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Analytical annex to the UK Emissions Trading Scheme (ETS) scope expansion: waste

Annex to the joint consultation of the UK Government, the Scottish Government, the Welsh Government and the Department of Agriculture, Environment and Rural Affairs for Northern Ireland

May 2024

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Contents

This annex covers proposals made in the UK Emissions Trading Scheme: scope expansion: waste consultation.

Analytical annex

This annex provides background to the UK Emissions Trading Scheme (UK ETS) and the waste sector, to which we are consulting to expand the scheme. It gives an overview of the factors influencing the impacts of the consultation options and considerations. It is not intended to reflect the full evidence base on which decisions will be taken, nor the full evidence base on which proposals have been developed to date. It is not a formal impact assessment. We will seek to gain further evidence to inform decisions from this consultation.

In the Authority Response to consultation, the UK ETS Authority, hereafter 'the Authority', made up of the UK Government, Scottish Government, Welsh Government and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland will set out impacts of combined proposals, considering the interaction of proposed options and overall scheme impacts. Where we identify specific risks of options, we will set out the actions we will take to appropriately mitigate any such impacts where it is necessary to do so.

Section 1: UK ETS overview

Characteristics of the UK ETS

To consider the context of scope expansion, this section sets out characteristics of the existing UK ETS.

Scope/size of market

The UK ETS represents approximately 25% of UK territorial emissions based on the latest 2022 data[1]. The scheme covers the UK's power sector, energy-intensive industry, and emissions from domestic flights, flights from the UK to the European Economic Area (EEA), flights from GB to Switzerland, and flights between the UK and Gibraltar.

There were 678 installations and 369 aircraft operators in the UK ETS main scheme in 2022.[2] In addition, the scheme regulates 250 installations under the Hospital and Small Emitter (HSE) opt out, as well as 110 Ultra-Small Emitters (USE).[3] Five UK installations – electricity generators in Northern Ireland – remain in the EU ETS under the terms of the Windsor Framework.

The UK ETS covers carbon dioxide emissions for all activities with the addition of perfluorocarbons for aluminium production and nitrous oxide produced in the production of nitric, adipic, glyoxal and glyoxylic acid.

The Authority confirmed in its 2023 Authority Response[4] that it intends to expand the scope of the scheme to waste incineration by 2028, preceded by a two-year phasing-in period. This would mean including the sector in the UK ETS and capping a greater proportion of UK emissions to further contribute to delivering net zero and UK carbon reduction targets at lowest cost for industry. Further details are subject to consultation.

Emissions

In 2022, UK ETS-covered emissions amounted to 111 million tonnes of CO2 equivalent (MtCO2e) – of which stationary installations accounted for 103 MtCO2e and aircraft operators 8 MtCO2e. This represents a year-on-year increase in UK ETS emissions of 3 MtCO2e since

[1] DESNZ analysis based on DESNZ (2023), 'Provisional UK greenhouse gas emissions national statistics 2022', https://www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2022
[2] Based on operators with recorded 2022 emissions in UK ETS Emissions and Surrenders report published in May 2023: https://reports.view-emissions-trading-registry.service.gov.uk/ets-reports.html
[3] See published list Hospital and Small Emitter list here: https://www.gov.uk/guidance/opt-out-of-the-uk-ets-if-your-installation-is-a-hospital-or-small-emitter; See published list of Ultra-Small Emitters here: https://www.gov.uk/guidance/opt-out-of-the-uk-ets-if-your-installation-is-an-ultra-small-emitter
[4] DESNZ, Welsh Government, The Scottish Government, and Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (2023), 'Developing the UK Emissions Trading Scheme: main response', https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets

2021. This was driven by an increase in aviation activity following the end of the COVID-19 pandemic. This compares to total UK territorial emissions of 417 MtCO2e in 2022.

Cap

In technical terms, the cap refers to the legal limit on the number of UK Allowances (UKAs) that can be created in each year. There is similarly a cap for the trading period (1 January 2020 – 31 December 2030). Whilst created as a form of a cap on emissions, these allowances will not automatically be surrendered for the year they are created since they can be banked for surrender in subsequent years or borrowed ahead of time. The cap does imply a limit on the emissions in scope of the scheme in the longer term, however, thereby acting as an abatement incentive.

The base annual cap level, before accounting for hospital and small emitters:

- in 2021 was 156 MtCO2e,
- in 2022 cap was 151 MtCO2e,
- in 2023 was 147 MtCO2e,
- in 2024 will be 92 MtCO2e,

In the Authority Response 2023[5], the Authority committed to reduce the annual base cap to approximately 49 MtCO2e in 2030 which means decreasing the overall Phase I, 2021-2030, base cap from 1,366MtCO2e to 936MtCO2e. This in line with the Carbon Budget Delivery Plan from March 2023, reflecting the full delivery of decarbonisation policies across sectors covered by the ETS such that the UK meets its carbon budgets (CBs) and nationally determined contribution (NDC) in 2030.

[5] DESNZ, Welsh Government, The Scottish Government, and Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (2023), 'Developing the UK Emissions Trading Scheme: main response', https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets

Section 2: Energy from waste and waste incineration

As noted in the consultation, the Authority is seeking stakeholder views on expanding the scheme to cover energy from waste (EfW), waste incineration without energy recovery and other forms of energy recovery from waste.

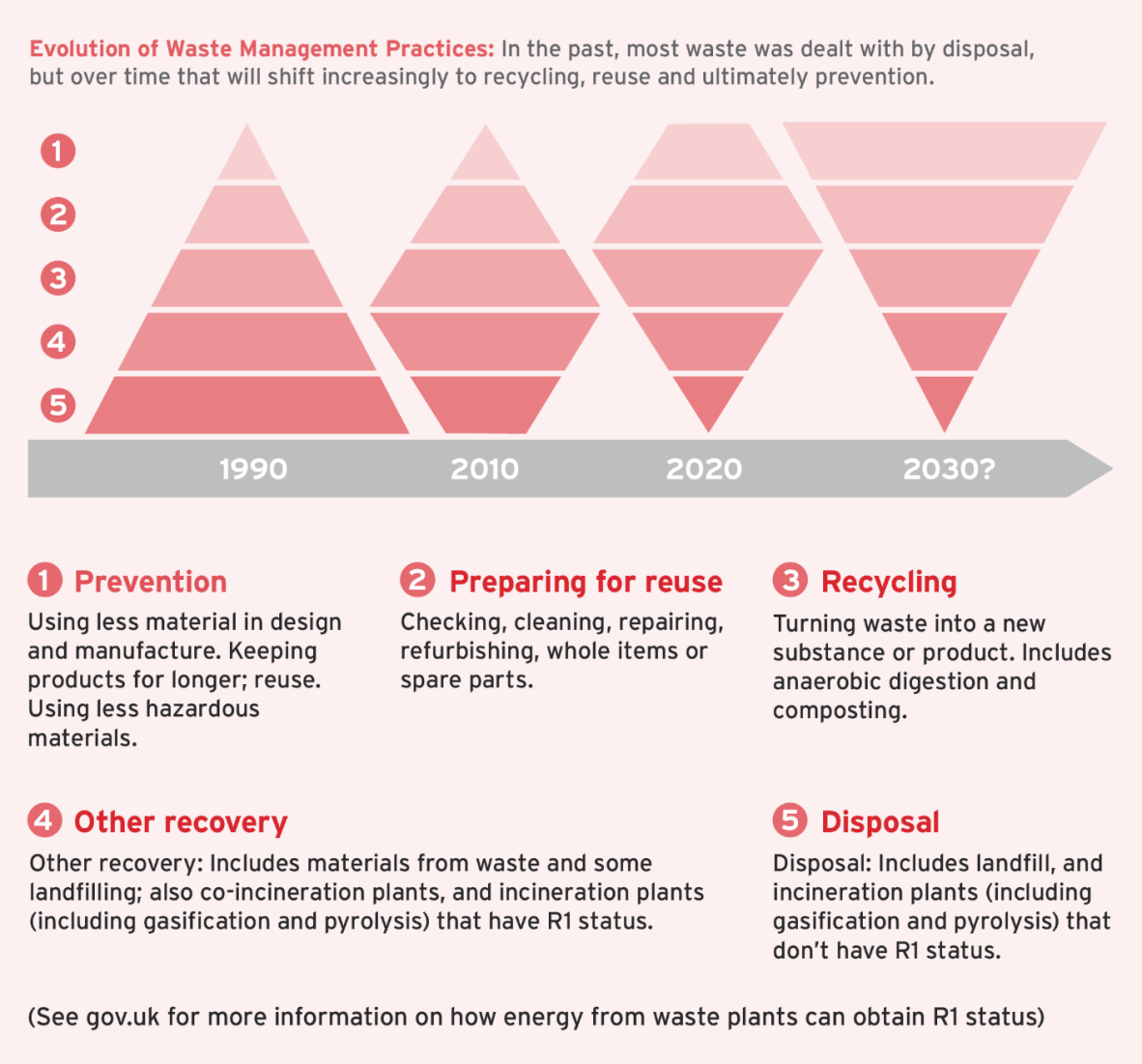
The purpose of this section of the analytical annex is to provide an overview of the analysis underpinning the energy from waste incineration part of the consultation. Where possible, we explain the approach to generating policy options and assessment for proposals outlined at consultation. It is not intended to reflect the full evidence base on which decisions will be taken, nor all evidence on which proposals were developed, and we seek further evidence as part of this consultation.

