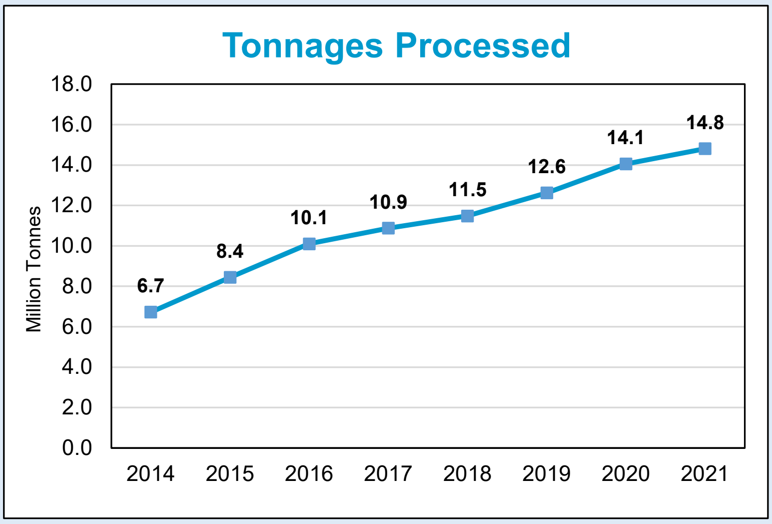


Figure 5: Total Tonnage of waste accepted at EfWs in 2014-2021 Source: APR

Mt	Input Tonnage	Annual Increase
2017	10.88	7.7%
2018	11.49	5.6%
2019	12.63	9.9%
2020	14.07	11.4%
2021	**14.85**	**5.5%**

Figure 6: Annual EfW Inputs
Source: APR

The Role of EfW in the UK Residual Waste Market

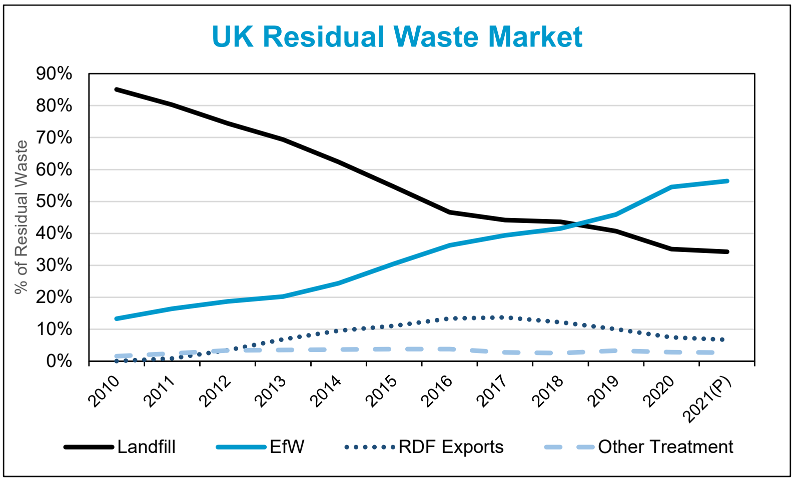


Figure 7: Development of the UK Residual Waste Treatment Source: Tolvik analysis

It is estimated that in 2021 EfW inputs represented 56% *(2020:52%)* of the UK Residual Waste market.

EfW Inputs by Waste Source and Code

Based on a detailed review of APRs for 2021 and Wastedataflow[1] for 2020/21 and other available data, it is estimated that in 2021 77.0% of all EfW inputs were derived from Residual Local Authority Collected Waste ("LACW") with the remainder being C&I Waste.

The trend of an increasing proportion of Residual C&I Waste inputs is expected to continue over the next few years as more "merchant" EfW capacity in the UK becomes operational.

Year	Waste Source		EWC Code		
	LACW	C&I Waste	20 03 xx	19 12 10/12	Other Codes
2018	82.4%	17.6%	68.9%	28.2%	2.9%
2019	81.5%	18.5%	63.4%	34.4%	2.3%
2020	80.1%	19.9%	62.0%	37.0%	1.0%
2021	**77.0%**	**23.0%**	**N/A**	**N/A**	**N/A**

Figure 8: Inputs by Waste Source Source: Wastedataflow, APR, Waste Data Interrogator[(2)]

According to available data, 62.0% of inputs to EfWs in 2020 was unprocessed Municipal Waste with a further 37.0% of inputs being Residual Waste arising after prior treatment.

In 2021, 38kt (*2020: 35kt*) of Clinical Waste was reported by operators as being processed by EfWs – an estimated 10% of Clinical Waste generated in the UK in 2021.

Net Calorific Value of Residual Waste

A detailed analysis in 2017 by Tolvik of data relating to the Net Calorific Value of waste (from a variety of sources, some of which was under confidentiality) suggested that the average NCV for Residual LACW was 8.87MJ/Kg and for Residual C&I Waste it was 11.01MJ/Kg.

In 2021, 32 facilities provided NCV data within their APR, although the quality of the NCV reporting was mixed.

Considering only those facilities primarily designed to accept untreated waste under 20 03 xx codes, the weighted average NCV for all inputs was 9.62MJ/kg *(2020: 9.11MJ/kg)* with those facilities reporting their NCV in total accepting 83.5% LACW and 16.5% C&I Waste.

Whilst 2020 NCV data was entirely consistent with the 2017 analysis; had this remained the case in 2021 the weighted average NCV for all inputs would have been 9.22MJ/Kg.

The implication of the most recent data is that, on a like-for-like basis, **average NCVs were 4.3% higher in 2021 than 2017**. Evidence, for example, from Germany, has shown average NCV across a number of EfWs typically fluctuates year-to-year. Given that this is data from a single year, it is therefore too early to infer that, on average across the UK, the NCV of Residual Waste is rising. It will, however, continue to be monitored.

Operator Market Shares

Viridor continues to have the greatest market share by operator based on input tonnages. MESE, MVV and Amey are not shown in the table, but each had a share of 2-3%.

Operator	2021 Input (kt)	Share
Viridor	3,203	21.6%
Veolia	2,401	16.2%
Suez	2,246	15.1%
enfinium	2,044	13.8%
FCC	1,510	10.2%
Council	830	5.6%
Cory	782	5.3%
Other	1,831	12.3%
Total	**14,846**	**100.0%**

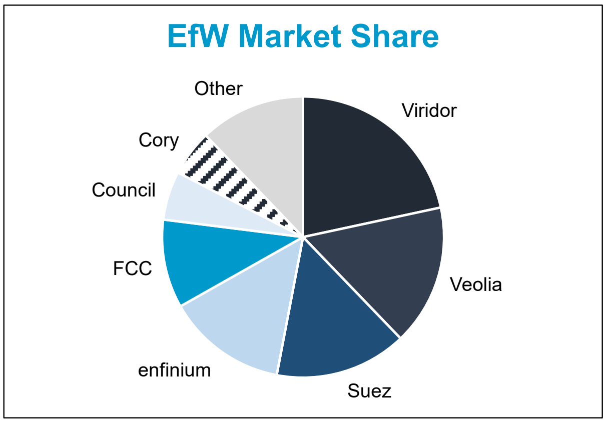


Figure 9: 2021 Share of Input Tonnage (includes Joint Ventures) Source: Tolvik analysis

4. ENERGY

It is estimated that the total power exported by EfWs in the UK in 2021 was 8,643GWh – approximately 2.9% of total net UK generation of 295,812 GWh[3].

	Est. Gross Power Generation GWh_e	Power Export GWh_e	Parasitic Load (excl. power import)	Parasitic Load (incl. power import)	Average Export kWh/tonne input	Net Heat Export GWh_{th}
2017	7,228	6,258	13.4%	14.1%	575	865
2018	7,150	6,230	12.9%	13.9%	542	1,112
2019	7,769	6,703	13.7%	16.2%	531	1,384
2020	9,002	7,769	13.7%	15.5%	553	1,651
2021	**10,060**	**8,643**	**14.1%**	**16.2%**	**591**	**1,845**

Figure 10: 2021 Power Generation   Source: Tolvik analysis

2021 saw a further significant improvement in power export per tonne of waste inputs following the 2019 low during which a number of EfWs suffered from significant turbine issues.

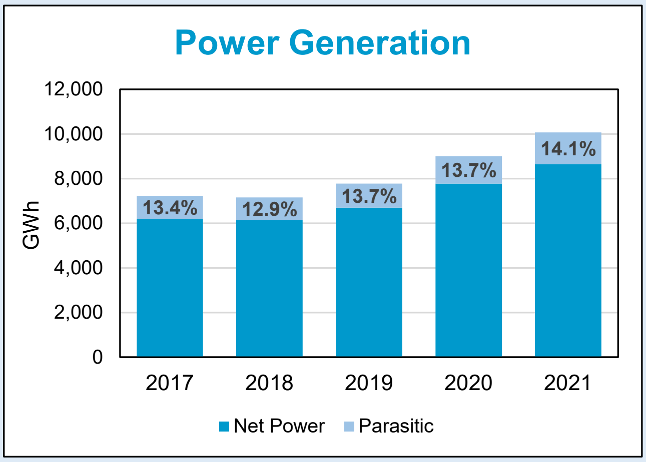


Figure 11: Power Generation from EfW

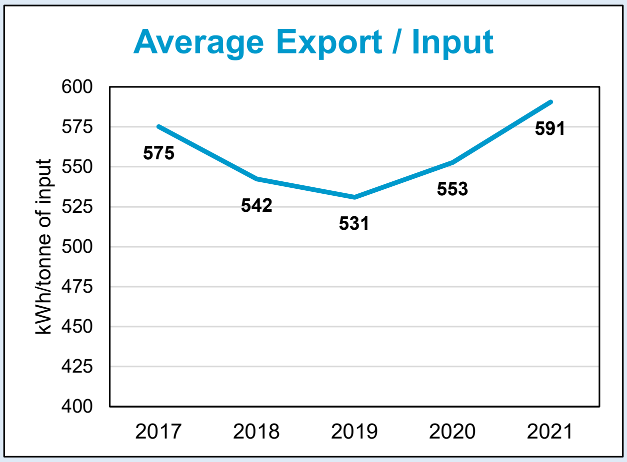


Figure 12: Average Power Export per tonne of input

Power: Benchmarking

For each EfW for which data was reported, Figures 13 and 14 show the distribution of the average net power exported per tonne of input and the average parasitic power load for the year.

With an average 591kWh/t generated per tonne of waste input in 2021 *(2020: 553kWh/t),* across all EfWs the output ranged from 197kWh/t to 949kWh/t.

The average parasitic load figures are to some extent impacted by those EfWs, particularly Advanced Conversion Technology ("ACT") facilities, which also undertake some pre-processing of waste prior to combustion. Such facilities account for the three highest parasitic loads in Figure 14. Excluding ACTs, in 2021 the average parasitic load was 13.8%.

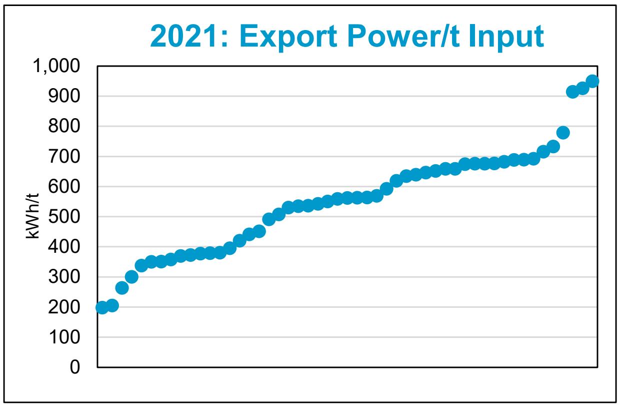


Figure 13: 2021 Net Power Exported per tonne of Input
Source: Tolvik analysis, 51 records

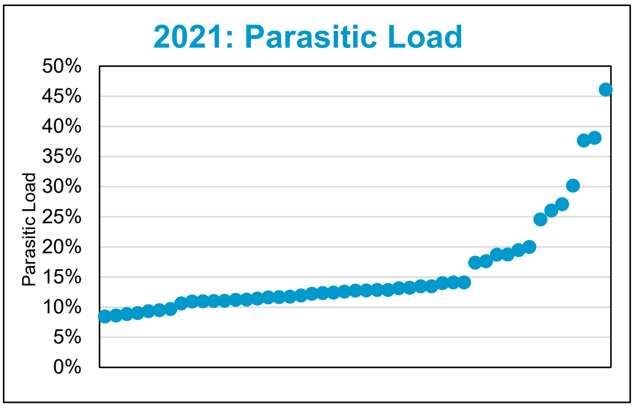


Figure 14: 2021 Parasitic Load Distribution
Source: Tolvik analysis, 47 records

Beneficial Heat Use

In 2021,12 EfWs in the UK exported heat for beneficial use alongside power with an estimated total export of 1,845GWh$_{th}$. *(2020: 1,651GWh$_{th}$)*. Across all EfWs this was the equivalent of 125kWh$_{th}$/tonne of inputs *(2020: 117kWh$_{th}$/tonne)*.

