

Friends of the Earth Scotland's response to the Scottish Government's review of decarbonisation options for incineration

September 2022

Executive Summary

The rapid and extensive decarbonisation of the residual waste management sector, especially incineration, is a vital step in meeting Scotland's national climate goals, circular economy aims and global justice concerns. Scotland's incineration capacity must reduce in line with our climate targets: emissions from incineration must reduce to 75% by 2030 and net zero by 2045, at the least, relative to 1990 levels. As with any sectors, all possible efforts to reduce the direct emissions from incineration must be made.

The only way to ensure extensive decarbonisation is achieved requires multiple actions, including:

1. A rapid phaseout of Scotland's incineration capacity, in line with Scotland's climate targets, by:
 - Maintaining the moratorium on new incinerators by applying it **strictly and extensively** to all proposals;
 - Planned incinerators, including those in construction, **should not be built or begin operating**;
 - Operational incinerators should be **prioritised for early closure** in a phase out scheme co-ordinated by the Scottish Government.
2. **Waste workers and their Unions** should be involved in shaping transformational changes to the sector.
3. Emissions from operational plants should be reduced by **banning the burning of plastics immediately and permanently**.
4. CHP is an unnecessary cost and risk of lock-in for plants which will be phased out. Any incinerators which it is necessary to operate after 2030 should, however, be CHP. Public financing of CHP for incinerators should not be permissible for plants identified for phased out.
5. **CCS as an abatement solution for incineration must be abandoned**. CCS would lock Scotland in to unnecessary levels of incineration. It is unproven, expensive, slow to install and poorly adapted for incineration.

In February 2022, Friends of the Earth Scotland responded to the Scottish Government's first call for evidence as part of the original review on incineration¹. This document builds on our earlier response with additional information and recommendations relating to the decarbonisation of incineration of waste.

¹ A full copy of our response can be found on the Friends of the Earth Scotland website: <https://foe.scot/resource/response-to-incineration-review/>

About Friends of the Earth Scotland

Friends of the Earth Scotland exists to campaign, with partners here and across the globe, for a just transition to a sustainable society. We work in Scotland for socially just solutions to environmental problems and to create a green economy; we campaign to end the degradation of our environment and to create a society which cherishes and protects the natural world on which we depend; we think globally and act locally, enabling people to take individual and collective action.

We are part of Friends of the Earth International - the world's largest grassroots environmental network, uniting 75 national member groups, over 2 million members and 5,000 local activist groups around the world. We are an independent Scottish charity with a network of thousands of supporters and active local groups across Scotland. Friends of the Earth Scotland's vision is of a world where everyone can enjoy a healthy environment without exceeding their fair share of the planet's resources, now and in the future.

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Details response and recommendations

1. Concerns about the scope of the study and supporting analysis

The Decarbonisation Study is supported by an analysis being conducted by Eunomia. The analysis approach has not been made public beyond a presentation at a stakeholder event which gave very little details of the methodology. Based on this presentation, the scope of the analysis appears to be narrow in at least two important aspects:

- The model only extends to 2035;
- Future decarbonisation of the electricity grid is not considered extensively.

It is not possible to give a thorough review of the approach as this has not been shared.

1.1 Concerns about the 2035 cut-off

The main Incineration Review models capacity to 2050 and the targets set out in the Climate Change (Emissions reduction Targets) (Scotland) Act are for 2045, so ideally the Decarbonisation Study should have modelled waste composition to 2050 or at least 2045. This would allow carbon impacts to be assessed in terms of their impact on Scotland's climate targets.

Eunomia claim that waste composition to 2035 is too uncertain to model. Waste composition analysis always has a high level of uncertainty due to the heterogenous nature of waste. The additional uncertainty from modelling to 2050, rather than to 2035 will be marginal compared to overall level of uncertainty. Uncertainty is commonly dealt with in a number of ways including:

- scientific approaches (e.g. do more research, improve data quality);
- social approaches (e.g. consult expert stakeholders);
- statistical (e.g. Monte Carlo analysis, confidence intervals).

The approach taken has restricted the model beyond the useful confines of the study. It falls far short of what is acceptable to complete the task. By restricting the analysis unnecessarily, policy makers to not able to make the most informed choice possible. It is the Scottish Government, not Eunomia or the Incineration Review team, that should set the parameters for policy in Scotland.

A more democratic and useful approach would be to model to 2050, reducing uncertainty as much as possible, and communicating the likely impact of the remaining uncertainty on the results in language which can be understood by a non-technical audience.