In the Authority Response to this consultation, the Authority will set out impacts of combined proposals, considering the interaction of proposed options and overall scheme impacts, including regional and sectoral impacts where feasible and appropriate. Where we identify specific risks of options, we will set out the actions we will take to appropriately mitigate any such impacts where it is necessary to do so. More information on this can be found in section 6 of this annex.

Overview

The waste regulations, introduced in varying forms across the four nations of the UK in 2011, provide for a “waste hierarchy”. This hierarchy sets out the order of priority to apply to products and waste, giving top priority to waste prevention. When waste is created, it gives priority to preparing it for re-use, then recycling, then energy recovery, and lastly disposal (such as landfill and incineration where there is no energy recovery). The hierarchy is illustrated in figure 1 – note it is illustrative only and the changing structure of waste management should not be seen as indicative of government policy or of the true evolution of the sector.

Figure 1: The waste hierarchy[6]



EfW is a term used to describe incineration processes that involve burning waste at high temperatures (>850°C) and where energy from this process is recovered in the form of heat or electricity. In the waste hierarchy EfW is categorised as other recovery, whilst waste incineration without energy recovery is regarded as disposal. This is because it is a less efficient process given none of the potential energy byproducts are extracted from the waste.

Rationale

There are negative externalities associated with production and management of waste due to the resulting emissions. In the absence of government policy, these would not be considered in the price mechanism, which would largely incorporate costs to the operator. By having operators of EfW and waste incineration without recovery facilities purchase and surrender UKAs to cover their emissions, UK ETS expansion will ensure that these costs to society of emitting carbon are incorporated into the costs of waste incineration. It will also alter the

[6] Defra (2021), 'Waste Management Plan for England 2021', https://www.gov.uk/government/publications/waste-management-plan-for-england-2021

relative costs of the waste hierarchy, to further make recycling, reuse, and prevention relatively cheaper options compared to EfW and waste incineration – further incentivising these preferable forms of waste management. In combination with other government policies designed to change the composition of the waste stream, such as Extended Producer Responsibility for packaging (pEPR), we expect that UK ETS expansion will incentivise decarbonisation in the waste sector in the same way that landfill tax incentivised the diversion of waste from landfill.

Scope of the scheme expansion

Coverage

As set out in the consultation, we are committed to ensuring that any expansion of the UK ETS to the waste management sector maintains a level playing field across different technologies, whilst supporting innovation and investment in more sustainable alternatives.

For that reason, the regulated activities we intend to include in the ETS in this sector are the incineration and combustion of waste, and other energy recovery from waste. This includes Advanced Thermal Treatment, Advanced Conversion Technology[7] and other related advanced waste treatment activities. It also includes waste-to-fuel activities, including the production of sustainable aviation fuel (SAF). Our position is to include the direct emissions associated with the production of these fuels, but not further life-cycle emissions from their outputs. As some of these technologies are still emerging and are not yet proven at large scale, the Authority will continue to work with stakeholders to understand the implications of this position and will review it if necessary. Only fossil CO_2 emissions will be in scope of these proposals, which we define as emissions associated with the incineration of fossil materials and not those from the incineration of biogenic materials in the residual waste, aligning with the current UK ETS scope. We define fossil and biogenic material as:

- Fossil – material in the waste stream that has come from sources such as coal, oil and natural gas that have been locked underground for millions of years. Examples include plastics made from oil.

- Biogenic – material in the waste stream that has come from biological sources and has grown recently (in the last hundred or so years). Examples include food, paper, garden waste, wood.

The EfW sector is the largest component of the proposed additional scope of the UK ETS. Our analysis indicates that it includes 55 operational facilities, with a further 16 in construction. In terms of number of facilities, the waste incineration without recovery sector is significantly smaller with 21 facilities which includes installations that manage clinical and hazardous waste.

[7] Advanced Thermal Treatment and Advanced Conversion Technology cover a range of technologies, but mostly refer to installations that use pyrolysis and gasification to recover energy from residual waste.

The capacity at installations varies significantly, especially amongst EfW facilities, as shown in table 1.

Table 1: Number of UK EfW and incineration sites by capacity, tonnage of waste per annum, 2022.[8]

Capacity (tonnes p.a.)	EfW facilities	Incinerators without recovery
≤ 25,000 tonnes p.a.	1	18
> 25,000 tCO2e to ≤ 250,000.	29	3
>250,000 to ≤ 500,000	16	0
>500,000	9	0

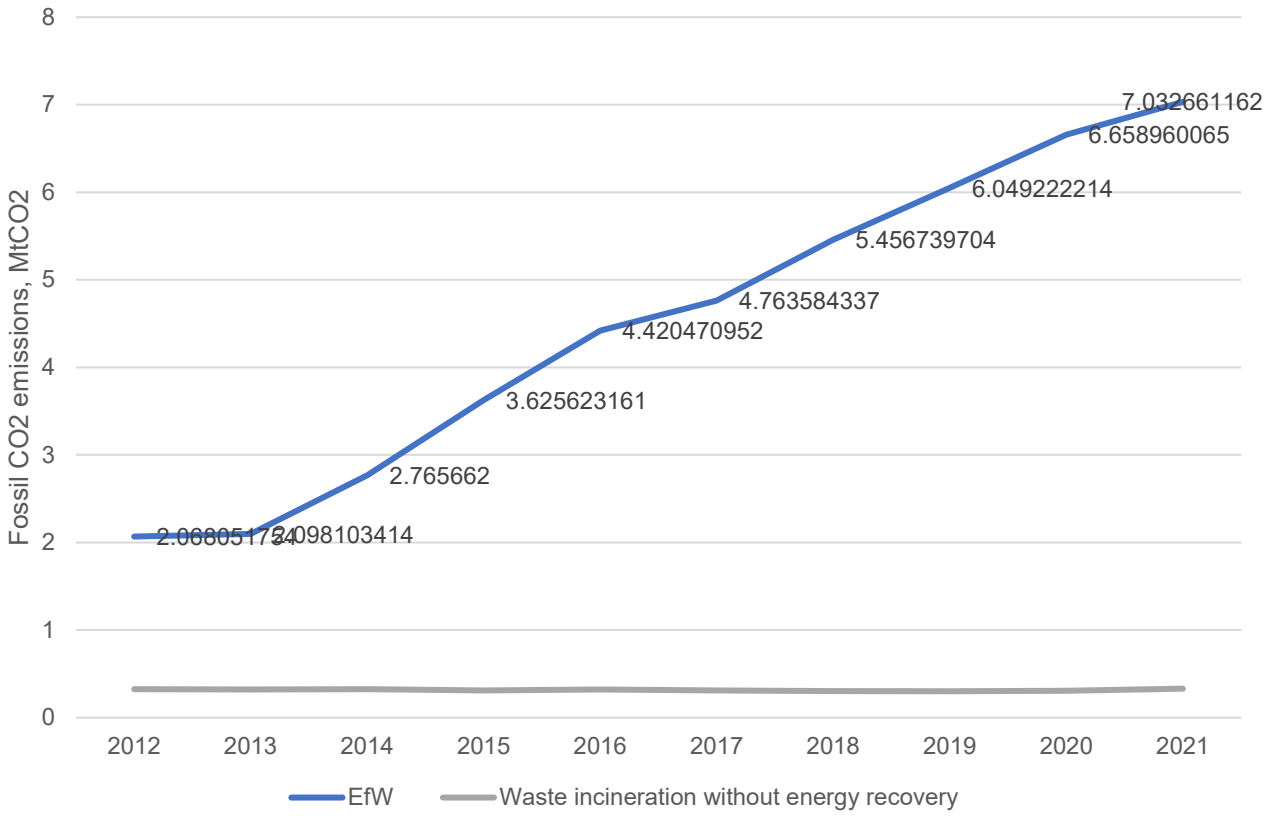
Table 1 shows that incinerators without recovery tend to have a much smaller capacity than EfW facilities. Eighteen of the 21 incinerators without recovery have a capacity below 25,000 tonnes p.a. and only three between 25,000 and 250,000 tonnes p.a. In contrast, there are no EfW facilities with a capacity below 25,000 tonnes p.a., with most installations having a capacity between 25,000 and 250,000 tonnes p.a. There are also several larger capacity EfW sites, with nine having a capacity over 500,000 tonnes p.a. The average capacity of an EfW plant in the UK in 2022 was 317,000 tonnes p.a., whilst incinerators had an average of 16,000 tonnes p.a.