EfW	Est. Export GWh$_{th}$				
	2017	2018	2019	2020	2021
Runcorn	405	408	405	480	616
Eastcroft	224	332	420	405	390
Wilton 11	-	100	303	373	332
Kemsley	-	-	-	123	235
Sheffield	96	112	111	95	98
Devonport	54	59	48	54	54
Gremista	40	40	40	50	42
SELCHP	37	38	39	40	44
Leeds	-	8	2	14	16
Coventry	5	11	13	8	12
NewLincs	3	3	3	7	3
Edmonton	-	-	-	2	2
Total	**865**	**1,112**	**1,384**	**1,651**	**1,845**

Figure 15: Reported Heat Exports from EfWs Source: APR

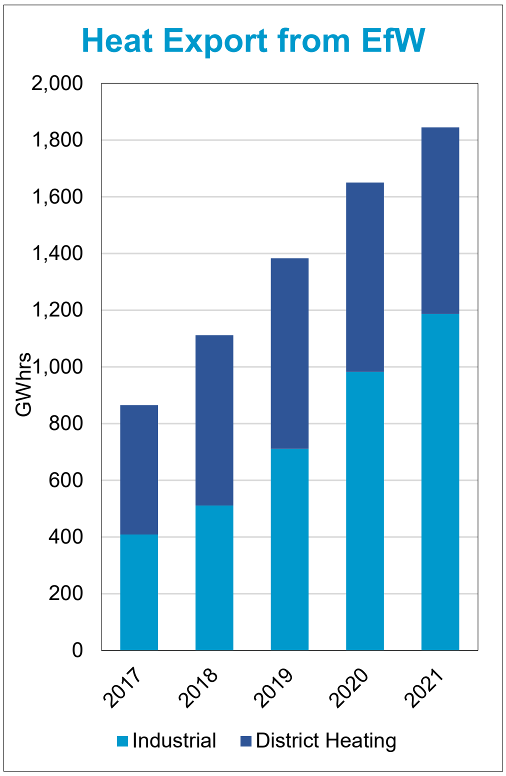


Figure 16: Heat Exports by Demand Source: APR

5. OPERATIONS

Across those EfWs which were operational for the whole of 2021, the weighted average availability based on waste combustion hours was 88.6% *(2020: 89.8%).* The simple average availability based on turbine operational hours was lower at 84.0% *(2020: 85.9%)*.

Figure 17 also shows ash generation and metals recovery were relatively steady.

	Availability - Hours			% of Input Tonnage		
	Waste Combustion - Simple Average	Waste Combustion – Weighted Average	Turbine Operations – Simple Average	Incinerator Bottom Ash (“IBA”)	Air Pollution Control Residue (“APCr”)	Metals Recovery (if reported)
2017	88.6%	89.3%		20.1%	3.4%	1.9%
2018	87.3%	89.8%		19.9%	3.3%	1.9%
2019	89.5%	90.0%	81.9%	19.4%	3.3%	1.9%
2020	89.2%	89.8%	85.9%	19.8%	3.1%	1.9%
2021	**85.7%**	**88.6%**	**84.0%**	**19.8%**	**3.2%**	**1.7%**

Figure 17: Operational Data Source: APR

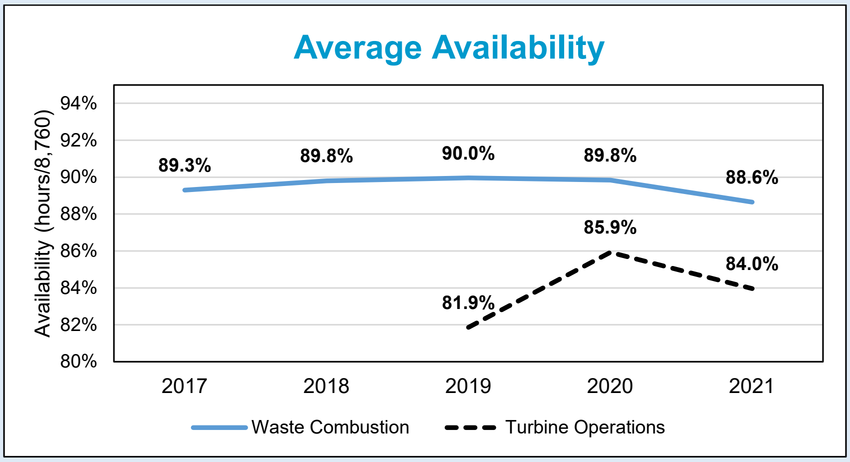


Figure 18: Average EfW Availability – Hours Source: Tolvik analysis

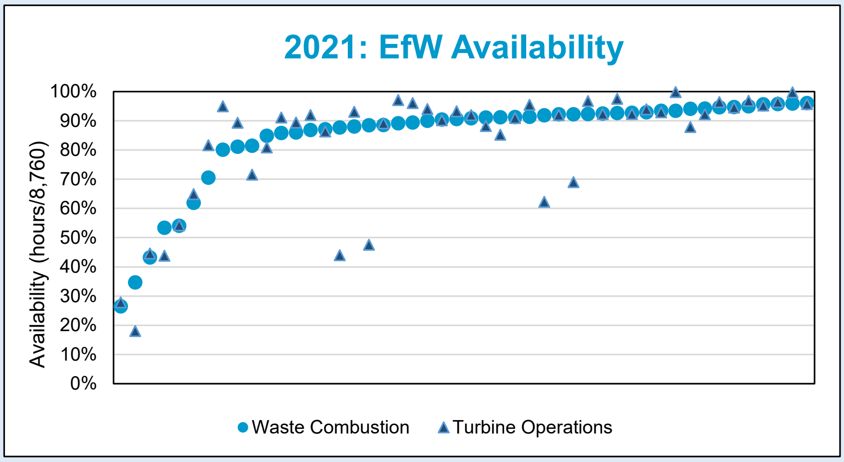


Figure 19: 2021 EfW Availability – Hours Source: Tolvik analysis, 53 records

As Figure 19 shows, during 2021 there was significant variation across EfWs in availability as measured by waste combustion hours - ranging from a low of around 26% to a high of over 99%. For the six reporting ACT facilities, average availability during 2021 was 48.5% with a high of 70.5%.

Excluding these ACT facilities, the average weighted average availability for waste combustion was 90.6% - i.e. 2.0% higher than that shown in Figure 17.

Operator	Number of EfWs reporting	Simple Average Availability	Capacity Weighted Average
Veolia	10	95.1%	94.3%
enfinium	4	92.3%	93.0%
Viridor	10	89.1%	91.2%
MESE	3	90.6%	90.0%
Cory	1	89.1%	89.1%
Suez	7	85.1%	89.1%
Public Sector	3	84.5%	89.0%
FCC	6	89.5%	88.0%
MVV	2	85.0%	85.7%
Amey	2	73.4%	81.1%
Other	5	71.5%	79.9%
Total	**53**	**85.7%**	**88.6%**

Figure 20: 2021 Average Availability (Waste Combustion) by Operator – EfWs operational for the full year

Outputs

Incinerator Bottom Ash

In 2021 IBA accounted on average for 19.8% *(2020: 19.8%)* of all waste inputs. In total, the tonnage of IBA generated in 2020 was just over 2.9Mt.

Except three ACT facilities at the lower end of the range, IBA outputs expressed as a percentage of waste inputs fell within the 11% - 27% range.

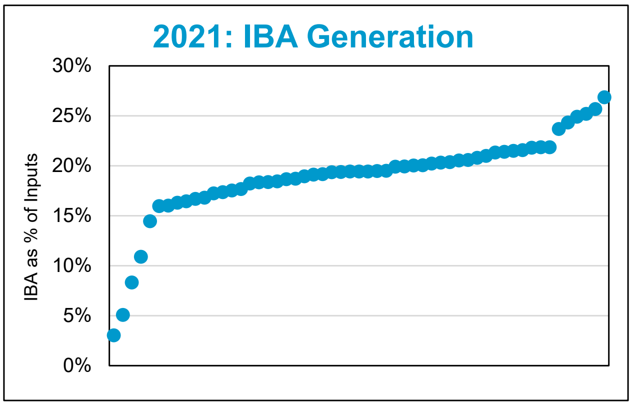


Figure 21: 2021 Distribution of IBA Generation (as % of inputs)
Source: Tolvik analysis, 51 records

Air Pollution Control Residues

In 2021 APCr generation was 3.2% of waste inputs *(2020: 3.1%)*. Total generation of APCr in 2021 is estimated to have been 470kt with 35.6% recycled.

Six facilities generated more than 5% of APCr as a percentage of inputs – being those EfWs using fluidised bed technology, ACTs and one small EfW. Two EfWs generated less than 2% of APCr.

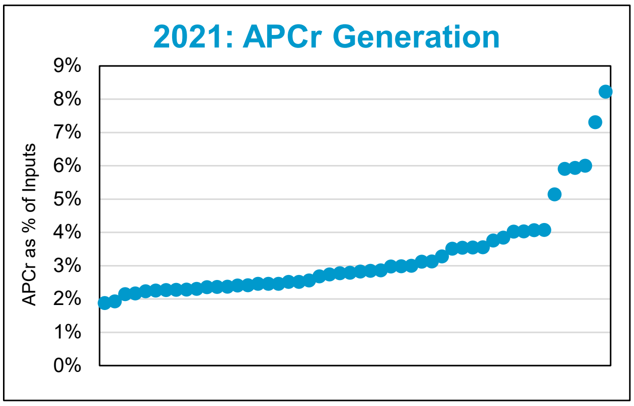


Figure 22: 2021 Distribution of APCr Generation (as % of inputs)
Source: Tolvik analysis, 51 records

Consumable Use

The analysis in this section is calibrated to "Specific Usage" i.e. usage per tonne of waste input. There have been no longer term trends which are discernible with respect to any of the consumables.

Consumable	Per tonne input	Low	Median	High
Total Water Usage	m^3	0.02	0.20	6.25
Activated carbon or coke	kgs	0.07	0.29	1.41
(Hydrated) lime or sodium bicarb	kgs	1.05	10.14	36.55
Urea	kgs	0.37	1.33	5.44
Ammonia	kgs	0.36	1.54	13.40
Fuel Oil	ltrs	0.04	1.42	81.36

Figure 23: 2021 Specific Consumable Usage (where reported)   Source: APR

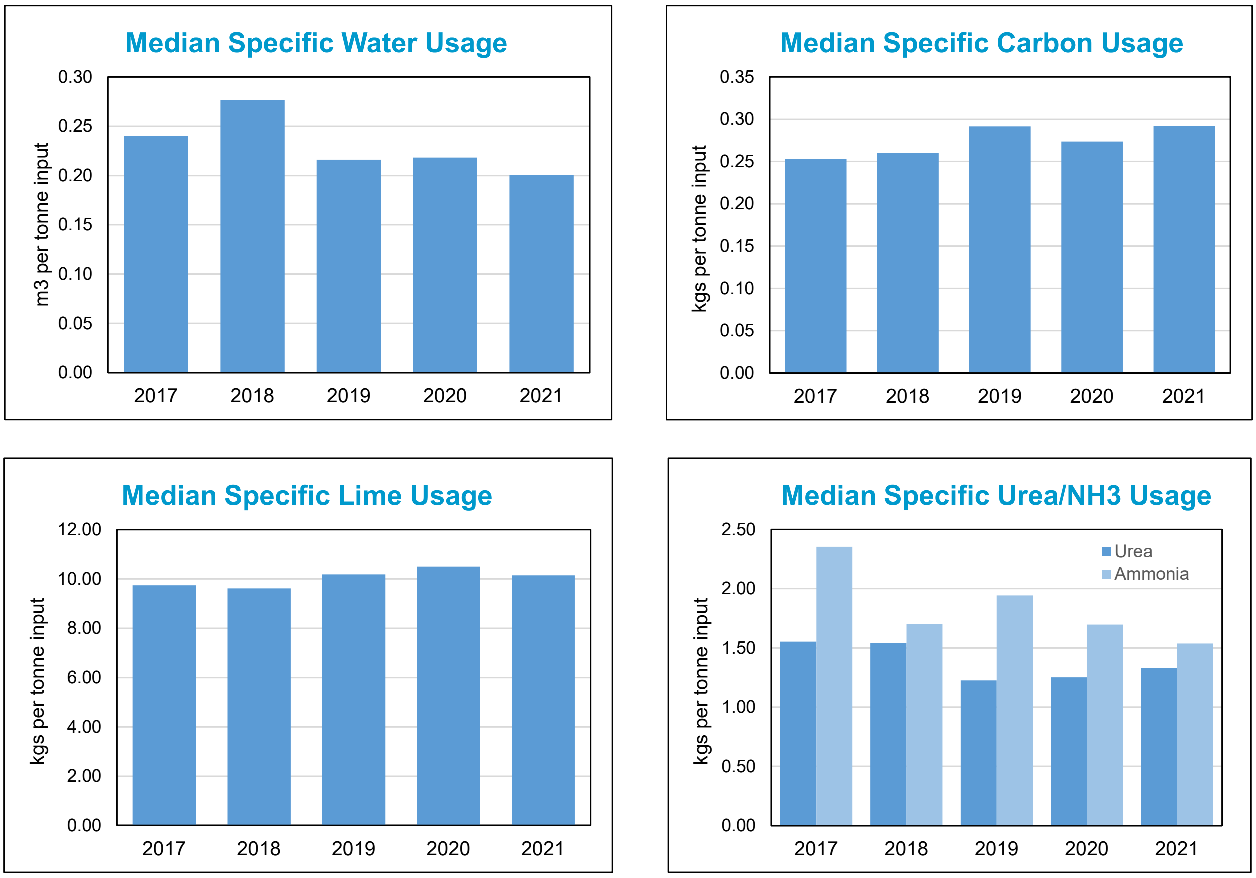
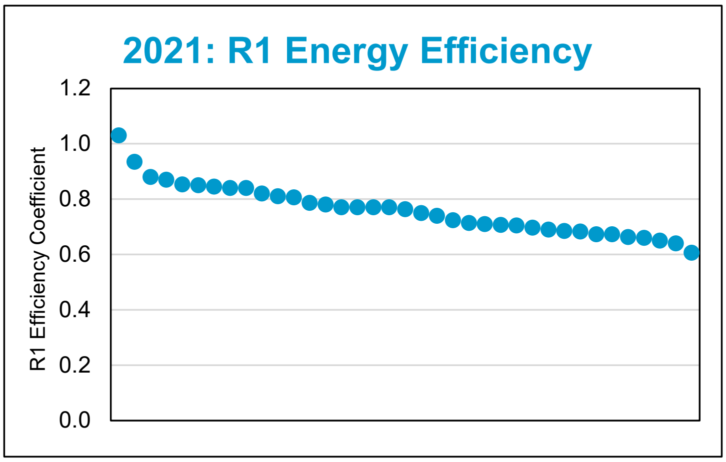


Figure 24: Trends in Specific Consumable Usage (where reported)   Source: APR

R1 Energy Efficiency Status



As at April 2022, based on EA data and information in the APR, 37 EfWs with a total headline capacity of 12.8Mt were accredited as R1 ("Recovery") operations.