Friends of the Earth Scotland strongly recommends that the scope of the review be extended from 2035 to 2050. Uncertainties in the modelling should be reduced and/or understood using the methods outlined above. The likely implications of the uncertainty of the results for decision making should be communicated to policy makers so that they can make an informed decision on how to develop policy around the best possible information.

1.2 Future grid decarbonisation scenarios are not considered extensively

A key factor in assessing the decarbonisation potential of any technology is to compare it to realistic alternative scenarios. For electricity producing technologies, the average carbon intensity of producing electricity for the UK grid is often used as a comparison. For heat, the carbon intensity of running gas boilers has been used as an alternative scenario in the past but experts are increasingly recognising that the carbon intensity of heat pumps and district heating schemes are more realistic alternative scenarios for the future.

The Zero Waste Scotland incineration report² on the carbon impacts of incineration found that burning residual municipal waste in EfW plants in Scotland in 2018, had an average carbon intensity of 509 gCO₂/kWh (Figure 15). This was nearly twice as high as the carbon intensity of the marginal electricity grid for the UK in 2018, which was 270 gCO₂e/kWh.

Four years later and the UK grid average carbon intensity has fallen 29% to 193 gCO₂/kWh, whilst there is no evidence to suggest the carbon intensity of electricity-producing incinerators have changed. The grid average will continue to reduce to 50 gCO₂e/kWh by 2030³ and, after that, it will reduce even further. Scotland's incinerators (none of which have become CHPs since the publication of the ZWS report) will become an increasingly obvious outlier as a carbon intensive way of making electricity.

The Zero Waste Scotland incineration report uses a gas boiler as an alternative scenario for heat and shows that producing heat by burning gas is 18% lower carbon emissions than burning waste⁴. Some life cycle analyses put heat pumps at half the carbon intensity of gas boilers⁵, so, like electricity, heat produced in incinerators will compare increasingly poorly to the alternative over time.

Incineration is already a high-carbon outlier for both electricity and heat production and the gap between average energy production and incinerators will only increase as decarbonisation of energy systems continue. Eunomia must therefore consider, not only a comparison of incinerator carbon intensity to today's electricity grid, but also to how energy production is expected to change over time.

We note that Scottish Government statements on the carbon intensity of incinerators compared to other energy generating technology are inconsistent with the evidence provided by their own advisory bodies. In Zero Waste Scotland's 2021 report on the climate impacts of incineration⁶, one of the main conclusions was "EfW can no longer be considered a source of low carbon energy". However, in a reply to a

² <https://www.zerowastescotland.org.uk/content/climate-change-impact-burning-municipal-waste-scotland>

³ CCC (2021) 6th Carbon Budget, Electricity Generation, p36 <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf>

⁴ Page 36 "The carbon intensity of HOP1 is 325 gCO₂/kWh. This is higher than the carbon intensity for heat generated from a central or small-scale natural gas plant for heat operating in the UK in 2018, which is 267 gCO₂/kWh."

⁵ For example, Sevindik et al (2021) [A Comparative Environmental Assessment of Heat Pumps and Gas Boilers towards a Circular Economy in the UK](#), *Energies*, 14, 3027.

⁶ <https://www.zerowastescotland.org.uk/content/climate-change-impact-burning-municipal-waste-scotland>

parliamentary question from Mark Ruskell in September 2022, on the level of carbon production associate with energy generation considered to be low-carbon, the Scottish Government lists energy from waste as a low carbon technology⁷. If the carbon intensity of incinerators, even with CHP, is above the average carbon intensity of alternatives, it cannot and should not be classified as low carbon. To do so is highly misleading.

Friends of the Earth Scotland recommends that Eunomia compare the carbon intensity of Scotland's incinerators to the UK electricity grid from 2022-2050 and the carbon intensity of heat pumps or district heating schemes, where a heat network could be considered.

Friends of the Earth Scotland strongly recommends that the Scottish Government stops referring to incineration as low carbon.

1.3 Timings of the Decarbonisation Study

This study would have been more useful had it been conducted and published as part of the original Incineration Review which was published in May 2022. The decarbonisation of incinerators, which are some of the greatest point sources of greenhouse gas emissions in Scotland, is an integral part of the environmental case against incineration. The delay in conducting and publishing the Decarbonisation Study means policy decisions on incinerators have not included full consideration of their climate impacts or their ability to jeopardise Scotland meeting its climate goals. The delay makes it more likely that incinerators being allowed to unnecessarily emit more greenhouse gases for longer.

To correct this, the Scottish Government must be ambitious, evidence-led and act quickly in its efforts to decarbonise incineration.