The Authority is also proposing to include advanced technologies in the UK ETS, including ATT and ACT, which are part of the overall EfW sector. These processes create fuels in the form of gases or liquids through gasification or pyrolysis. These outputs may be used to generate electricity or heat or converted into fuels for use in the transport sector. Gasification converts waste into gas using high temperatures in an environment that controls the quantity of oxygen and steam in the reaction. Pyrolysis involves a high-temperature reaction in the absence of oxygen which facilitates the thermal decomposition of waste.

In the UK there are currently nine operational ATT and ACT sites, with a further two under construction. Their capacities vary from over 100,000 tonnes p.a. to under 25,000 tonnes p.a., with an average capacity of 98,000 tonnes p.a.

[8] Based on internal DESNZ analysis.

Figure 2: EfW and waste incineration fossil CO2 emissions, 2012-21

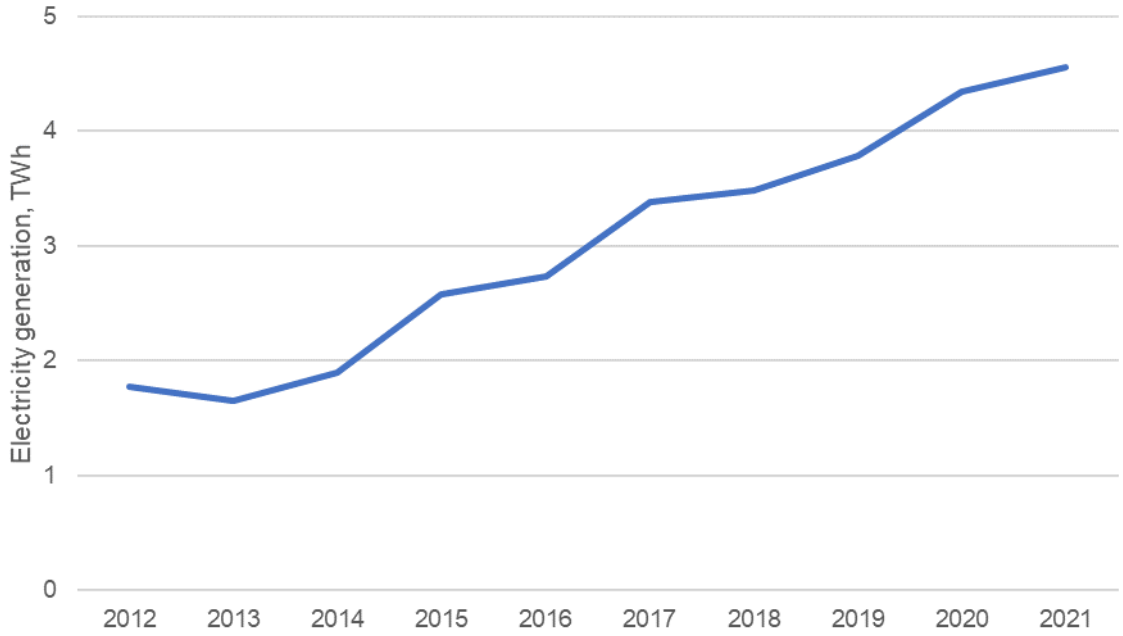


Source: Final UK greenhouse gas emissions national statistics: 1990 to 2021[9]

As Figure 2 illustrates, EfW emissions have risen year on year since 2012, driven by increasing plant deployment and the diversion of residual waste from landfill to EfW (the results of which on emissions are illustrated in figure 5). This has meant that total EfW capacity has steadily increased over the same period, allowing more waste to be combusted to generate power and heat. Fossil emissions from waste incineration without recovery has remained broadly flat over the same timeframe. Note that Figure 2 includes fossil carbon dioxide only, since this is the proposed scope of the UK ETS.

[9] DESNZ (2023), 'Final UK greenhouse gas emissions national statistics: 1990 to 2021', https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021

Figure 33: EfW Electricity Generation TWh by Technology, 2012-21



Source: Digest of UK Energy Statistics (DUKES): renewable sources of energy[10]

Figure 3 illustrates that electricity generation by EfW plants has increased year on year since 2013, which aligns to the increase in emissions (Figure 2) and is again primarily driven by increasing deployment of EfW facilities and the substitution of landfill for EfW. Between 2012 and 2021 electricity generation increased from 1.8TWh to 4.6TWh.

Hospital and Small Emitter (HSE) and Ultra Small Emitter (USE) status

The consultation proposes that operators that produce between 2,500 and 25,000 tonnes of carbon dioxide per year through the incineration of fossil material will be eligible to apply for the HSE status, with these plants receiving emissions reduction targets rather than having obligations to surrender UKAs. Our provisional analysis suggests that around 6 EfW plants, 10 incinerators, and 4 ATT/ACT plants will have this level of emissions in 2028, when we expect that waste incineration facilities will be required to surrender sufficient UKAs to cover their emissions. It is important to note that these numbers may change depending on the tonnage of waste processed and the commissioning of new or decommissioning of old plants.

The consultation proposes that operators producing less than 2,500 tonnes of fossil carbon dioxide per year will be eligible to apply for USE status, meaning they will monitor and report their emissions but are not subject to UKA purchase and surrender obligations. Our provisional analysis suggests that around 10 plants are likely to be eligible for this status in 2028 – but we will update this analysis to confirm the number before the Authority Response.

[10] DESNZ (2023), 'Digest of UK Energy Statistics (DUKES): renewable sources of energy', https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

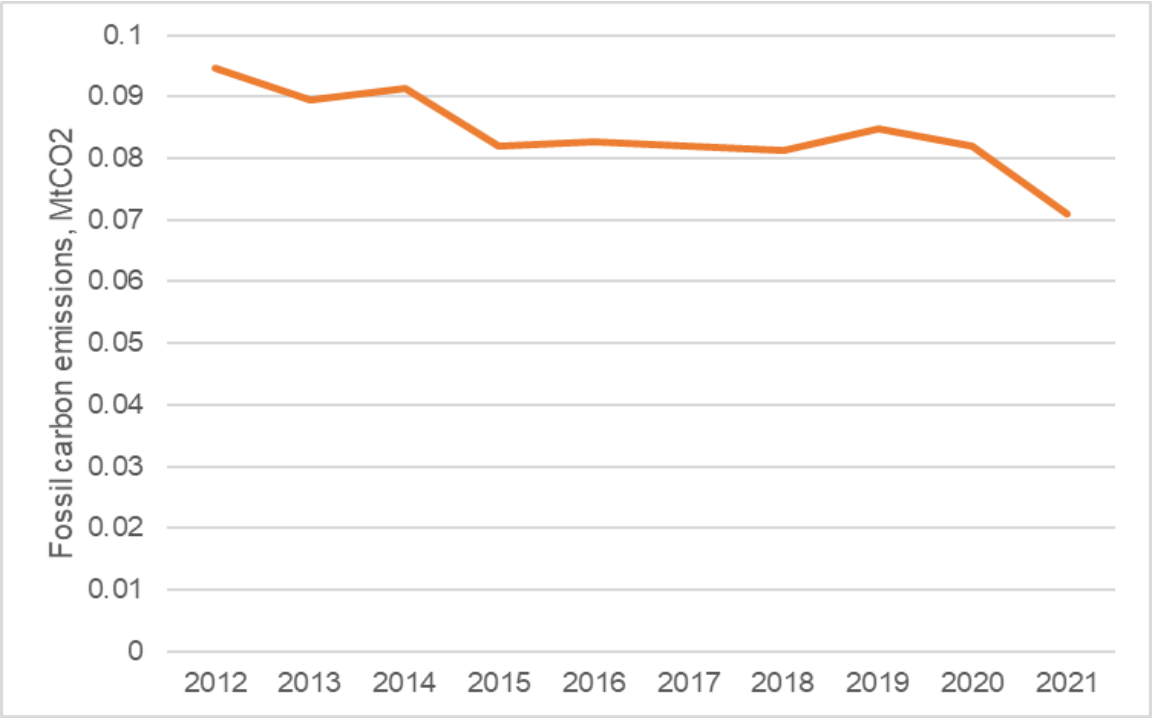
These proposed status thresholds differ from those for other combustion facilities in the UK ETS because they do not include a thermal input threshold. This is because, waste incineration plants' thermal inputs vary based on their heterogenous waste inputs, unlike for plants already in scope of the scheme that have consistent fuels. Given emissions also vary based on waste inputs, we think that an emissions threshold alone will be sufficient, but welcome stakeholder views on this.