19 EfWs that were fully operational in 2021 do not have R1 status and are therefore classified as "Disposal" operations.

To achieve R1 requires an efficiency coefficient of at least 0.60 (for pre 2009 EfWs) and 0.65 (for new EfWs).

Figure 25: R1 Energy Efficiency Status   Source: EA, APRs

Carbon Intensity of EfW (per tonne)

It continues to be the case that, in the absence of a standard methodology, there is a significant element of subjectivity in estimating carbon intensity of EfW. This is further complicated by the wide variation in the operational performance of individual EfWs and the range of wastes accepted.

There is a general consensus that EfWs are not simply power stations and that it is incorrect to benchmark them solely against other sources of power generation. The general view is that any estimate of carbon intensity needs to also recognise their role in diverting Residual Waste from landfill and, depending on their operational configuration, generating heat and power and contributing to recycling.

The analysis of carbon intensity is very sensitive to the estimates given as to the total tonnage of CO_2 emitted by each EfW. As previously, we have based our data on Pollution Inventory returns. There are indications in the latest available data, which relates to 2020, that operators have reconsidered the basis of their submissions. As a result there is limited merit in analysing year-on-year trends as they do not appear directly comparable.

As Figure 26 shows, there continues to be is a very significant variation in reported CO_2 emissions. It seems highly unlikely that actual emissions from EfWs range by the 540% indicated by reported data. Further work is needed to ensure consistent calculation methodology and reporting.

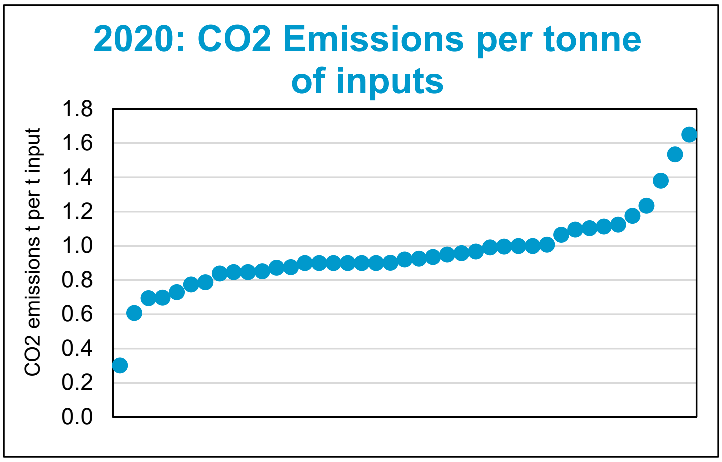


Figure 26: CO_2 emissions per tonne of inputs   Source: Pollution Inventory(4)

In 2021 there were improvements in both power and heat exports with a combined c.7% increase from 663kWh per tonne of waste to 709kWh/t. However, the rate of decarbonisation of UK energy generation, particularly in the power sector, was greater (at around 10%). As a result, **despite efficiency improvements, the carbon benefit from power and heat generation deriving from the UK EfW fleet continued to fall** (by just over 3%).

Excluding any benefits from avoiding landfill, it is estimated that in 2021, on average across the UK fleet, net carbon emissions were 0.340 tCO_2e per tonne of waste, up 2.1% on the recalculated 0.333 tCO_2e per tonne of waste seen in 2020.

	Per tonne of Input Waste	Unit	Data Source	2020	2021
	Average CO_2 emitted	*tCO_2*	*2020 Pollution Inventory[(4)]*	*0.992*	*0.992*
	% Fossil		*WRAP Composition – 2017[(5)]*	*47.9%*	*48.0%*
Emissions	Fossil CO_2 emitted	tCO_2		0.475	0.476
	Other GHG emitted	tCO_2e	*N_20 from Pollution Inventory[(4)]*	0.037	0.037
	Fuel import	tCO_2e	*APR and UK GHG Conversion Factor*	0.007	0.007
	Total Fossil Emissions	**tCO_2e**		**0.519**	**0.520**
EfW Outputs	*Total Power Export*	*MWh*	*Figure 10*	*0.553*	*0.591*
	Imported Power	*MWh*	*APR*	*(0.007)*	*(0.006)*
	Net Power Export	*MWh*		*0.546*	*0.584*
	Heat Export	*MWh*	*Figure 15 text*	*0.117*	*0.125*
	Recycling Benefit	*t*	*Figure 17*	*0.019*	*0.017*
Substitution Benefits	Net Power Export	tCO_2e	*Converted using UK Government GHG Conversion Factors for company reporting for the applicable year[(6)]*	(0.127)	(0.124)
	Heat Export	tCO_2e		(0.020)	(0.021)
	Recycling Benefit	tCO_2e		(0.039)	(0.034)
	Total Benefits	**tCO_2e**		**(0.186)**	**(0.180)**
	Impact (Net Emissions)	**tCO_2e**		**0.333**	**0.340**

Figure 27: Estimated Carbon Emissions per tonne of waste input

6. COMPLIANCE

Compliance in the EfW sector is a combination of operator self-monitoring, reporting to and monitoring by the relevant regulator.

EfWs, like most large industrial installations, are required under EU and UK law to monitor their emissions to air both continuously (on site) and periodically (by sample sent to an accredited laboratory). Emissions to water and composition of ash residues are also monitored at regular intervals.

Operators advise that measurement uncertainty, limits of detection for small samples and impact of background pollutant levels can all affect the analysis, but the protocols used by the sector should be such that reported results are effectively a worst case.

Across all continuously monitored emissions to air, on average in 2021 emissions were 28.4% of the Emission Limit Value ("ELV") *(2020: 29.1%)*. Meanwhile, for periodically monitored emissions, on average emissions were 8.6% of ELV *(2020: 8.1%)*.

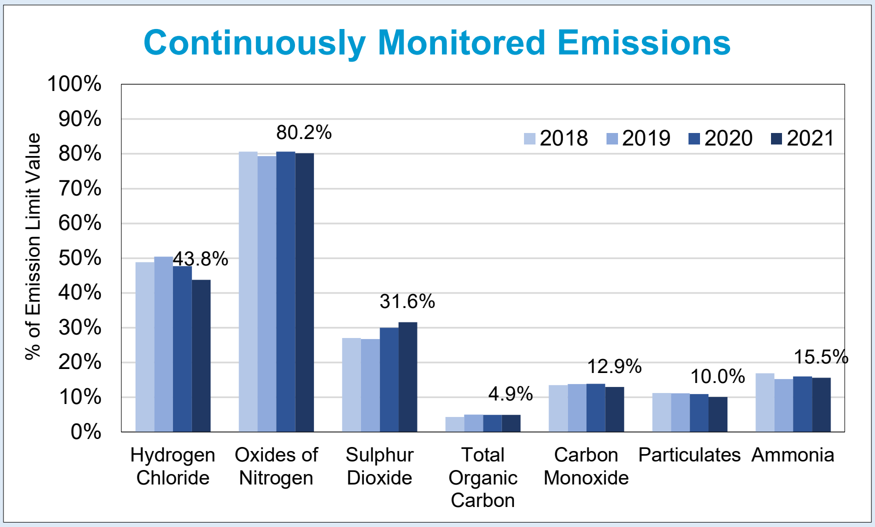


Figure 28: Continuously Monitored Emissions to Air Source: APR

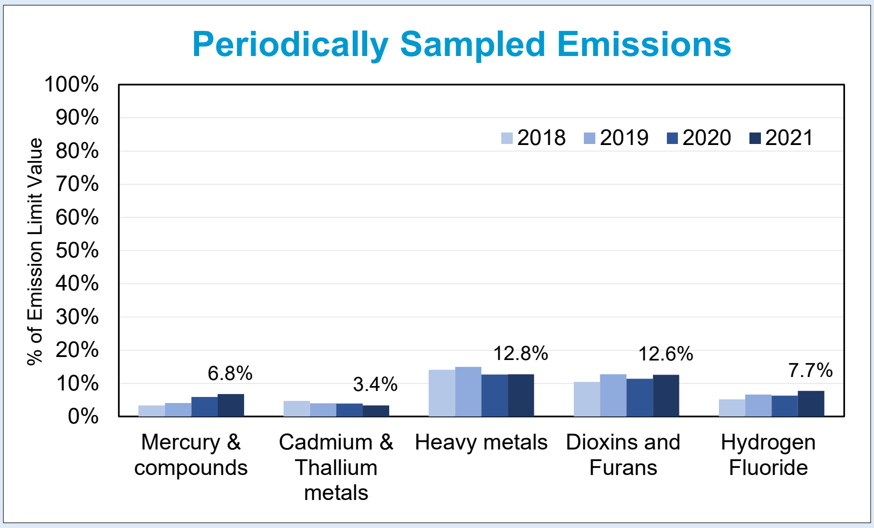


Figure 29: Periodically Monitored Emissions to Air Source: APR

It is to be noted that emission levels of Hydrogen Chloride (HCl), Sulphur Dioxide (SOx) and Oxides of Nitrogen (NOx) are controlled by the dosing rate of consumable reagents (see Section 5). Typically in the UK, operators look to optimise resource consumption against achieving emissions levels within the specified ELV.

There have been no discernible trends in continuously monitored emissions to air over the last 4 years.

However, as Figure 30 shows, based upon the last 5 years of data, for most substances that are continuously monitored, in general newer EfWs operate at slightly lower emission levels than older facilities.

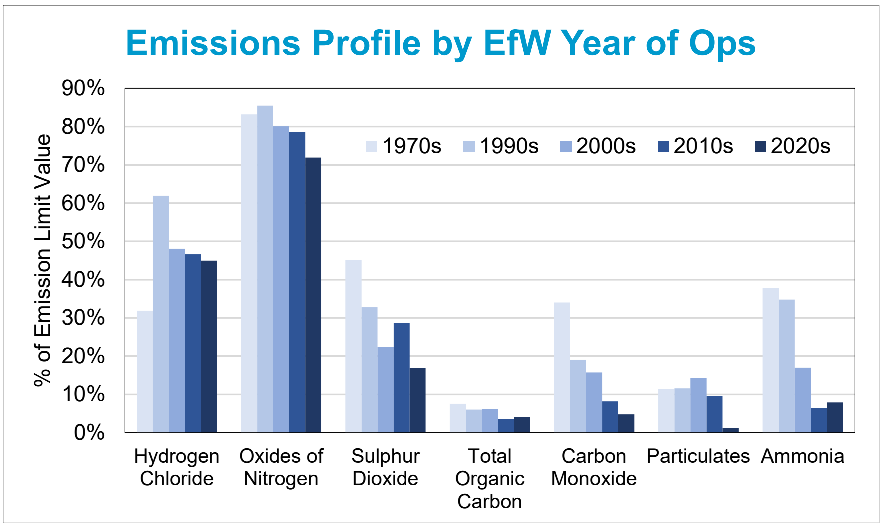


Figure 30: Continuously Monitored Emissions to Air – by First year of EfW Operation   Source: APR

Abnormal Operations

Abnormal Operations	Unit	Year	Total	Number of EfWs Reporting	Per EfW
Abnormal Hours	Hours	2018	130	38	3.4
		2019	96	42	2.3
		2020	168	48	3.5
		2021	**120**	**52**	**2.3**
Abnormal Events	Instances	2019	87	44	2.0
		2020	72	48	1.5
		2021	**101**	**51**	**2.0**
Permit Breaches	Instances	2019	127	39	3.3
		2020	148	47	3.1
		2021	**139**	**50**	**2.8**

Figure 31: Abnormal Operations   Source: APR

In 2021 one facility reported abnormal operations for 57% of the year. This facility has been excluded from Figure 31 as it materially distorts the overall performance of UK EfWs.

As in previous years, in 2021 five different EfWs reported more than 10 permit breaches and together accounted for 52% of all breaches.

7. CAPACITY DEVELOPMENT

Based on EfWs which were operational or in construction as at December 2021, Section 2 identifies the total Permit Capacity of 21.7Mtpa.

Permit Capacity is not suitable for projecting future EfW capacity in any analysis of the UK Residual Waste market – as EfWs generally do not operate at this level. "Operational Capacity" is a more appropriate measure; it is estimated (based upon the EfWs listed in Appendix 1, that by 2026 the UK Operational Capacity will be **19.4Mtpa.**

Figure 32 also shows historic Residual Waste tonnages in the UK – including a preliminary estimate for 2021. It does not show the projected Residual Waste tonnages, as such projections involve consideration of a number of factors outside the scope of this report.