Participating in the scheme

Exemptions

The Authority is not proposing any exemptions from the UK ETS for EfW and waste incineration, including for facilities under the usual 20MW thermal input threshold. We expect that all specialist clinical waste facilities would be eligible for either HSE or USE status so would not be subject to UKA purchase and surrender obligations. Some but not all hazardous waste facilities are likely to be eligible for HSE or USE status.

Figure 44: clinical waste fossil CO2 emissions, 2012-21



Source: Final UK greenhouse gas emissions national statistics: 1990 to 2021[11]

Figure 4 shows that clinical waste emissions are very small when compared to the overall waste sector, having declined slightly from their level of 0.1MtCO2 fossil emissions per year in

[11] DESNZ (2023), 'Final UK greenhouse gas emissions national statistics: 1990 to 2021', https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021

2012, reaching 0.07MtCO2 in 2021, this representing about 1% of the waste emissions that will be in scope of the UK ETS from 2028.

Monitoring, reporting, and verification (MRV)

The following section describes the MRV methods that EfW and waste incineration sites could use to identify the biogenic-fossil split of CO2 emissions and are outlined in the consultation document. More information on these methods can be found in Ricardo's research, published alongside this consultation.

Emission factors

This would be the simplest approach to MRV and would involve the use of emission factors to determine emission levels at the installation. The exact emission factors used would need to be developed. The sector has a variable feedstock composition and, therefore, the emission factor in real terms would differ over a given period. Further analysis on how the emission factors would be developed and how granular these emission factors would be, will be carried out if this is a preferred option following the consultation.

Manual sorting method

The manual sorting method samples waste at regular intervals to be analysed to identify its composition according to a sampling strategy. The samples would be sorted into different fractions, e.g. wood and plastics, and then sieved to remove particles smaller than 10 mm (classified as fines), before being heated to 105°C until a constant mass is obtained. The dried fractions are then aggregated into one of three categories: biomass, non-biomass or inert. Each category is then weighed to understand the composition of the waste.

Selective dissolution method

The selective dissolution method places a waste sample in a concentrated solution of sulphuric acid and hydrogen peroxide, which dissolves biomass materials but not fossil materials. By comparing the quantity of carbon in the initial sample and post dissolution, the quantity of biomass and fossil material can be derived. A limitation of the method is that some fossil materials will dissolve in the sulphuric acid hydrogen peroxide mixture, e.g. coal, whilst some biomass materials will not e.g. charcoal.

Carbon-14

The Carbon 14 (14C) method is an analytical method that can accurately determine the age of organic materials. The biogenic-fossil fuel content of the waste can be determined using the half-life of 14C. Most of the carbon in the environment is 12C (~99%) and 13C (~1%), but there are also trace amounts of 14C. 14C has a half-life of 5,780 years, therefore a fossil fuel material will contain close to zero 14C, whilst biomass materials will contain trace levels of 14C.

Balance method

The balance method uses a mathematical model derived from first principles which establishes a set of mass and energy balances describing the waste incineration system. Input to the model consists of real-time operational data, as well as values from literature. The most widely deployed commercial example of this method is BIOMA. This method typically involves the use of a software package that is fed live data regarding facility operation and for emissions data is effectively a Predictive Emission Monitoring System (PEMS).

Impacts of the scheme and reducing adverse risks

Diversion to landfill and waste export

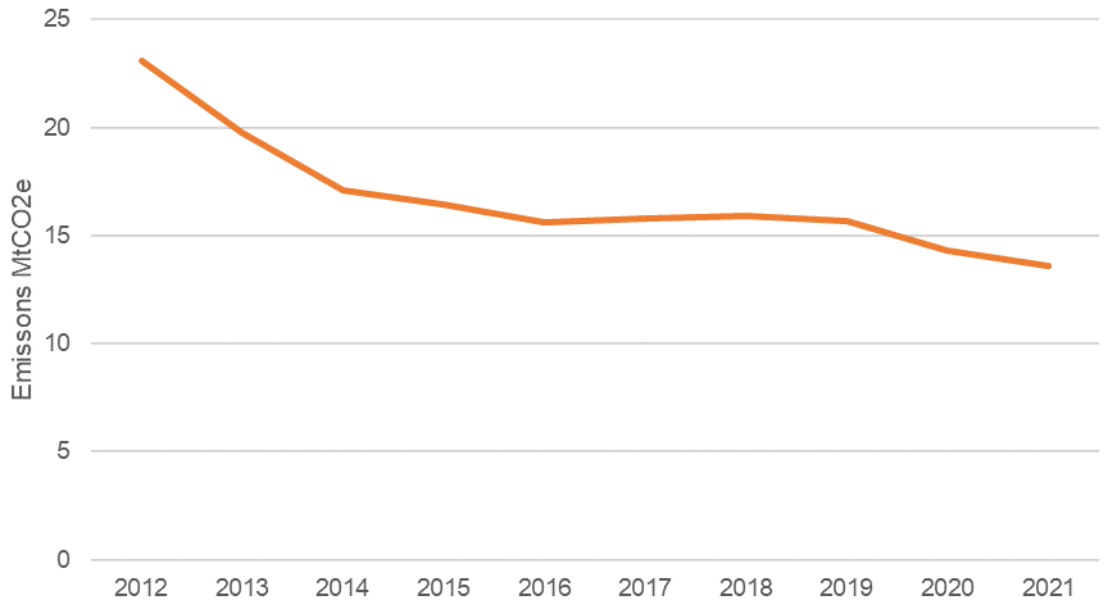
In this section we will examine the risks associated with substitution of EfW for either landfill or the export of refuse derived fuel (RDF) and solid recovered fuel (SRF), where domestic EfW is substituted for further processing of waste to create RDF and SRF which is then exported, moving emissions abroad.

Landfill

The landfilling of waste is lower in the waste hierarchy than energy recovery and is generally associated with worse environmental outcomes than EfW, although this depends on the composition of the waste[12,13]. For this reason, the Authority wants to ensure that expansion of the UK ETS to waste incineration does not lead to the substitution of waste incineration for landfill.

[12] https://www.zerowastescotland.org.uk/resources/climate-change-impact-burning-municipal-waste-scotland
[13] Scottish Government (2022), 'Stop, Sort, Burn, Bury – incineration in the waste hierarchy: independent review',

Figure 55: UK landfill emissions, 2012-21



Source: Final UK greenhouse gas emissions national statistics: 1990 to 2021[14]

Figure 5 illustrates that landfill emissions in the UK between 2012 and 2021 have been falling, from 23MtCO2e in 2012 to 13MtCOe in 2021, a decrease of just over 40%. This in part has been caused by the increase in waste going to EfW facilities, leading to an increase in emissions for the EfW sector (Figure 2). The increase in uptake of landfill gas capture technologies has also contributed to reducing landfill emissions.

Expanding the UK ETS to the waste incineration sector will mean operators will purchase UKAs to cover their emissions and experience increased administrative costs, the costs of which are likely to be passed on through increased gate fees. The median 2022 UK gate fee for waste sent to EfW facilities was £103 per tonne (with a range of £45 to £175 per tonne) [15]. In comparison, the median 2022 UK gate fee (excluding Landfill Tax) for non-hazardous waste sent to landfill was £28 per tonne (for a range of £11 to £87 per tonne)[16], landfill taxes applied on top of this gate fee were £98.60 per tonne for standard rated waste (which broadly applies to active, combustible types of waste) in all nations [17]. If the gate fees for EfW and incinerators without recovery were to rise above the combination of landfill tax and landfill gate fee, then we may see the substitution of waste incineration for landfill. We expect this risk to be lowered by the fact that many LA customers of EfW have minimum tonnage clauses in their contracts so such substitution will not be possible in some cases. We also expect some policies to mitigate

[14] DESNZ (2023), 'Final UK greenhouse gas emissions national statistics: 1990 to 2021', https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021
[15] The Waste and Resources Action Programme (WRAP) Gate Fees Report 2022-2023 https://wrap.org.uk/resources/report/gate-fees-report-2022-23
[16] The Waste and Resources Action Programme (WRAP) Gate Fees Report 2022-2023 https://wrap.org.uk/resources/report/gate-fees-report-2022-23
[17] HMRC Landfill Tax rates https://www.gov.uk/government/publications/rates-and-allowances-landfill-tax/landfill-tax-rates-from-1-april-2013

this risk, such as the ban on landfilling biodegradable municipal waste (BMW) coming into force in Scotland from 31 December 2025 and the near elimination of BMW to landfill in England by 2028.

Landfill risk mitigations outlined in the consultation:
The potential role of landfill taxes: HMT will continue to keep Landfill Tax rates in England and Northern Ireland under review to ensure they continue to support the waste hierarchy by incentivising waste to be diverted away from landfill. **The potential inclusion of landfill emissions in the UK ETS**: expand the scope of the UK ETS to include landfill emissions following further consultation.

In England and Northern Ireland, HMT keep landfill tax rates under review to ensure that they continue to support the waste hierarchy, by incentivising waste to be diverted away from landfill[18]. Rates are set by the Chancellor in line with the fiscal event timetable, following consideration of a range of factors, including environmental objectives, impacts on business and local authorities, and waste crime. Scotland and Wales have similar devolved taxes, the Scottish Landfill Tax[19] and Landfill Disposals Tax in Wales[20], which are broadly similar in their objectives, design and structure.

Landfill taxes help divert waste away from landfill towards more sustainable alternatives, including EfW, by increasing the relative price of sending waste to landfill. They typically comprise a large proportion of the cost of sending waste to landfill. A range of factors are considered when setting rates of landfill taxes, including environmental objectives, impacts on businesses and local authorities, risk of unintended consequences such as waste crime, and wider public finances. From 2028, a key consideration will be the impact of carbon pricing on EfW and incineration without recovery, and its relative cost to landfill.

Landfill Tax rates are set annually, whereas the UK ETS carbon price fluctuates. There is therefore a risk that forecast carbon prices used to inform future decisions on rates of landfill taxes do not reflect actual in-year changes.

In addition, there are a range of wider factors considered when setting rates of landfill taxes which includes, but are not limited to, the fiscal and macro-economic outlook, impacts on local authorities and businesses and impacts on incentives to commit waste crime.

[18] HMRC (2023), 'a general guide to Landfill Tax', https://www.gov.uk/government/publications/excise-notice-lft1-a-general-guide-to-landfill-tax/excise-notice-lft1-a-general-guide-to-landfill-tax#section3

[19] Scottish Government, 'Scottish Landfill Tax', https://www.gov.scot/policies/taxes/landfill-tax/#:~:text=Scottish%20Landfill%20Tax%20(SLfT)%20is,about%20and%20sets%20SLfT%20rates.

[20] Welsh Government, 'Landfill Disposals Tax rates', https://www.gov.wales/landfill-disposals-tax-rates

Any increase in landfill taxes due to the consideration of UKA prices will lead to increased costs of waste disposal. This could have a secondary impact on business or local authorities who could see an increase in the cost of disposal of waste landfilled, despite this being outside the scope of the proposed expansion of the UK ETS. Such an impact is likely to vary significantly across local authorities given the significant difference in the proportion of their waste that is landfilled.

Expanding the scope of the UK ETS to include landfill emissions would mean that both the waste incineration sector and landfill sector would both be exposed to the UK ETS carbon price. This would reduce the risk of waste disposal via landfill activities becoming less expensive than waste incineration facilities, due to the sector's inclusion in the UK ETS, and maintain the waste hierarchy.

The consultation invites stakeholder views to help understand if expansion of the UK ETS to landfill emissions should be explored through further consultation. If stakeholder views indicated it was a viable option, this work would include significant further analysis on the cap adjustment level, market impacts, scope, any potential exemptions and impacts of the policy to be completed before further consultation. Such an expansion of the UK ETS would also come with challenges, for example the fact that most landfill emissions are biogenic, which is not currently covered by other parts of the UK ETS.

Refuse derived fuel (RDF) and solid recovered fuel (SRF) export

Residual waste can also be exported in the form of RDF and SRF to generate energy in power facilities or cement kilns abroad. This may result in emissions in other countries increasing and therefore no overall reduction in global emissions, subject to decarbonisation policies in these countries. Like the risks associated with substitution of waste incineration for landfill, if the price of processing waste to RDF and SRF and exporting this for energy recovery overseas became lower than that of incineration in the UK then we may see substitution of waste incineration for RDF or SRF export. Again, this risk will be limited by contractual arrangements between waste incinerators and their customers. The median 2022 UK gate fee for waste sent to EfW facilities was £103 per tonne (with a range of £45 to £175 per tonne) [21]. For comparison, the approximate average cost of exporting RDF in 2022, including transport and importer gate fees but excluding wrapping costs, was £104[22]. Wrapping typically costs an additional £15 per tonne. If the gate fees for EfW and incineration without recovery were to rise above the cost of exporting RDF or SRF, then we may see the substitution of waste incineration for export.

[21] The Waste and Resources Action Programme (WRAP) Gate Fees Report 2022-2023 https://wrap.org.uk/resources/report/gate-fees-report-2022-23

[22] LetsRecycle (2022), 'EfW, landfill, RDF 2022 gate fees', https://www.letsrecycle.com/prices/efw-landfill-rdf/efw-landfill-rdf-2022-gate-fees/

Table 2: RDF and SRF exported from UK, 2022[23]

Waste export type	Quantity exported (tonnes)
Solid recovered fuel (SRF)	1,372,000
Refuse derived fuel (RDF)	295,000

As shown in table 2, our analysis of the latest data from the Environment Agency and devolved governments shows that just under 1.4Mt of RDF and 0.3Mt of SRF was exported from the UK in 2022, suggesting there is a risk of RDF and SRF export. The Authority is therefore exploring options to mitigate this risk.

Waste export mitigation measures explored:
RDF/SRF export tax: in response to the 2022 call for evidence, some stakeholders suggested that levying a tax on RDF and SRF exports could be a suitable option to mitigate the risk of waste export substitution. **Ban on RDF/SRF exports:** stakeholders also suggested that an outright ban on RDF and SRF exports could be a suitable option. **Permitting/license systems**: use the permitting/licensing systems as mechanism to influence the flow of RDF/SRF exports. This could take the form of limiting the number of permits issued or implementing an additional permitting charge.

As outlined in the consultation, we have explored the ideas of developing an RDF/SRF export tax or implementing an outright ban, as had been suggested by stakeholders in response to the 2022 call for evidence. We note that some of the UK's free trade agreements may prohibit export taxes being levied in certain circumstances, and work is ongoing to identify such agreements. Also, we note that an export ban would conflict with our objective of ensuring that RDF/SRF export remains an option where necessary.

An alternative option that we have identified is the use of permitting/licensing systems as a mechanism through which we could seek to influence the flow of RDF/SRF exports. We could limit the number of permits/licenses that are issued for exporting these forms of waste. However, such a measure could be challenging to implement from a regulatory standpoint in seeking to fairly allocate permits among exporters. Alternatively, we could implement a charge that would be applied through or alongside existing permitting/licensing requirements, which