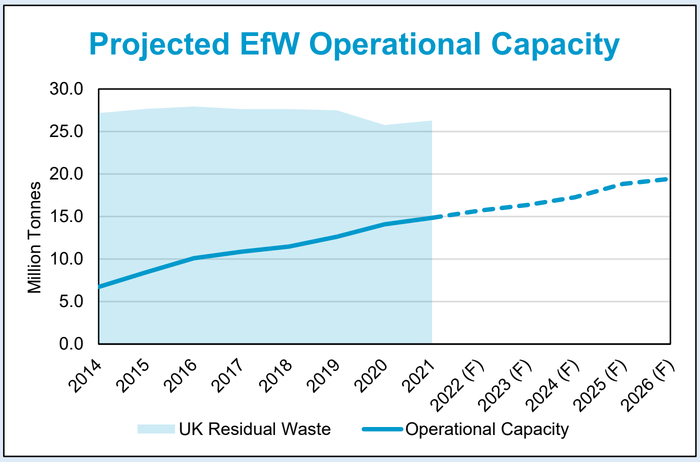


Figure 32: Projected UK EfW Operational Capacity Source: Tolvik analysis

EfW in Development – Additional Capacity

The Operational Capacity beyond 2026 will be dependent on the extent of development of new additional EfWs. Tolvik's database of active development projects has reversed previous trends as a number of projects have reached financial close, seemingly ceased being progressed, been cancelled and/or have been refused consent.

As Figure 33 shows, this suggests that fewer new projects are now being actively brought forward which is likely to reflect challenges in securing suitable waste supply commitments and also a construction market that is somewhat constrained at present.

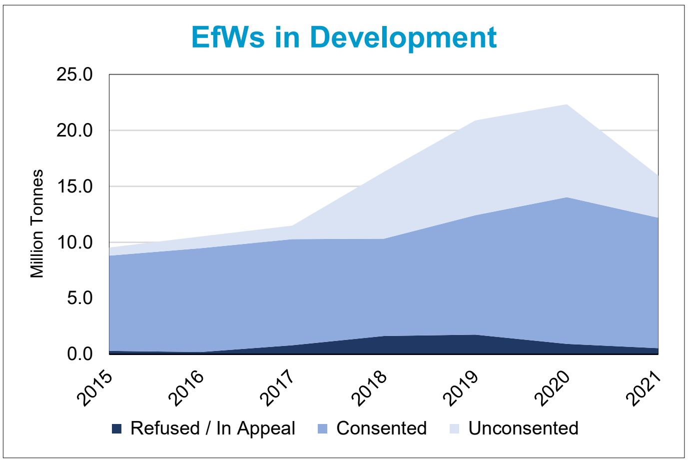


Figure 33: Historic EfW Capacity in Development

APPENDIX 1: ENERGY FROM WASTE FACILITIES INCLUDED IN THE REPORT

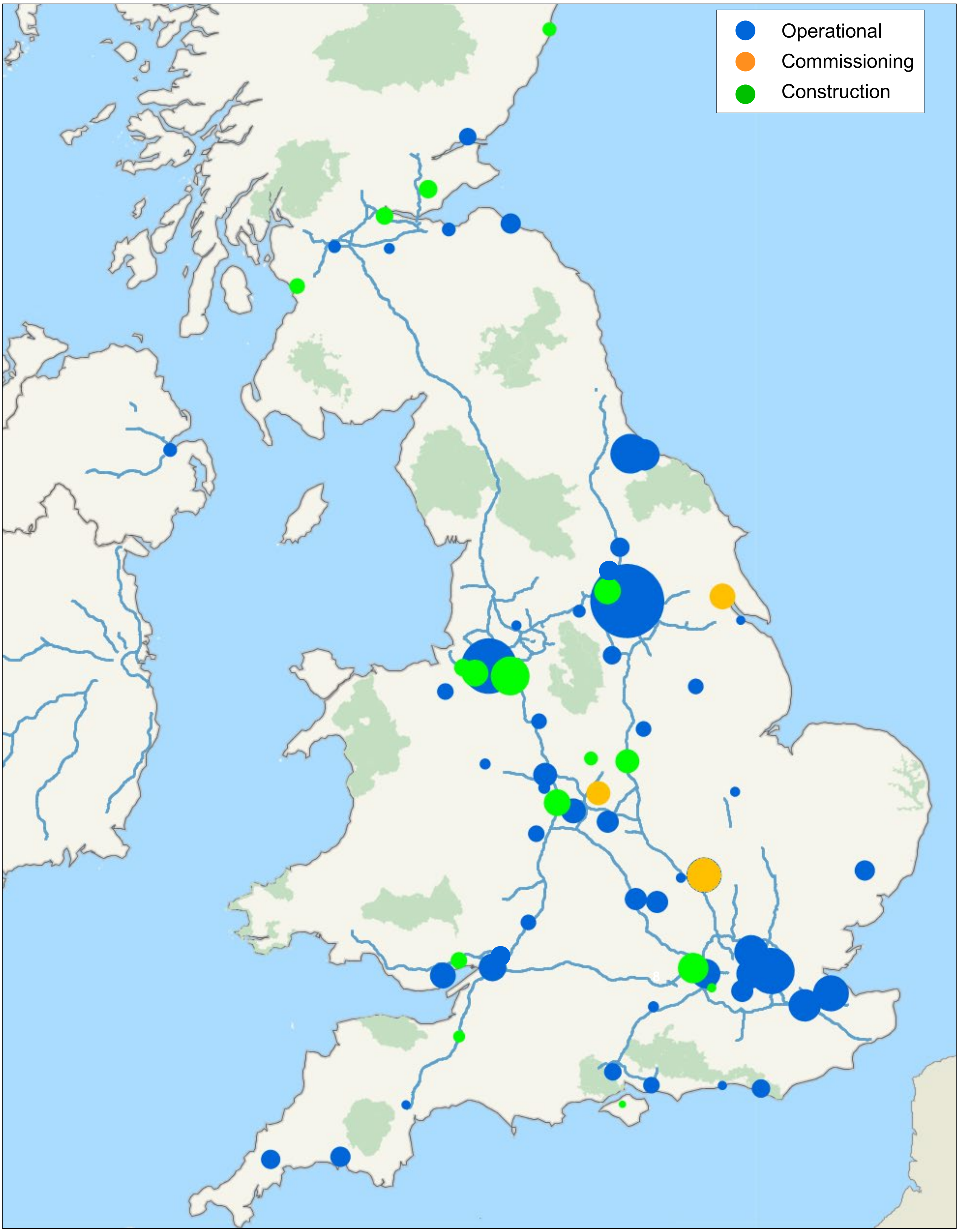


Figure 34: Location of EfW facilities (for further details on the EfWs shown see Figures 35-38)

Operational EfWs

	Permitted Name	Known As	Location	Operator	Permit Capacity (ktpa)	Processed (ktpa) 2019	2020	2021
1	Runcorn EfW Facility	Runcorn	Halton	Viridor	1,100	962	943	957
2	Riverside Resource Recovery Facility	Riverside	Bexley	Cory	785	743	731	782
3	Tees Valley - EfW Facility	Tees Valley	Stockton-on-Tees	Suez	756	651	682	675
4	Ferrybridge Multifuel 1	Ferrybridge FM1	Wakefield	enfinium	725	667	599	656
47	Ferrybridge Multifuel 2	Ferrybridge FM2	Wakefield	enfinium	725	129	615	669
51	Kemsley Park EfW	Kemsley	Kent	enfinium	657		410	527
5	Edmonton EcoPark	Edmonton	Enfield	Council	620	498	542	516
6	Allington Waste Management Facility	Allington	Kent	FCC	560	488	423	472
9	Wilton 11 EfW	Wilton 11	Middlesborough	Suez	500	448	470	459
12	Severnside Energy Recovery Centre	Severnside	S.Gloucestershire	Suez	467	397	411	402
7	SELCHP ERF	SELCHP	Lewisham	Veolia	464	439	369	434
8	Lakeside EfW	Lakeside	Slough	Lakeside	450	427	420	382
11	Tyseley ERF	Tyseley	Birmingham	Veolia	441	343	363	375
10	Cardiff Energy Recovery Facility	Trident Park	Cardiff	Viridor	425	366	379	378
54	Severn Road RRC	Avonmouth	Bristol	Viridor	377		68	285
45	Beddington Energy Recovery Facility	Beddington Lane	Croydon	Viridor	347	279	322	320
13	Greatmoor EfW	Greatmoor	Buckinghamshire	FCC	345	295	300	303
14	Staffordshire ERF	Four Ashes	Staffordshire	Veolia	340	337	340	339
15	Ardley EfW Facility	Ardley	Oxfordshire	Viridor	326	280	290	334
43	Dunbar Energy Recovery Facility	Dunbar	East Lothian	Viridor	325	251	325	307
41	Allerton Waste Recovery Park	Allerton Park	North Yorkshire	Amey	320	255	227	287
16	CSWDC Waste to Energy Plant	Coventry	Coventry	Council	315	299	313	295
17	SUEZ Suffolk - EfW Facility	Great Blakenham	Suffolk	Suez	295	267	291	292
18	Devonport EfW CHP Facility	Devonport	Plymouth	MVV	265	265	261	243
20	Sheffield ERF	Sheffield	Sheffield	Veolia	245	230	240	228
21	Newhaven ERF	Newhaven	East Sussex	Veolia	242	223	229	229
19	Cornwall Energy Recovery Centre	Cornwall	Cornwall	Suez	240	243	237	242
25	EnviRecover EfW Facility	Hartlebury	Worcestershire	Severn	230	201	213	216
22	Integra South West ERF	Marchwood	Southampton	Veolia	220	211	204	210
23	Integra South East ERF	Portsmouth	Portsmouth	Veolia	220	195	205	200
24	Stoke EfW Facility	Hanford	Stoke-on-Trent	MESE	210	179	189	185
26	Eastcroft EfW Facility	Eastcroft	Nottingham	FCC	200	188	191	186
48	Parc Adfer ERF	Parc Adfer	Deeside	enfinium	200	58	197	192
28	Lincolnshire EfW Facility	North Hykeham	Lincolnshire	FCC	190	175	185	171
46	Millerhill Recycling and ERC	Millerhill	Edinburgh	FCC	190	142	157	161
49	Javelin Park ERF	Javelin Park	Gloucestershire	UBB	190	68	183	191
27	Leeds Recycling and ERF	Leeds	Leeds	Veolia	190	174	182	181
31	Baldovie Waste To Energy Plant	Baldovie	Dundee	MVV	175	96	92	161
44	Glasgow RREC	Polmadie ACT	Glasgow	Viridor	154	83	149	99
29	Kirklees EfW Facility	Kirklees	Huddersfield	Suez	150	134	124	134
52	Full Circle Generation EfW	Belfast ACT	Belfast	Bouygues	144	34	76	49
30	Bolton ERF	Bolton	Gtr Manchester	Suez	120	76	53	42
32	Wolverhampton EfW Facility	Wolverhampton	Wolverhampton	MESE	118	114	114	112
33	Integra North ERF	Chineham	Hampshire	Veolia	110	94	98	105
34	Dudley EfW Facility	Dudley	Dudley	MESE	105	96	98	97
35	Battlefield EfW Facility	Battlefield	Shropshire	Veolia	102	99	97	99
53	Levenseat Renewable Energy	Levenseat ACT	West Lothian	Outotec	97	20	50	50
42	Milton Keynes Waste Recovery Park	Milton Keynes ACT	Milton Keynes	Amey	94	58	66	56
36	Peterborough EfW Facility	Peterborough	Peterborough	Viridor	85	80	80	81
37	Enviropower Ltd, Lancing	Lancing	West Sussex	Enviropower	75	55	64	67
38	Exeter ERF	Exeter	Devon	Viridor	60	58	60	60
39	Integrated Waste Management Facility	NewLincs	NE Lincolnshire	Tiru	56	51	54	51
40	Energy Recovery Plant	Gremista	Shetland Islands	Council	26	21	23	19
	Other EfWs in Commissioning but not achieved Takeover					83	63	281
			Totals		**16,367**	**12,626**	**14,069**	**14,846**

Figure 35: Operational EfWs in 2021   Source: APR

EfWs In Commissioning

	Permitted Name	Known As	Location	Operator	Start Date	Permit Capacity (ktpa)	Processed (ktpa)	
							2020	2021
C6	Hull Energy Works	Energy Works ACT	Hull	Engie	Q1 2016	227	13	35
C14	Baddersley EfW	Baddersley	Warwickshire	Equitix	Q1 2018	130	12	40 (est)
C18	Rookery South ERF	Rookery South	C Bedfordshire	Covanta	Q1 2019	585	0	170
				Total		**942**	**24**	**244**

Figure 36: EfWs In Commissioning as at December 2021 Source: Tolvik analysis

EfWs In Construction

	Permitted Name	Known As	Location	Developer	Financial Close	Capacity (ktpa)
C5	Charlton Lane Eco Park	Eco Park ACT	Surrey	Suez	Q2 2016	60
C12	Isle of Wight EfW	Isle of Wight	Isle of Wight	Amey	Q2 2017	30
C15	Hooton Park Sustainable Energy	Hooton Park ACT	Merseyside	BWSC/Cogen	Q4 2018	266
C16	Bridgwater Resource Recovery	Bridgwater	Somerset	Equitix/Iona	Q4 2018	123
C17	Earls Gate Energy Centre	Earls Gate	Falkirk	Earls Gate	Q4 2018	236
C19	Lostock Sustainable Energy Plant	Lostock	Cheshire West	FCC	Q1 2019	600
C20	NESS EfW Facility	NESS	Aberdeenshire	Indaver/Acconia	Q3 2019	150
C21	Newhurst ERF	Newhurst	Leicestershire	Biffa/Covanta/GIG	Q1 2020	350
C22	Drakelow Energy Generation Facility	Drakelow ACT	Derbyshire	Vital	Q1 2020	170
C23		Newport	Newport	Vogen/Aviva	Q1 2020	220
C24	Protos Refuse Derived Fuel Plant	Protos	Cheshire West	Biffa/Covanta/GIG	Q4 2020	410
C25	Slough Multifuel	Slough	Slough	SSE/CIP	Q4 2020	480
C26	Skelton Grange EfW	Skelton Grange	Leeds	enfinium	Q4 2021	435
C27	Oldhall Energy Recovery Facility	Oldhall	North Ayrshire	Octopus	Q4 2021	186
C28	Kelvin Energy Recovery Facility	Kelvin Way	West Bromwich	enfinium	Q4 2021	400
C29	Westfield Energy Recovery	Westfield	Fife	Brockwell	Q4 2021	250
C30	*Edmonton EcoPark (Replacement)*	*Edmonton*	*Enfield*	*Council*	*Q4 2021*	*700*
				Total		**4,365**

Figure 37: EfWs In Construction in 2021 Source: Tolvik analysis

No additional EfW capacity reached financial close in Q1 2022.

Mothballed

	Permitted Name	Known As	Location	Last Operator	Date	Processed (ktpa)		
						2018	2020	2021
M1	Sinfin IWTC	Sinfin Road ACT	Derby	Renewi	Aug-19	50	0	0
M2	Hoddesdon EfW Plant	Hoddesdon ACT	Hertfordshire	BIG	Jan-22	0	39	36
				Total		**50**	**39**	**36**

Figure 38: Mothballed EfWs Source: Tolvik analysis

Co-Incinerated in Cement and Lime Kilns

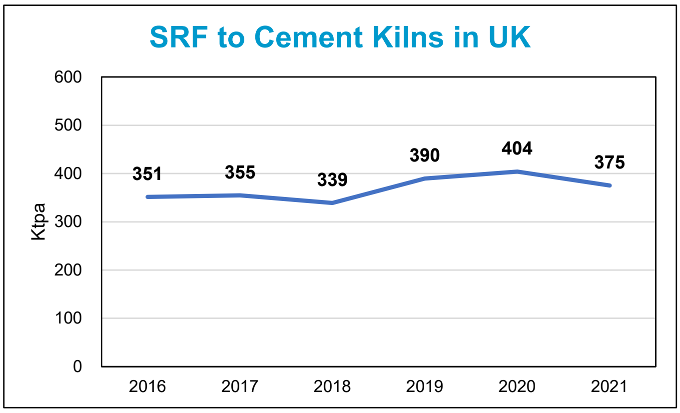


Figure 39: SRF to UK Cement and Lime Kilns Source: Tolvik analysis

In 2021 the tonnage of SRF under EWC code 19 10 12 sent to cement and lime kilns in the UK was an estimated 375kt – broadly similar to the figure over recent years. In 2021, excluding fly ash, cement and lime kilns processed circa 250ktpa of other wastes – primarily tyres and hazardous solvents (each around 100kt).

APPENDIX 2: INTERNATIONAL BENCHMARKS

EfW Capacity per Capita

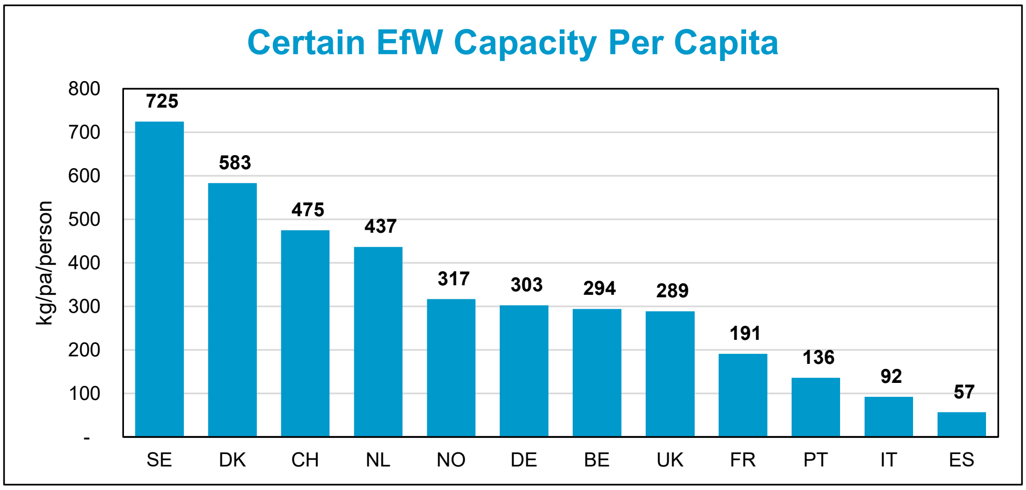


Figure 40: EfW Capacity per Capita as at March 2022 Source: Tolvik analysis

Figure 40 shows the estimated EfW capacity per person across selected European countries. The UK figure is based on the 19.4Mtpa of Operational Capacity in Section 7.

Heat and Power Generation

Figure 41 illustrates that UK EfWs are largely focussed on electricity export. Aside from Italy, where the average calorific value of waste sent to EfW is high (reportedly over 12 MJ/kg), the UK generates the greatest MWh/t of electricity per tonne of waste input.

By contrast, with the exception of Portugal and Spain, the UK exports the least heat – whether in the form of either hot water or steam.

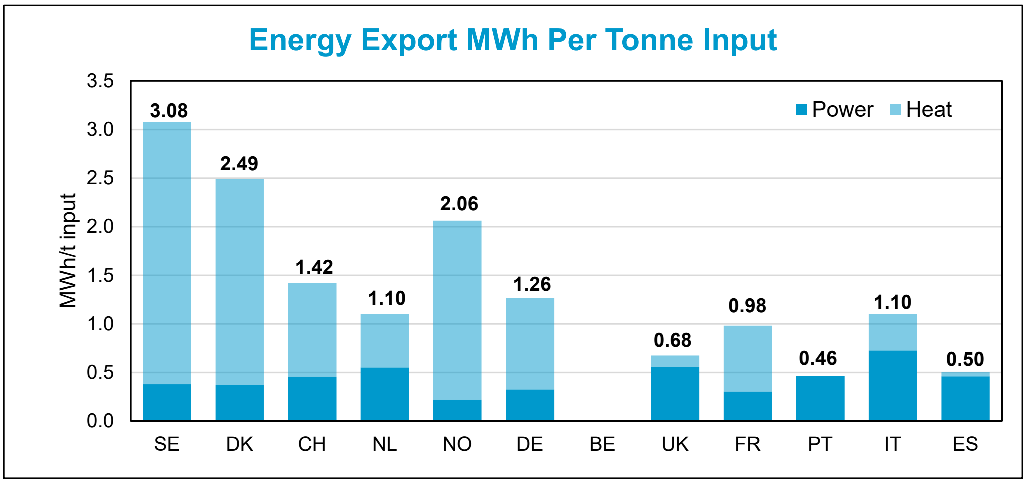


Figure 41: Energy Export per tonne of Residual Waste processed Source: Various

APPENDIX 3: DATA SOURCES

APR have either been provided by operators or released under the Freedom of Information Act.

EA Contains public sector information licensed under the Open Government Licence v3.0

NIEA Contains public sector information licensed under the Open Government Licence v3.0

NRW Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights reserved.

SEPA Contains SEPA data © Scottish Environmental Protection Agency and database right 2021. All rights reserved.

(1) http://www.wastedataflow.org/ Q100 for four quarters Apr 2020 – Mar 2021

(2) Environment Agency: 2020 Waste Data Interrogator
https://environment.data.gov.uk/portalstg/home/item.html?id=f4adcd438cb144f8ad2b24529bbec78f

(3) 2021 Digest of UK Energy Statistics ("DUKES") Table 5.5
https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2021

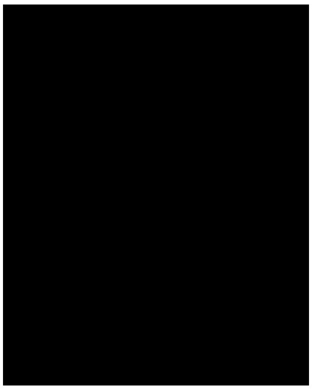
(4) 2020 Pollution Inventory Dataset – Version 2
https://environment.data.gov.uk/portalstg/home/item.html?id=9fd350cf2d264cf2967f28cb6bd5895c

(5) WRAP: National Municipal Waste Composition, England 2017
https://wrap.org.uk/content/quantifying-composition-municipal-waste

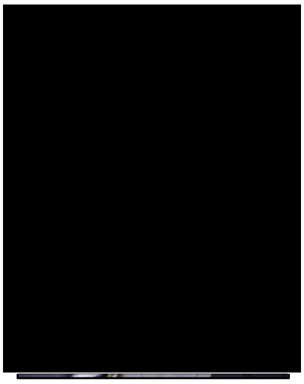
(6) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

APPENDIX 4: GLOSSARY

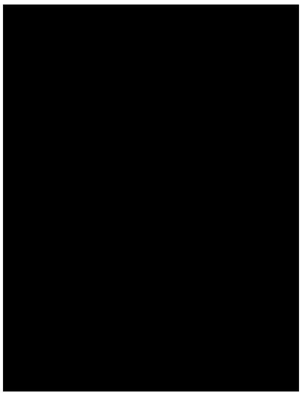
ACT	Advanced Conversion Technology
APCr	Air Pollution Control residue
APR	Annual Performance Reports
C&I	Commercial and Industrial Waste
CCS	Carbon Capture and Storage
EA	Environment Agency
EfW(s)	Energy from Waste (facilities)
ELV	Emission Limit Value
ETS	Emissions Trading Scheme
EWC	European Waste Catalogue
IBA	Incinerator Bottom Ash
Kt (pa)	'000s tonnes (per annum)
LACW	Local Authority Collected Waste
Mt (pa)	Million tonnes (per annum)
NCV	Net Calorific Value
NIEA	Northern Ireland Environment Agency
NRW	Natural Resources Wales
RDF	Refuse Derived Fuel
Residual Waste	Solid, non-hazardous, combustible waste which remains after recycling either treated (in the form of RDF or SRF) or untreated (as "black bag" waste).
SEPA	Scottish Environmental Protection Agency
SRF	Solid Recovered Fuel



Adrian Judge



Chris Jonas



Sally Freshwater

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DUE DILIGENCE

Tolvik Consulting Ltd is a privately-owned specialist provider of independent market analysis, commercial due diligence and advisory services across the waste and biomass sectors.

Our clients include the UK's leading waste companies, project finance investors, developers, and equity investors.

This report has been written by Tolvik Consulting Ltd on an independent basis using our knowledge of the current UK waste market and with reference inter alia to various published reports and studies and to our own in-house analysis.

This report has been prepared by Tolvik Consulting Ltd with all reasonable skill, care, and diligence as applicable. Whilst we have taken reasonable precautions to check the accuracy of information contained herein, we do not warrant the accuracy of information provided.

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UK Energy from Waste Statistics – 2022

May 2023

INTRODUCTION

As in previous years, Tolvik's 2022 report on the UK Energy from Waste ("EfW") sector brings together data, sourced primarily from the Annual Performance Reports ("APR") submitted by operators to their respective regulator, into a single, readily accessible document.

The focus of this report remains upon facilities in the UK designed for the combustion of Residual Waste. Residual Waste is defined as non-hazardous, solid, combustible mixed waste which remains after recycling activities. This definition is a little broader than that for Municipal Waste but primarily includes wastes falling within European Waste Catalogue ("EWC") 19 12 10, 19 12 12 and 20 03 01. The report continues to exclude EfW facilities in Jersey and the Isle of Man.

As last year, the report also provides a high level summary of the tonnage of Residual Waste, generally in the form of Solid Recovered Fuel ("SRF"), sent to co-incineration facilities in the UK.

In recent years the number of operational EfWs in the UK has risen, and at the same time APR reporting requirements have, understandably, become more detailed. The consequence is that the volume of data has increased significantly. We have therefore decided that whilst the published report will continue to be available free of charge via www.tolvik.com, its focus will be upon the performance of the EfW "fleet" as a whole rather than analysing the range of performances of individual EfWs or operators.

If asset / operator specific or longer term trend data is required then Tolvik would be willing to provide bespoke analysis for a modest fee commensurate with the time spent. If this is of interest please contact us at info@tolvik.com and we can provide a fee proposal.

We continue to be very grateful to the co-operation from all concerned in releasing information on a timely basis and their assistance in filling any gaps in the information which arise. We also thank those who have provided feedback on prior issues of the report.

Please note, where applicable, prior year data has been updated to reflect the latest available information and that data tables may not add up to the total due to rounding. Third parties are entitled to freely use the contents of the report, subject to appropriately acknowledging its source.

Front Cover Image: Baldovie EfW CHP Facility Courtesy: MVV

1. KEY METRICS FOR 2022

Residual Waste Processed	**↑ 2.6%**	**Power Exported to Grid**	**↑ 9.1%**	**Average Availability**	**↓ 0.9%**
No. of fully Operational EfWs	**57**	**Total Heat Exported**	**↓ (4.1)%**	**Net Fossil CO_2 per tonne Input**	**↓ (5.2)%**

Figure 1: Comparison of 2022 vs 2021

2022 saw the lowest year on year increase in EfW inputs since Tolvik's annual EfW statistics report was first published in 2014. This was in large part a function of the commissioning profile of new EfWs, although 2022 also saw the lowest average EfW availability since 2015. It is noted that a significant number of APRs made reference to the adverse impact of gas canisters in Residual Waste on EfW reliability.

Turbine reliability continues to improve, helping to contribute to a significant increase in power exports.