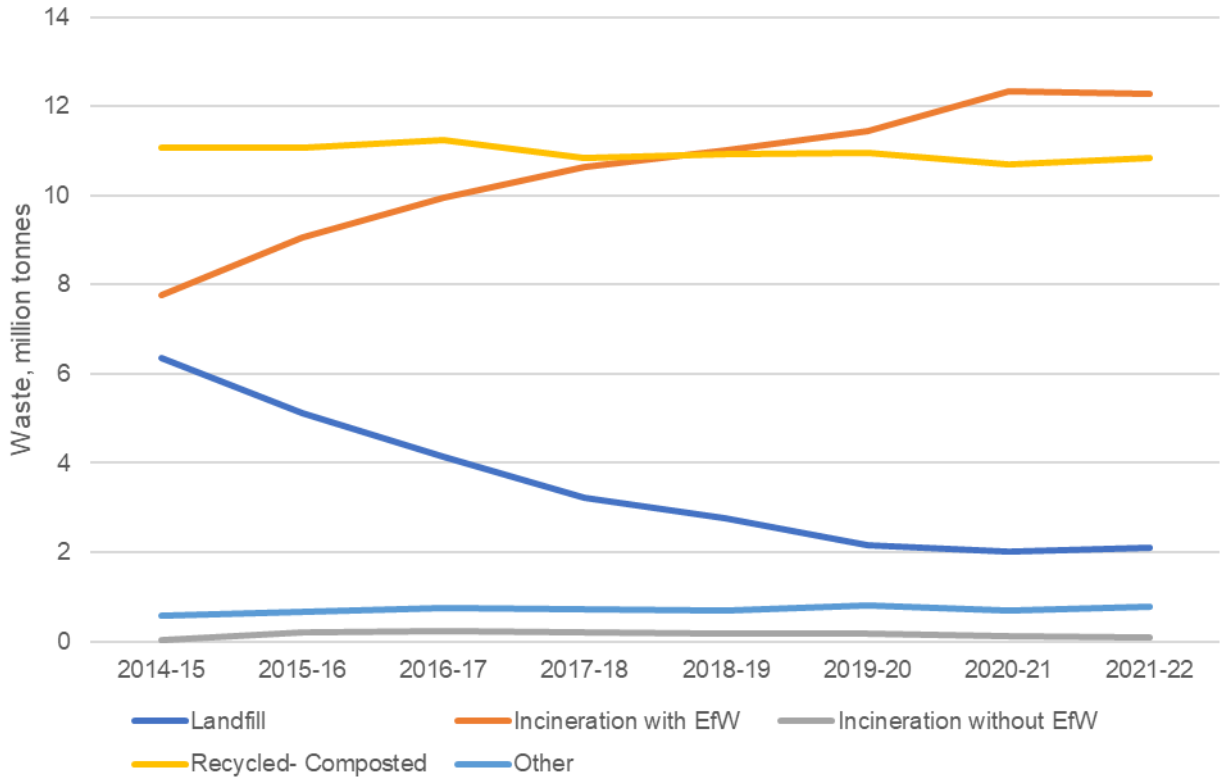
[23] DESNZ analysis

could be fixed or variable (e.g. designed to fluctuate with the carbon price). We note that charges are currently applied on RDF/SRF exporters through notification controls under the Transfrontier Shipment of Waste Regulations 2007[24], which are levied to cover the administrative costs incurred by regulators. We note that an assessment of how these measures will align with international trade rules is ongoing.

Local authority and other customer impacts

Due to the qualifying change in law (QCiL) clauses in waste incineration facilities customer contracts discussed in the consultation, UK ETS costs may, depending on contractual arrangements, be passed from operators to their customers, including commercial and industrial customers and local authorities (LAs). The consultation outlines decarbonisation pathways, the steps we will be taking to consider support for local authorities, and a proposed means through which some UK ETS costs may be passed back to the producers through the Extended Producer Responsibility for packaging (pEPR).

Figure 6: Management of local authority-collected waste, England, 2014-15 to 2020-21



Source: ENV18 – Local authority collected waste: annual results tables (Historical) [25]

[24] The Transfrontier Shipment of Waste Regulations 2007. https://www.legislation.gov.uk/uksi/2007/1711/contents/made

[25] Defra (2022), 'ENV18 – Local authority collected waste: annual results tables (Historical)', https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables

LAs are the largest customers for waste incineration facilities, with their waste comprising around 80% of EfW fossil emissions in 2022. Figure 6 illustrates that LAs have increasingly moved to EfW as a means of disposing of waste. In England, LA waste processed in this way has increased from 30% of the total waste managed of in 2014-15 to 47% in 2021-22. It became the largest method of waste management in 2018-19 and has remained so ever since. Correspondingly, the proportion of waste sent to landfill in England has dropped from 25% in 2014-15 to 8% in 2020-21.

The picture is different in the other devolved governments of the UK, where incineration of waste makes up a smaller proportion of waste management by LAs. In Wales in 2021-22, 28% of municipal waste was incinerated, up from 12% in 2014-15[26]. In Scotland in 2022, 26% of household waste was incinerated, up from 5% in 2014[27]. In Northern Ireland, 23% of municipal waste was incinerated with energy recovery in 2021-22[28], up from 15% in 2014-15[29]. These figures demonstrate that, like England, all the devolved governments of the UK have increasingly moved to EfW as a means of disposing of waste.

There are large differences in the proportion of residual waste sent to incineration between LAs. In 2021-22, UK LA incineration rates of residual waste disposed of, excluding recycling, varied from 0% to 100%. This means expansion of the UK ETS to waste incineration will have varying impacts on different LAs.

Commercial and industrial customers, which currently account for around 20% of EfW fossil emissions, will also be affected by the expansion of the UK ETS. We will undergo further analysis before the Authority Response to better understand the impacts on businesses and to identify which sectors will be most exposed.

Some of these UK ETS costs could be passed back to the producers of waste due to the proposed alignment of the UK ETS with Packaging Extended Producer Responsibility (pEPR). pEPR aims to improve efficiency by placing responsibility on businesses for the environmental impact of their packaging. This should act as an incentive for packaging producers to reduce plastic and other forms of packaging in the waste stream, reducing the fossil waste being sent to waste incineration facilities and reducing the fossil emissions for which UKAs must be surrendered. We currently estimate that about 20-30% of LA waste by weight will be in scope of pEPR. We will undertake further policy development and ahead of the Authority Response, as we recognise that work on pEPR is ongoing.

[26] Stats Wales, 'Local authority municipal waste, https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Waste-Management/Local-Authority-Municipal-Waste
[27] SEPA, 'Household waste data', https://www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/household-waste-data/
[28] DAERA (2015), 'Northern Ireland local authority collected municipal waste management statistics 2014/15 annual report', https://www.daera-ni.gov.uk/publications/northern-ireland-local-authority-collected-municipal-waste-management-statistics-2014
[29] DAERA (2023), 'Northern Ireland local authority collected municipal waste management statistics 2021/22 annual report', https://www.daera-ni.gov.uk/publications/northern-ireland-local-authority-collected-municipal-waste-management-statistics-2021

As detailed in the consultation, UK Government is considering the process for supporting local authorities in England once waste incineration facilities are included in the UK ETS until they have decarbonisation pathways in place, including considering the pressures resulting from the expansion of the UK ETS in the round at the next Spending Review. The devolved governments will continue to be funded in line with the Statement of Funding Policy and UK Government will continue to work with the devolved governments during this process.

Table 3 presents illustrative figures highlighting the potential impact on LAs' costs if waste incineration facilities are required to surrender UKAs in 2028. It assumes the composition of the sector remains identical to in 2021-22, when the waste data underlying the analysis was recorded. It is best interpreted as snapshot in time, not a prediction of future LA costs when we expect UK ETS surrender obligations to apply from 2028, because we expect multiple factors to drive a change in fossil waste being sent to waste incineration before that date.

Table 3: Illustrative annual local authority UK ETS waste cost

Country	Proportion of UK incinerated waste, 2021-22	Illustrative annual costs, £m
England	91%	418
Scotland	4%	20
Wales	3%	14
Northern Ireland	2%	8
Total UK	100%	461

The introduction of planned policies in the next four years is a key factor that we expect will change these cost estimates before 2028. For example, we expect the proportion of local authority residual waste sent to incineration in Scotland to increase following the ban on landfilling biodegradable municipal waste (BMW) from 2025[30]. Our provisional analysis suggests that if all household waste that currently goes to landfill in Scotland were to be redirected to incineration because of the ban on landfilling of BMW, total costs for all Scottish LAs could increase to £40million. This figure includes a 25% cost reduction due to pEPR and is likely to be an upper estimate because of other policies that we expect to reduce residual waste further up the waste stream. For example, policies set out in the consultation on the

[30] https://www.gov.scot/publications/consultation-delivering-scotlands-circular-economy-route-map-2025-beyond/pages/11/

Scottish Government's Circular Economy and Waste Route Map are not considered in this analysis. The UK Government, Scottish Government, Welsh Government, and Northern Ireland Executive all have policies that we expect to impact the amount of waste being incinerated, in both upwards and downwards directions. Examples of such policies which include pEPR, limitations and bans on landfilling BMW, collection and packaging reforms across the UK and upstream policies such as those in the Resources and Waste Strategy in England, Beyond Recycling Strategy in Wales, Waste Management Strategy in Northern Ireland, and the forthcoming Circular Economy & Waste Route Map in Scotland[31].This means future LA costs are very difficult to predict. We will work with relevant stakeholders to update our analysis to make more accurate predictions about the costs to local authorities and publish a full impact assessment alongside the Authority Response to this consultation.