Analysis of expanded data on Net Calorific Value ("NCV") would appear to further support the analysis in last year's report that the average NCV of unprocessed Residual Waste is around 5% higher than in 2017.

2. CAPACITY AND WASTE INPUTS

The EfWs falling within the scope of this report are listed in Appendix 1.

As at December 2022 there were 57 fully operational EfWs in the UK (i.e. those which prepared an APR for 2022) with a further three EfWs which accepted waste during the year as part of commissioning. 14 EfWs were under construction at the end of the year. Three facilities (Sinfin Road ACT, Hoddesdon ACT and Newport), have been categorised as "mothballed / decommissioned" and excluded from further analysis.

The Total Permit Capacity of those EfWs which were fully operational at the end of 2022 was 17.52Mtpa. With an additional 0.74Mtpa of capacity at EfWs which also accepted Residual Waste and 4.98Mtpa at EfWs in construction the "certain" Total Permit Capacity as at the end of 2022 was 23.24Mtpa – an increase of 7.2% over the previous year.

According to data provided, in 2022 a total of 15.32Mt of waste was combusted in UK EfWs, an increase of 2.6% when compared with the revised 2021 total. This is the smallest annual percentage increase in inputs since 2008. For EfWs fully operational throughout 2022, inputs were the equivalent to 88.0% of the Permit Capacity *(2021: 89.0%).*

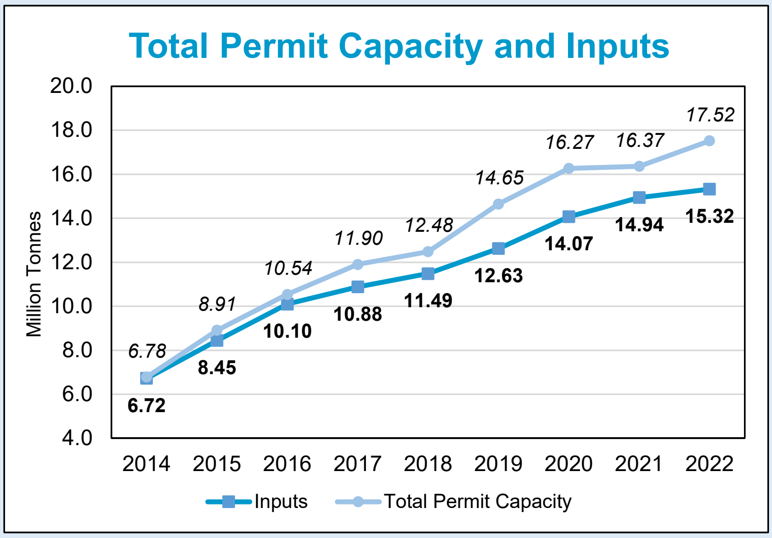


Figure 2: Total Permit Capacity and EfW Inputs in 2014-2022 Source: APR

Mtpa	Permit Capacity		Total Inputs	
	Fully Operational	Total (incl. in construction)	Tonnage	Annual Increase
2018	12.48	16.88	11.49	5.6%
2019	14.65	18.41	12.63	9.9%
2020	16.27	20.37	14.07	11.4%
2021 (r)	16.37	21.67	14.94	6.2%
2022	**17.52**	**23.24**	**15.32**	**2.6%**

Figure 3: Total Permit Capacity (as at December 2022) and EfW Inputs Source: Tolvik analysis

As at December 2022 the capacity-weighted average age of the 60 UK EfWs which accepted waste in 2022 was 11.1 years *(2021: 10.7 years).*

EfW Inputs by Waste Source and Code

Based on a detailed review of APRs for 2022 and Wastedataflow(1) for 2021/22, it is estimated that in 2022 76.3% *(2021: 77.0%)* of all EfW inputs were derived from Residual Local Authority Collected Waste ("LACW") with the remainder being Commercial and Industrial Waste ("C&I").

In 2022, 38kt (*2021: 38kt*) of Clinical Waste was reported by operators as being processed by EfWs.

Net Calorific Value of Residual Waste

In 2022, for the first time the majority of facilities (36) provided NCV data within their APR. In a few cases the data was clearly incorrect (being an order of magnitude wrong) and so has been excluded from analysis.

Considering only those EfWs primarily accepting untreated waste under 20 03 xx codes, the weighted average NCV for all inputs was 9.78MJ/kg *(2021: 9.62MJ/kg).* These facilities in total accepting 79.4% LACW and 20.6% C&I Waste.

A detailed analysis by Tolvik of data relating to the NCV of Residual Waste (from a variety of sources, some of which were under confidentiality) suggested that the average NCV for Residual LACW in 2017 was 8.87MJ/kg and for Residual C&I Waste it was 11.01MJ/kg.

The 2021 report estimated that, on a like-for-like basis, **average NCVs were 4.3% higher in 2021 than 2017,** but as this was the first such year in which there was a variance to 2017 data it was not statistically significant. In 2022, using the 2017 data as the basis for calculation the expected weighted average NCV of Residual Waste inputs would have been 9.31MJ/kg. On a like-for-like basis, this infers that **average NCVs were 5.0% higher in 2022 than 2017** – i.e. broadly in line with last year's analysis, so suggesting a modest increase of around 5% in average NCVs over the last 5 years.

3. ENERGY

It is estimated that the total power exported by EfWs in the UK in 2022 was 9,428GWh – approximately 3.2% of total net UK power generation of 293,746GWh(2).

	Est. Gross Power Generation GWh_e	Power Export GWh_e	Parasitic Load (excl. power import)	Parasitic Load (incl. power import)	Average Export kWh/tonne input	Net Heat Export GWh_{th}
2018	7,150	6,230	12.9%	13.9%	542	1,112
2019	7,769	6,703	13.7%	16.2%	531	1,384
2020	9,002	7,769	13.7%	15.5%	553	1,651
2021	10,060	8,643	14.1%	16.2%	591	1,845
2022	**10,861**	**9,428**	**13.2%**	**14.3%**	**620**	**1,770**

Figure 4: 2022 Power Generation Source: Tolvik analysis

The average power exported per tonne of waste inputs was 620kWh – the highest reported figure. This was in part due to improved turbine availability during the year (see page 4), but it is also likely to have been influenced by the modest rise in Residual Waste NCV as discussed in Section 2.

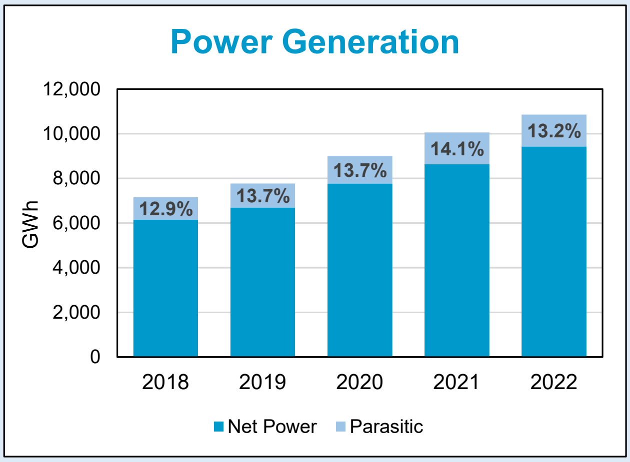


Figure 5: Power Generation from EfW

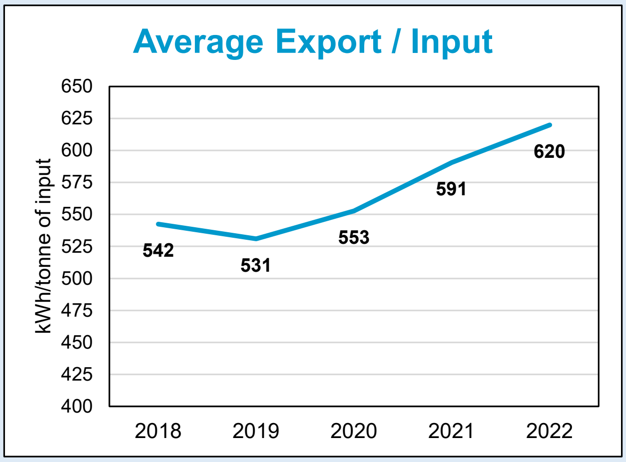


Figure 6: Average Power Export per tonne of input

Beneficial Heat Use

In 2022, 1,770GWhth *(2021: 1,845GWhth)* of heat was exported for beneficial use alongside power. Across all EfWs this was the equivalent of 115kWhth/tonne of inputs *(2021: 123kWhth/tonne)*.

EfW	Est. Export GWhth				
	2018	2019	2020	2021	2022
Runcorn	408	405	480	616	502
Eastcroft	332	420	405	390	361
Wilton 11	100	303	373	332	289
Kemsley	-	-	123	235	344
Sheffield	112	111	95	98	91
Devonport	59	48	54	54	52
Gremista	40	40	50	42	49
SELCHP	38	39	40	44	39
Leeds	8	2	14	16	25
Coventry	11	13	8	12	13
NewLincs	3	3	7	3	4
Other	-	-	2	2	-
Total	**1,112**	**1,384**	**1,651**	**1,845**	**1,770**

Figure 7: Reported Heat Exports from EfWs Source: APR

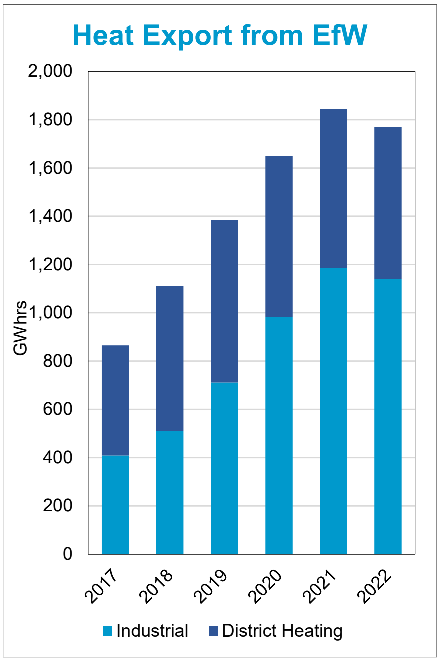


Figure 8: Heat Exports by Demand Source: APR

4. OPERATIONS

For those EfWs which were operational for the whole of 2022, the weighted average availability based on waste combustion hours was 87.7% *(2021: 88.6%).* The simple average turbine availability was identical at 87.7% *(2021: 84.0%)* – the first time turbine availability has been at least as great as waste combustion availability. This enhanced turbine availability helped contribute to the higher average net power export.

For the six reporting ACT facilities, the average availability during 2022 was 58.3% *(2021: 48.5%)* with a high of 81.6%. Excluding these ACT facilities, the weighted average availability for waste combustion at “conventional” EfWs during the year was 89.4% *(2021: 90.6%)*.

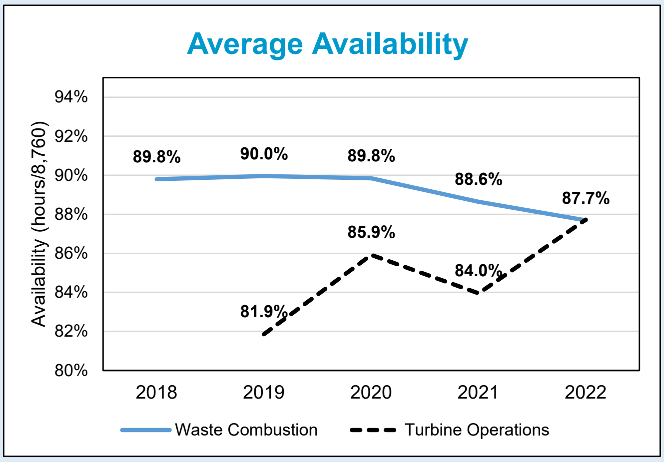


Figure 9: Average EfW availability - Hours Source: Tolvik analysis

	Availability - Hours		% of Input Tonnage		
	Waste Combustion – Weighted Average	Turbine Operations – Simple Average	Incinerator Bottom Ash ("IBA")	Air Pollution Control Residue ("APCr")	Metals Recovery (if reported)
2018	89.8%		19.9%	3.3%	1.9%
2019	90.0%	81.9%	19.4%	3.3%	1.9%
2020	89.8%	85.9%	19.8%	3.1%	1.9%
2021	88.6%	84.0%	19.8%	3.2%	1.7%
2022	**87.7%**	**87.7%**	**19.3%**	**3.0%**	**1.6%**

Figure 10: Operational Data Source: APR

Figure 10 also shows ash generation and metals recovery per tonne of waste input declining modestly.

Consumable Use

The analysis in this section is calibrated to "Specific Usage" i.e. usage per tonne of waste input.

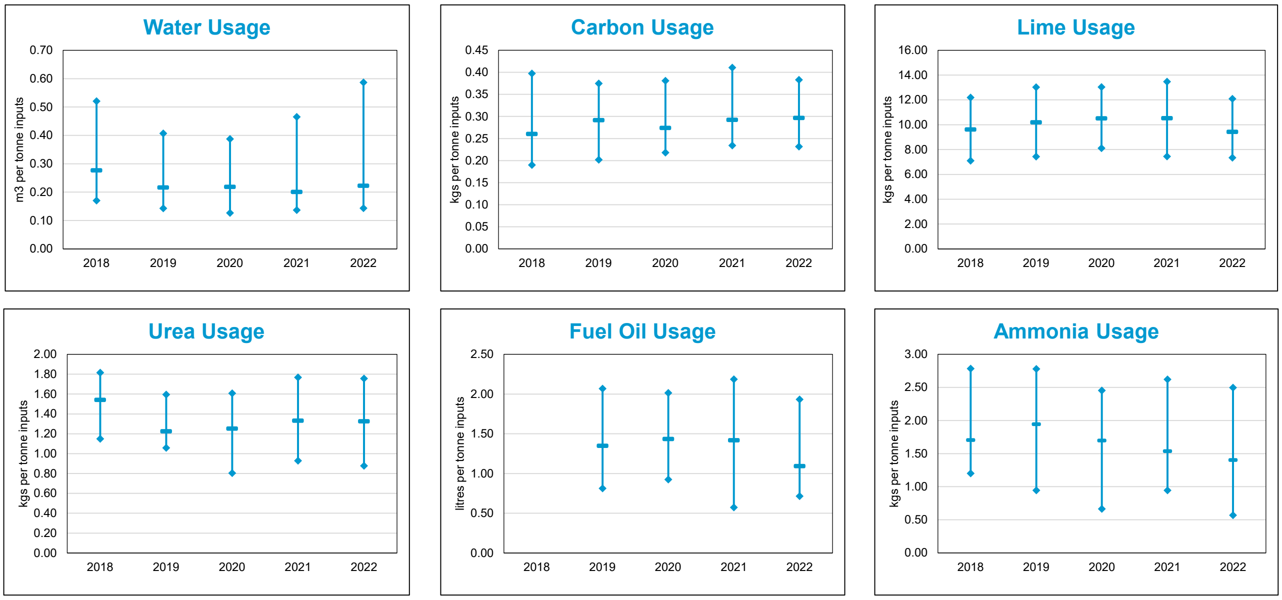


Figure 11: Trends in Consumable Usage (where reported) Source: APR

Note the trend in reduction in the last few years in fuel oil usage and ammonia usage; both perhaps reflecting the significant increase in the cost of these commodities.

R1 Energy Efficiency Status

As at April 2023, based on EA data and information in the APR, 35 fully operational EfWs with a total headline capacity of c. 13.5Mtpa were accredited as R1 ("recovery") operations.

Those EfWs in 2022 which did not have R1 status were classified as "disposal" operations.

Carbon Intensity of EfW (per tonne)

In 2022 the standard APR format in England was expanded to include data reporting with respect to carbon emissions. Of the 47 fully operational EfWs in England, 41 provided returns on carbon emissions.

The key new elements of data relate to total CO_2 emissions per tonne, N_2O emissions per tonne and biogenic/qualifying CO_2 emissions.

As Figure 12 shows, the weighted average reported CO_2 emissions per tonne has fallen over the last 5 years. In some cases this is because previous Pollution Inventory ("PI") returns from EfW operators had been estimates. Whilst the quality of data continues to improve, 2022 returns included one EfW reporting total emissions of 0.30tCO_2 per tonne of Residual Waste input and another 1.44tCO_2 per tonne.

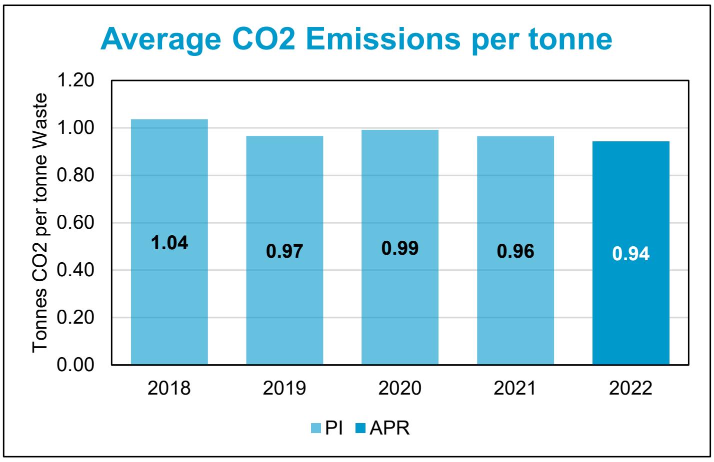


Figure 12: Trends in CO_2 emissions per tonne

In 2022 the average estimated biogenic content of CO_2 emitted from UK EfWs was 52.5% with a range across all facilities of 26.4% to 70.8%. The corresponding 47.5% fossil content was broadly similar to the estimates Tolvik used in past editions of this report.

In 2022 the average reported N_2O emissions per tonne were significantly lower than the average reported in previous years in the PI. This could be due to a greater number of facilities reporting in the APR (the number of returns in the PI was relatively low – and potentially those with higher emissions tended to report). However the reported data varies so further validation of data from future returns may be beneficial.

Excluding any benefits from avoiding landfill, it is estimated that in 2022, on average across the UK fleet, net carbon emissions were 0.308tCO_2e per tonne of waste.

The figures for 2021 have been updated with the latest available PI data and overall in 2022 across the UK EfW fleet net carbon emissions per tonne were down 5.2% on the revised estimated emissions of 0.324tCO_2e per tonne of waste for 2021.

	Per tonne of Input Waste	Unit	Data Source	2020	2021 (revised)	2022
	Average CO_2 emitted	*tCO_2*	*2020/21 PI(3). 2022 APR*	*0.992*	*0.965*	*0.942*
	% Fossil		*2020/21 Estimate, 2022 APR*	*47.9%*	*47.9%*	*47.5%*
Emissions	Fossil CO_2 emitted	tCO_2		0.475	0.463	0.448
	N_2O emitted	tCO_2e	*2020/21 PI(3). 2022 APR*	0.037	0.028	0.014
	Fuel import	tCO_2e	*APR and UK GHG Conversion Factor*	0.007	0.006	0.006
	Total Fossil Emissions	**tCO_2e**		**0.519**	**0.497**	**0.468**
EfW Outputs	*Total Power Export*	*MWh*	*Figure 4*	*0.553*	*0.591*	*0.620*
	Imported Power	*MWh*	*APR*	*(0.007)*	*(0.006)*	*(0.005)*
	Net Power Export	*MWh*		*0.546*	*0.584*	*0.615*
	Heat Export	*MWh*	*Figure 7 text*	*0.117*	*0.124*	*0.115*
	Recycling Benefit	*t*	*Figure 10*	*0.019*	*0.017*	*0.016*
Substitution Benefits	Net Power Export	tCO_2e	*Converted using UK Government GHG Conversion Factors for company reporting for the applicable year(4)*	(0.127)	(0.124)	(0.119)
	Heat Export	tCO_2e		(0.020)	(0.026)	(0.020)
	Recycling Benefit	tCO_2e		(0.039)	(0.022)	(0.021)
	Total Benefits	**tCO_2e**		**(0.186)**	**(0.173)**	**(0.160)**
	Impact (Net Emissions)	**tCO_2e**		**0.333**	**0.324**	**0.308**

Figure 13: Estimated Carbon Emissions per tonne of waste input

5. COMPLIANCE

Compliance in the EfW sector is a combination of operator self-monitoring, reporting to and monitoring by the relevant regulator. Operators advise that measurement uncertainty, limits of detection for small samples and impact of background pollutant levels can all affect the analysis, but the protocols used by the sector should be such that reported results are effectively a worst case.

Across all continuously monitored emissions to air, on average in 2022 emissions were modestly higher at 29.3% of the Emission Limit Value ("ELV") *(2021: 28.4%).* Meanwhile, for periodically sampled emissions, on average emissions were 9.4% of ELV *(2021: 8.6%).*

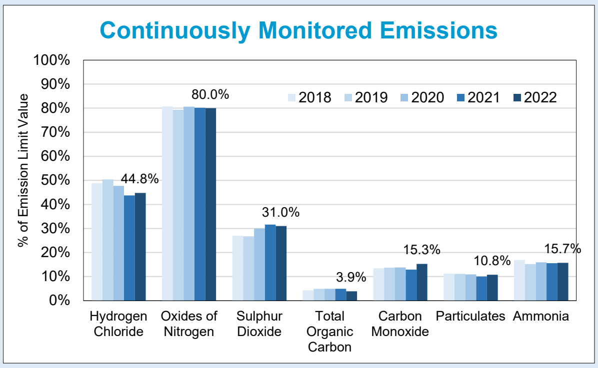


Figure 14: Continuously Monitored to Air Source: APR

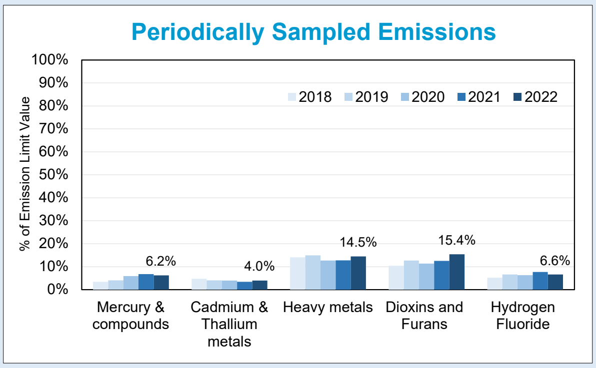


Figure 15: Periodically Sampled to Air Source: APR

Abnormal Operations

Abnormal Operations	Unit	Year	Total	Number of EfWs Reporting	Per EfW
Abnormal Hours	Hours	2020	168	48	3.5
		2021	120	52	2.3
		2022	**168**	**48**	**3.5**
Abnormal Events	Instances	2020	72	48	1.5
		2021	101	51	2.0
		2022	**95**	**54**	**1.8**
Permit Breaches	Instances	2020	148	47	3.1
		2021	139	50	2.8
		2022	**222**	**55**	**4.0**

Figure 16: Abnormal Operations Source: APR

In 2022 nine different EfWs reported more than 10 permit breaches and together accounted for 66% of all breaches. Three EfWs, whose operator went into administration during the year, accounted for 27% of all permit breaches.

6. CAPACITY DEVELOPMENT

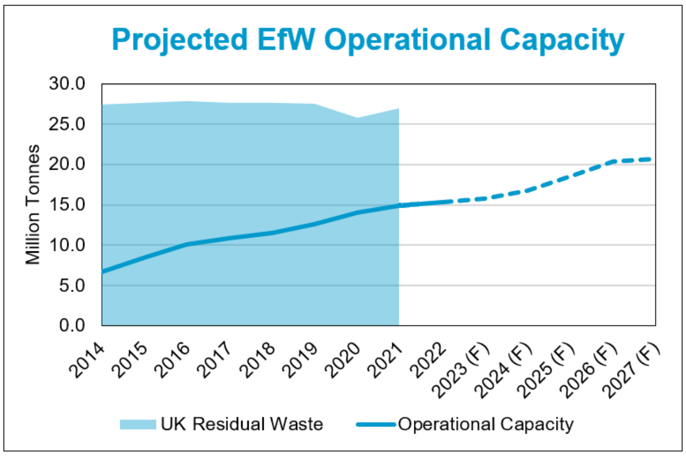


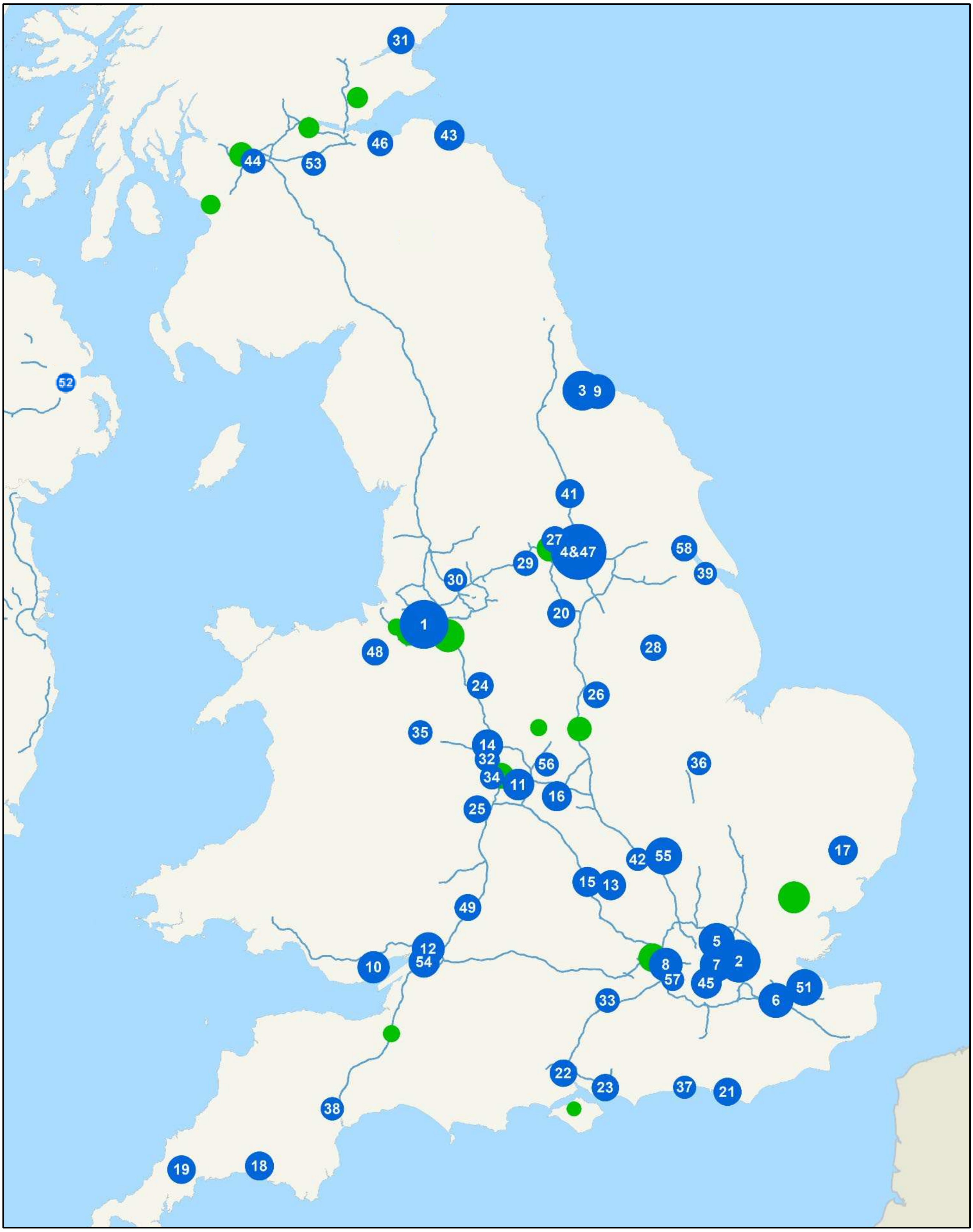
Figure 17: Projected EfW Operational Capacity and Residual Waste Source: APR

Based on EfWs which were operational and in construction as at December 2022, Section 2 identifies the Total Permit Capacity of 23.24Mtpa. Permit Capacity is not suitable for projecting future EfW capacity – as EfWs generally do not operate at this level.