The figures in table 3, are based on the following assumptions:

- A 2028 carbon price in line with DESNZ's market carbon value series of £98. [32] A 2028 price has been used as that's the first-year operators would be exposed to the carbon price, UK ETS prices are inherently uncertain with current carbon prices lower than the figures used in this analysis.

- Emissions in the sector align to the cap adjustment set out in the consultation and cap section of this annex, and all are subject to UKA surrender obligations. A figure of 7.9MtCO2e has been used, as this aligns to the 2028 cap figure.

- In 2028, LA collected waste will account for 80% of the fossil emissions resulting from waste incineration.

- The proportion of waste in each nation is based upon published LA waste management statistics. 2021-2022 have been used for England[33], Wales[34], and Northern Ireland[35] and 2022 for Scotland[36].

- 25% of fossil carbon emissions are in scope of the EPR, as discussed above.

[31] Scottish Government Consultation on the Draft Circular Economy and Waste Route Map 2024 https://consult.gov.scot/zero-waste-delivery/draft-circular-economy-and-waste-route-map
[32] DESNZ (2023), 'Traded carbon values used for modelling purposes, 2023', https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023
[33] Defra (2022), 'ENV18 – Local authority collected waste: annual results tables (Historical)', https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables
[34] Stats Wales 'Local authority municipal waste, https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Waste-Management/Local-Authority-Municipal-Waste
[35] DAERA (2023), ''Northern Ireland local authority collected municipal waste management statistics time series data', https://www.daera-ni.gov.uk/publications/northern-ireland-local-authority-collected-municipal-waste-management-statistics-time-series-data
[36] SEPA, 'Household waste data', https://www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/household-waste-data/

- Household numbers for England, Scotland and Wales align to 2021 ONS figures[37], with NI 2021 figures coming from NISRA[38] .

We will undertake further analysis to refine these assumptions prior to the Authority Response, which will feed into updated analysis for the government response.

Table 3 demonstrates the variance in costs between devolved governments, but there will also be large variance in the impact that LAs will experience in each of these nations, as discussed above. This is due to differences in the proportion of waste sent to EfW facilities by LAs across the four devolved governments.

This analysis only accounts for direct costs associated with the potential increase in cost of waste disposal via EfW and incinerator faculties. Costs from secondary impacts, such as the options discussed in the diversion to landfill and waste export section or MRV costs, have not been considered but it is expected that these secondary costs would be smaller than the direct costs. We will undertake further analysis to understand the full impact of the expansion to EfW and incineration for the Authority Response.

We also expect that some of these costs will be reduced because of decarbonisation, which reduces UK ETS surrender obligations. For example, EfW and waste incineration plants can adopt CCUS to capture and store the emissions resulting from their processes, dependent on location, demonstrated by the inclusion of CCS abatement though track 1 of the Industrial Carbon Capture Business Model (ICC BM). Increased waste sorting is another way to reduce such costs. We will undertake further analysis to increase understanding of the decarbonisation pathways available to both LAs and commercial and industrial customers before the Authority Response.

Call for evidence: incentivising heat networks

The Authority recognises that the UK ETS could incentivise new and existing participants, including EfW facilities, to export heat via heat networks. Such a policy could support with decarbonisation in the heating sector due to the emissions savings potentially associated with heat from EfW combined heat and power facilities. Heat networks supply heat from a central source to consumers and help reduce emissions associated with heating domestic and commercial buildings. As outlined in the consultation document, we are therefore calling for evidence on how to further encourage UK ETS participants to capture and utilise surplus or waste heat.

[37] ONS (2022), 'Households by type of household and family, regions of England and GB constituent countries', https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/datasets/householdsbytypeofhouseholdandfamilyregionsofenglandandukconstituentcountries
[38] DAERA (2023), 'Census 2021 Population and household estimates for Northern Ireland', https://www.nisra.gov.uk/system/files/statistics/census-2021-main-statistics-for-northern-ireland-phase-1-statistical-bulletin-demography-and-households.pdf

We will undergo analysis following the call for evidence ahead of the Authority Response, building upon stakeholder responses to inform policy development in this area. This will include assessing the impacts of any policy incentive, identifying any perverse incentives that may arise, and assessing the impact on emissions and UKA prices.

Section 3: Cap adjustment

Approach to cap adjustment

In the 2023 Authority Response[39], we set out our intention to reduce the overall scheme cap to make it consistent with net zero, meaning a total of 936 million allowances will be available over Phase I (2021-2030) before accounting for hospital and small emitters. This proposed revised cap was set based on whole-system modelling of the economy-wide emissions reductions to meet our carbon budgets (CBs), nationally determined contribution (NDC), and net zero, as well as analysis of the policies required to achieve them. If we were to leave the cap at the same level as the proposed net zero-consistent cap when expanding the scope of the UK ETS, sectors covered by the scheme would be forced into additional abatement. Instead, we propose to adjust the cap to reflect the additional waste incineration emissions brought into scope using the same net zero consistent approach as for the 2023 Authority Response[40].

Details of cap adjustment

Our proposed net zero-consistent cap adjustment to account for the addition to the scheme of emissions from EfW and waste incineration is based on three main components:

1. EfW pathway: EfW, including EfW combined heat and power (CHP) and advanced conversion technology (ACT) emissions, from the Dynamic Dispatch Model (DDM)'s internally held Net Zero Scenarios. These scenarios inform the emissions trajectory for the overall power sector in the UK Government's Net Zero Strategy and Carbon Budget Delivery Plan.

2. Waste incineration without recovery pathway: DESNZ's published "Energy & Emissions Projections"[41] for waste incineration without recovery.

3. Government decarbonisation policy: estimated emissions abatement from the sector through Track 1 projects of the Industrial Carbon Capture Business Model (ICC BM).

These emissions pathways include the fossil proportion of carbon dioxide only, as this is what will be in scope of the UK ETS for EfW and waste incineration from 2028.

[39] [39] DESNZ, Welsh Government, The Scottish Government, and Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (2023), 'Developing the UK Emissions Trading Scheme: main response', https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets
[40] [40] DESNZ, Welsh Government, The Scottish Government, and Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (2023), 'Developing the UK Emissions Trading Scheme: main response', https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets
[41] DESNZ (2023), 'Energy and emissions projections: 2022 to 2040', https://www.gov.uk/government/publications/energy-and-emissions-projections-2022-to-2040

The cap adjustment has been calculated by summing the EfW, EfW CHP, and ACT emissions trajectories, as well as the waste incineration without recovery figures. Estimated abatement through track 1 of the ICC BM is then subtracted from this total.

Table 44: Fossil carbon emissions projections for cap adjustment 2024-2030, MtCO2e.

Year	2024	2025	2026	2027	2028	2029	2030
Emissions pathway, MtCO2e	7.9	8.3	8.0	8.0	7.9	7.2	6.8

Table 4 shows the emission pathway for the sector between 2024 and 2030, based upon the proposed formula outlined above. The overall UK ETS scheme cap will be adjusted from 2028, when we expect to bring waste incineration into the scheme. The figures shows that the relevant emissions grow between 2024 and 2025 from 7.9MtCO2e to 8.3MtCO2e, falling slightly to 8.0MtCO2e in 2026, before falling again to 6.8MtcO2 in 2030.

Based on the figures in Table 4 for 2028-2030, expansion to waste incineration (inc. EfW) would result in the addition to the cap of 21.9 million UKAs over the UK ETS Phase I. Further adjustments to the cap will be made to account for HSEs, using the HSE reduction factor in the normal way.

Waste cap adjustment data sources

EfW (including EfW CHP and ACT) emissions pathways

As discussed in the consultation, the EfW emissions pathways align to Net Zero Strategy pathways for the sector based upon outputs from the Dynamic Dispatch Model (DDM), which inform the overall trajectory for the power sector in the Net Zero Strategy and Carbon Budget Delivery Plan. We propose to use these same pathways to determine the proposed cap adjustment.

The DDM is a comprehensive, fully integrated power market model covering the GB power sector out to 2050. The model enables analysis of electricity dispatch from GB power generators and investment decisions in generating capacity. It considers electricity demand and supply on a half hourly basis for sample days. Investment decisions are based on projected revenue and cashflows allowing for policy impacts and changes in the generation mix. The full lifecycle of power generation facilities are modelled, from planning through to decommissioning, and the DDM also allows for risk and uncertainty involved in investment decisions. The DDM enables analysis comparing the impact of different policy decisions on generation, capacity, costs, prices, security of supply and carbon emissions.