"Operational Capacity" is a more appropriate measure. It is estimated that, based on the level of inputs in 2022 of 88% as discussed in Section 2, by 2027 the UK Operational Capacity will be **20.7Mtpa.**

Figure 17 also shows historic Residual Waste tonnages in the UK.

APPENDIX 1: ENERGY FROM WASTE FACILITIES INCLUDED IN THE REPORT



Key: Location of EfW facilities (ID Numbers refer to page 10, Blue = Operational, Green = In Construction / Commissioning)

Operational EfWs *(i.e. those providing an APR for 2022)*

(P) denotes Public Sector

	Permitted Name	Known As	Location	2022 Operator	Permit Capacity (ktpa)	Processed (ktpa) 2021	Processed (ktpa) 2022
1	Runcorn EfW Facility	Runcorn	Halton	Viridor	1,100	957	930
2	Riverside Resource Recovery Facility	Riverside	Bexley	Cory	850	782	789
3	Tees Valley - EfW Facility	Tees Valley	Stockton-on-Tees	Suez	756	675	675
4	Ferrybridge Multifuel 1	Ferrybridge FM1	Wakefield	enfinium	725	656	621
47	Ferrybridge Multifuel 2	Ferrybridge FM2	Wakefield	enfinium	725	669	633
51	Kemsley Park EfW	Kemsley	Kent	enfinium	657	527	542
5	Edmonton EcoPark	Edmonton	Enfield	LondonEnergy (P)	620	516	489
55	Rookery South ERF	Rookery South	C Bedfordshire	Encyclis	585	170	477
6	Allington Waste Management Facility	Allington	Kent	FCC	560	472	464
9	Wilton 11 EfW	Wilton 11	Middlesborough	Suez	500	459	356
8	Lakeside EfW	Lakeside	Slough	Lakeside	468	382	425
12	Severnside Energy Recovery Centre	Severnside	S.Gloucestershire	Suez	467	402	383
7	SELCHP ERF	SELCHP	Lewisham	Veolia	464	434	428
11	Tyseley ERF	Tyseley	Birmingham	Veolia	441	375	376
10	Cardiff Energy Recovery Facility	Trident Park	Cardiff	Viridor	425	378	360
54	Severn Road RRC	Avonmouth	Bristol	Viridor	377	285	364
45	Beddington Energy Recovery Facility	Beddington Lane	Croydon	Viridor	347	320	334
13	Greatmoor EfW	Greatmoor	Buckinghamshire	FCC	345	303	297
14	Staffordshire ERF	Four Ashes	Staffordshire	Veolia	340	339	340
15	Ardley EfW Facility	Ardley	Oxfordshire	Viridor	326	334	309
43	Dunbar Energy Recovery Facility	Dunbar	East Lothian	Viridor	325	307	314
41	Allerton Waste Recovery Park	Allerton Park	North Yorkshire	Thalia	320	287	284
16	CSWDC Waste to Energy Plant	Coventry	Coventry	CSWDC (P)	315	295	298
58	Hull Energy Works	Energy Works ACT	Hull	BIG	315	35	52
17	SUEZ Suffolk - EfW Facility	Great Blakenham	Suffolk	Suez	295	292	283
18	Devonport EfW CHP Facility	Devonport	Plymouth	MVV	265	243	260
20	Sheffield ERF	Sheffield	Sheffield	Veolia	245	228	224
21	Newhaven ERF	Newhaven	East Sussex	Veolia	242	229	229
19	Cornwall Energy Recovery Centre	Cornwall	Cornwall	Suez	240	242	240
25	EnviRecover EfW Facility	Hartlebury	Worcestershire	Severn	230	216	213
22	Integra South West ERF	Marchwood	Southampton	Veolia	220	210	200
23	Integra South East ERF	Portsmouth	Portsmouth	Veolia	220	200	206
24	Stoke EfW Facility	Hanford	Stoke-on-Trent	MESE/Cobalt	210	185	194
26	Eastcroft EfW Facility	Eastcroft	Nottingham	FCC	200	186	182
48	Parc Adfer ERF	Parc Adfer	Deeside	enfinium	200	192	198
28	Lincolnshire EfW Facility	North Hykeham	Lincolnshire	FCC	190	171	172
46	Millerhill Recycling and ERC	Millerhill	Edinburgh	FCC	190	161	157
49	Javelin Park ERF	Javelin Park	Gloucestershire	Urbaser	190	191	189
27	Leeds Recycling and ERF	Leeds	Leeds	Veolia	190	181	187
31	Baldovie Waste To Energy Plant	Baldovie	Dundee	MVV	175	161	182
44	Glasgow RREC	Glasgow ACT	Glasgow	Viridor	154	99	132
29	Kirklees EfW Facility	Kirklees	Huddersfield	Suez	150	134	120
52	Full Circle Generation EfW	Belfast ACT	Belfast	MESE/Cobalt	144	49	99
56	Baddesley EfW	Baddesley	Warwickshire	Kantor	130	71	74
32	Wolverhampton EfW Facility	Wolverhampton	Wolverhampton	MESE/Cobalt	118	112	110
33	Integra North ERF	Chineham	Hampshire	Veolia	110	105	97
30	Bolton ERF	Bolton	Gtr Manchester	Suez	107	42	65
34	Dudley EfW Facility	Dudley	Dudley	Urbaser Env.	105	97	93
35	Battlefield EfW Facility	Battlefield	Shropshire	Veolia	102	99	94
53	Levenseat Renewable Energy	Levenseat ACT	West Lothian	Levenseat	97	50	55
42	Milton Keynes Waste Recovery Park	Milton Keynes ACT	Milton Keynes	Amey	94	56	56
36	Peterborough EfW Facility	Peterborough	Peterborough	Viridor	85	81	91
37	Enviropower Ltd, Lancing	Lancing	West Sussex	Enviropower	75	67	53
38	Exeter ERF	Exeter	Devon	Paprec/Viridor	60	60	60
39	Integrated Waste Management Facility	NewLincs	NE Lincolnshire	Paprec	56	51	51
57	Charlton Lane Eco Park	Eco Park ACT	Surrey	Suez	55	0	27
40	Energy Recovery Plant	Gremista	Shetland Islands	SHEAP (P)	26	19	23
	Other EfWs					100	167
			Totals		**17,522**	**14,941**	**15,323**

EfWs In Construction / Commissioning

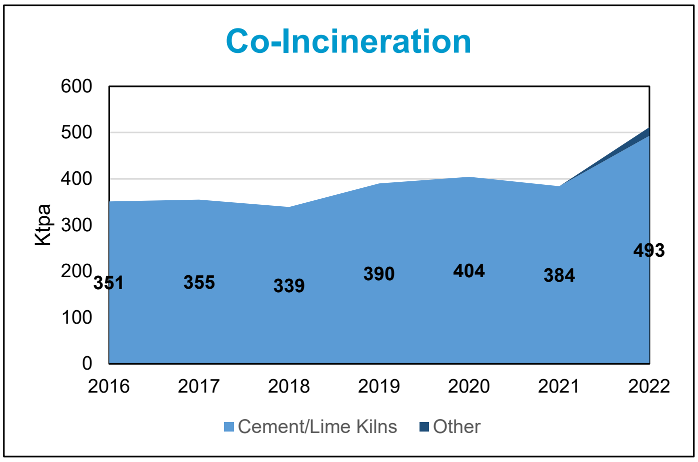
	Permitted Name	Known As	Location	Developer	Financial Close	Capacity (ktpa)
C12	Isle of Wight EfW	Isle of Wight	Isle of Wight	Thalia	Q2 2017	30
C15	Hooton Park Sustainable Energy	Hooton Park ACT	Merseyside	BWSC/Cogen	Q4 2018	266
C16	Bridgwater Resource Recovery	Bridgwater	Somerset	Equitix/Iona	Q4 2018	123
C17	Earls Gate Energy Centre	Earls Gate	Falkirk	Brockwell/Encyclis	Q4 2018	236
C19	Lostock Sustainable Energy Plant	Lostock	Cheshire West	FCC/CIP	Q1 2019	600
C20	NESS EfW Facility	NESS	Aberdeenshire	Indaver/Acconia	Q3 2019	150
C21	Newhurst ERF	Newhurst	Leicestershire	Biffa/Encyclis	Q1 2020	350
C22	Drakelow Energy Generation Facility	Drakelow ACT	Derbyshire	Vital Energi	Q1 2020	170
C24	Protos Refuse Derived Fuel Plant	Protos	Cheshire West	Biffa/Encyclis	Q4 2020	410
C25	Slough Multifuel	Slough	Slough	SSE/CIP	Q4 2020	480
C26	Skelton Grange EfW	Skelton Grange	Leeds	enfinium	Q4 2021	435
C27	Oldhall Energy Recovery Facility	Oldhall	North Ayrshire	Octopus	Q4 2021	186
C28	Kelvin Energy Recovery Facility	Kelvin Way	West Bromwich	enfinium	Q4 2021	400
C29	Westfield Energy Recovery	Westfield	Fife	Viridor/Equitix	Q4 2021	250
C30	*Edmonton EcoPark (Replacement)*	*Edmonton*	*Enfield*	*NLWA (P)*	*Q4 2021*	
C31	Rivenhall IWMF	Rivenhall	Essex	Indaver	Q2 2022	595
C32	South Clyde Energy Centre EfW	South Clyde	Glasgow	Octopus	Q3 2022	385
C33	Riverside Energy Park	Riverside 2	Bexley	Cory	Q4 2022	650
				Total		**5,716**

Note that no additional EfW capacity reached financial close in Q1 2023.

Mothballed / Decommissioned EfW

	Permitted Name	Known As	Location	Last Operator	Date	Processed (ktpa) 2021	Processed (ktpa) 2022
M1	Sinfin IWTC	Sinfin Road ACT	Derby	Renewi	Aug-19	0	0
M2	Hoddesdon EfW Plant	Hoddesdon ACT	Hertfordshire	BIG	Jan-22	36	0
M3	No permit	Newport	Newport	Vogen/Aviva	Apr-23	0	0
				Total		**37**	**0**

Residual Waste Co-Incinerated in the UK



In 2022, 10 cement and lime kilns (out of 11 operational facilities in the UK) accepted a total of 493kt of SRF under EWC code 19 10 12. This was a 28% increase on the tonnage in the previous year reflecting investment activity at several kilns. The total tonnages of other wastes co-incinerated at these facilities were broadly in line with previous years.

In addition, in 2022 two facilities, originally consented for the processing of biomass, accepted 18kt of Refuse Derived Fuel (“RDF”).

APPENDIX 2: DATA SOURCES

APR have either been provided by operators or released under the Freedom of Information Act.

EA Contains public sector information licensed under the Open Government Licence v3.0

NIEA Contains public sector information licensed under the Open Government Licence v3.0

NRW Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights reserved.

SEPA Contains SEPA data © Scottish Environmental Protection Agency and database right 2022. All rights reserved.

(1) http://www.wastedataflow.org/ Q100 for four quarters Apr 2021 – Mar 2022

(2) Digest of UK Energy Statistics ("DUKES") 2022 Table 5.5 https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2022

(3) 2021 Pollution Inventory Dataset https://environment.data.gov.uk/portalstg/home/item.html?id=7ddf166a9b41444ebdca1baec1eede38

(4) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

APPENDIX 3: GLOSSARY

ACT	Advanced Conversion Technology
APCr	Air Pollution Control residue
APR	Annual Performance Reports
C&I	Commercial and Industrial Waste
EA	Environment Agency
EfW(s)	Energy from Waste (facilities)
ELV	Emission Limit Value
EWC	European Waste Catalogue
IBA	Incinerator Bottom Ash
Kt (pa)	'000s tonnes (per annum)
LACW	Local Authority Collected Waste
Mt (pa)	Million tonnes (per annum)
NCV	Net Calorific Value
NIEA	Northern Ireland Environment Agency
NRW	Natural Resources Wales
PI	Pollution Inventory
RDF	Refuse Derived Fuel
Residual Waste	Solid, non-hazardous, combustible waste which remains after recycling either treated (in the form of RDF or SRF) or untreated (as "black bag" waste).
SEPA	Scottish Environmental Protection Agency
SRF	Solid Recovered Fuel

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[redacted]

Sally Freshwater

This report has been written by Tolvik Consulting Ltd on an independent basis using our knowledge of the current UK waste market and with reference inter alia to various published reports and studies and to our own in-house analysis.

This report has been prepared by Tolvik Consulting Ltd with all reasonable skill, care, and diligence as applicable. Whilst we have taken reasonable precautions to check the accuracy of information contained herein, we do not warrant the accuracy of information provided.

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