However, EfW is modelled differently than most other technologies, because the DDM recognises that these facilities exist primarily to handle waste rather than to maximise profit through power generation. This means that the model does not provide for EfW capacity to be built independently– rather, it is based on our best understanding of capacity in the sector. The DDM also assumes that EfW is baseload, meaning EfW facilities generate at maximum potential whenever possible. Its capacity figures are based on our understanding of current EfW capacity in the UK, and we use emissions factors to convert the model's power generation outputs to emissions.

The DDM Net Zero Scenarios include net zero-consistent emissions trajectories for each of EfW, EfW Combined Heat and Power (CHP) and Advanced Conversion Technology (ACT). However, it does not incorporate the impact of existing and future waste emissions reduction policies, as detailed in the future cap adjustment development section below. Instead, it is better understood as a top-down assessment of what is required to meet the UK's carbon budgets, nationally determined contribution, and net zero.

Our initial analysis on emissions pathways in the DDM has found that these trajectories align relatively well with the emissions expected from the sector up to the end of Phase I of the UK ETS (2028-2030). Further development will seek to increase the accuracy of the trajectories by incorporating the impact of existing and future waste emissions reduction policies. This will improve the modelling underpinning the DDM, which will refine the cap adjustment to be confirmed in the Authority Response.

We will also continue to explore emissions pathways for chemical recycling facilities, with a view to discounting emissions from facilities that produce polymers and monomers from the cap adjustment figures. This is because we do not propose that we include these facilities in the UK ETS, as outlined in the consultation, and only intend to include chemical recycling facilities that perform energy recovery activities.

Waste incineration without recovery pathway

The waste incineration without recovery pathway corresponds to UK government Energy and emissions projections[42] (EEP) for the sector. The EEP projects greenhouse gas emissions and energy demand based on firm and funded government policies. Given the size of the sector, as seen in figure 2, and the expectation that it won't rise significantly over the phase, the risks associated with using these figures to calculate the adjustment are relatively low.

Government decarbonisation policy

As part of the cap adjustment, we intend to account for government decarbonisation policies that affect the EfW and incineration sectors. One key policy outlined in the Carbon Budget Delivery Plan is the Industrial Carbon Capture Business Model (ICC BM), with the fossil proportion of abatement delivered through Track 1 projects accounted for in the cap trajectory.

[42] DESNZ (2023), Energy and emissions projections, https://www.gov.uk/government/collections/energy-and-emissions-projections

This pathway is the current best estimate for abatement,[43] and the cap adjustment confirmed in the Authority Response will be based on the most up-to-date and robust estimates available.

Future cap adjustment development

As discussed above, we will undertake further analysis to improve the modelling of emissions from EfW and waste incineration facilities, including to further understand the impact of waste policies from the four Governments on emissions (e.g., Resources and Waste Strategy policies in England, such as Extended Producer Responsibility for Packaging, Better Recycling, and Deposit Return Scheme), all of which will feed into the overall cap trajectory to be confirmed in the Authority Response.

Market Impact

In this section we outline the potential impact on the UK ETS market of expanding to EfW and waste incineration with the proposed cap adjustment.

Table 55: Comparison of size of EfW and waste incineration cap adjustment with the net-zero consistent UK ETS cap 2028-2030, millions of UKAs.

Type	2028	2029	2030
EfW and waste incineration proposed cap adjustment	7.9	7.2	6.8
Net zero-consistent overall scheme cap	53.5	50.9	49.3
Cap adjustment + net zero-consistent cap	61.4	58.1	56.2
EfW and waste incineration cap adjustment as a percentage of the overall adjusted net zero-consistent cap	13%	12%	12%

Table 5 demonstrates that the proposed cap adjustment for the scope expansion to EfW and waste incineration would make up a significant proportion (12%) of the overall UK ETS cap in 2028-2030. The adjustment would increase the cap between 2028-2030 from 154MtCO2e to 176MtCO2e, which is an increase of 2% to the total cap for UK ETS Phase I (2021-2030), from 936 MtCO2e to 958 MtCO2e. All figures are base cap figures, meaning they do not account for the HSE reduction factor.

Given the size of the cap adjustment, it has a potential to affect the current ETS market price and emission levels. If the cap adjustment is too loose (i.e. it is increased by a greater amount

[43] This estimate is not provided here due to commercial sensitivities around the data.

than true emissions in the sector), our provisional analysis indicates that the extra allowances released would lead to an increase in emissions in other traded sectors and carbon values would likely fall. If the cap adjustment is too tight (i.e. it is increased by a lesser amount than true emissions in the sector), carbon values will likely rise and additional abatement will be required of the traded sector.

Further analysis on the impact of the cap adjustment for EfW and waste incineration on the UK ETS market will be conducted in due course based on the emissions coverage of the final policy design. This analysis will be conducted prior to confirming the cap adjustment in the Authority Response.

Section 4: Analytical considerations for the Authority Response

Following the consultation, the Authority Response will assess the feasibility and impact of scope expansion in more detail, considering stakeholders' responses to this consultation. This will be based upon analysis of the options presented in this consultation. We will also assess the following considerations:

Emissions reductions, carbon prices, and wider environmental impacts

The primary benefit of an ETS is the benefit to society of emissions reductions that are achieved as operators choose to abate rather than purchase and surrender UKAs. Expanding the scope of the UK ETS is expected to incentivise abatement in the EfW and waste incineration sector and lead to emissions reductions. Depending on the impact on carbon price, UK ETS scope expansion will also impact the decarbonisation pathway of the current traded sector. If scope expansion leads to a higher carbon price, we would expect additional abatement in the existing traded sector, and vice versa. We hope to quantify these benefits using modelling based on marginal abatement cost curves (MACCs), business as usual (BAU) emissions, and the updated cap trajectory. We will also look to consider wider environmental impacts where data allows.

Resource costs to operators

A key cost of this policy is expected to be resource costs to waste incineration operators newly in scope of the UK ETS associated with reducing their emissions. We expect that this will include permanent abatement and efficiency measures, both of which will require investment by operators. The precise level of abatement will be determined the UKA price, which higher prices driving more abatement and thus higher resource costs. We hope to quantify these costs using MACCs for EfW and waste incineration.

Compliance costs

Compliance costs reflect the costs incurred by operators to purchase the allowances necessary to meet their obligations under the UK ETS. This will be an increased burden on new participants to the UK ETS since they will have to comply with UKA surrender obligations. Additional scope expansion could potentially lead to a change in carbon prices and thus compliance costs for existing participants. In general, higher carbon prices will tend to increase compliance costs, while reductions in emissions will tend to reduce them. Compliance costs

constitute a social transfer from market participants to government when UKAs are purchased on the primary market, or a social transfer between participants when they are traded on the secondary market. We hope to quantify these costs using data from UKA auctions.

Administrative costs

Administrative costs to participants are the costs incurred from complying with obligations in the UK ETS. This includes costs associated with monitoring, reporting, and verification, as well as the administrative costs related to managing, planning, and surrendering allowances for compliance.

New participants to the scheme in the energy from waste and waste incineration sector will be exposed to these costs. However, we do not expect these costs to be significant compared to operational costs. We expect that the assessment of these costs will be a mixture of qualitative and quantitative.

Operator impacts

The new compliance costs for operators in the waste sector could impact their competitiveness, but also lead to an impact in the industrial sector. This is an indirect impact, where UK ETS costs in the new sector are passed through to other firms. For example, any additional cost to industries of disposing of waste, through increased gate fees at EfW facilities or increased landfill costs to mitigate the risk of waste transference. These could impact the competitiveness of industrial firms in the UK. We expect that the assessment of these impacts will be qualitative.

Wider economic impacts

The impact that scope expansion has on the market itself could have an impact on the wider economy. By increasing the scope of the UK ETS, we would be incentivising more businesses to decarbonise and potentially invest in decarbonisation technologies and could also contribute to increased technological innovation, for example via increased R&D spending. This could lead to positive spillovers, reducing the cost (and accelerating uptake) of future abatement. Additionally, this decarbonisation could support jobs and investment in the green economy across the UK. We expect that the assessment of these impacts will be qualitative.

Firm behaviour

All the potential impacts listed above depend significantly on how operators engage with the UK ETS and compliance markets. Compliance costs will also depend on operators' UK ETS market behaviours, such as banking, hedging and the use of future free allocation. Where

possible and known, we will analyse the impacts of these behaviours. Where the extent or impact of these behavioural factors are unknown, we will highlight this uncertainty.

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