Friends of the Earth Scotland recommends that the Scottish Government acts rapidly and extensively to decarbonise existing and planned incineration activity. Policy should be guided by evidence, rather than industry views, on how to decarbonise the residual waste management sector.

2. Incinerators jeopardise Scotland's climate targets

As stated in FoES original submission, incinerators jeopardise climate targets in two main ways:

- they emit fossil carbon directly into the atmosphere from the waste they burn;
- they lock societies into a linear model of resource use and high levels of consumption.

The Scottish Government must act on both these issues to ensure that incinerator emissions are curbed in both the short and medium term. The section below includes some additional information to our original response regarding the ways in which incinerators jeopardise climate goals.

⁷ <https://www.parliament.scot/chamber-and-committees/written-questions-and-answers/question?ref=S6W-10304>

2.1 The waste hierarchy requires updating

The waste hierarchy has become waste policy dogma since the introduction of the concept many decades ago. Technical understanding and the policy landscape have moved on considerably but the waste hierarchy still sits as the unchallengeable cornerstone of waste policy. Whilst the waste hierarchy can still be useful, particularly for members of the public making day to day decisions about waste, rigidly adhering to it in the face of more up to date evidence is damaging progress. Nowhere is this clearer than for the issue of burning plastics where Life Cycle Analysis has shown conclusively that burning plastics has a far greater climate impact than landfill. **The waste hierarchy must not be used as an excuse to burn plastics anymore.**

99% of plastics are made from fossil fuels. Burning them contributes directly to climate change by releasing fossil carbon into the atmosphere. If they are landfilled instead (ideally in an orderly manner, separated into type and baled to make future recycling efforts easier, once the appropriate technologies and facilities are available) the carbon in them remains in the landfill. Whilst landfill has environmental impacts beyond climate change, for plastic, climate is a significant and immediate concern. Landfill is a better climate outcome than incineration for waste plastic which cannot yet be recycled.

Prevention and reuse reduce total material requirements and so are preferable to both incineration and landfill. “Recycling” is a difficult to define concept which includes a spectrum of processes, some of which may be carbon intensive. Chemical and mechanical recycling of plastic, for example, are completely different processes with different climate impacts⁸. A recent study by Zero Waste Europe and the Rethink Plastic alliance found that the GHG emissions from mechanical recycling of plastic are nine times lower than those from chemical recycling⁹.

One way of prioritising recycling methods would be to engineer the desired outcome in a definition of the term: any process with a carbon intensity above that of landfill should not be considered recycling¹⁰. A code of practice for measuring the carbon intensity of recycling processes could be developed by the Scottish Government to allow industry to measure and fairly compare where existing and new processes for managing plastic waste.

The Scottish Government should clearly state that decisions regarding the fate of residual plastic waste should be based on life cycle analysis evidence rather than the original waste hierarchy.

⁸ More information on the limits of chemical recycling can be found in this Zero Waste Europe report: <https://zerowasteurope.eu/library/el-dorado-of-chemical-recycling-state-of-play-and-policy-challenges/>

⁹ ZWE and Rethink Plastic alliance (2022) [Climate impact of pyrolysis of waste plastic packaging in comparison with reuse and mechanical recycling](#)

¹⁰ It could be argued that this measure should be based on material intensity, not climate intensity. However, the risk of lock-in to recycling processes and the lack of an established method for measuring the scale of lock-in impact on material demand means it would be difficult to establish a fair and complete approach for this. The method for measuring and comparing the direct carbon intensity of recycling processes is well established.

Friends of the Earth Scotland suggests a definition for recycling of plastics is required. This should be defined by the Scottish Government. This could be based on a carbon intensity threshold related to landfill. Guidance on how to measure carbon intensity of recycling methods should be developed by government, not industry.

2.2 The dangers of lock-in

The Scottish Government's Incineration Review confirmed Friends of the Earth Scotland's arguments that lock-in is a genuine concern. The Review recommends that "local authorities specifically address this in their contracts" to prevent further lock-in but does not say what steps can be taken to unlock the current system. This is disappointing as lock-in to high carbon industries (not just incineration) are well established and known to have numerous interconnections and interactions within and between national and local institutions, industry and households which require government intervention to change¹¹.

It is vital that Scotland's waste management system is unlocked from incineration in order to allow a circular economy to develop: it is not possible to use resources again if they have been burnt. In this way, incinerators represent a threat to Scotland achieving its climate goals, which cannot be achieved without reducing consumption created by a linear system of resource use. The Decarbonisation Study must recognise this and suggests practical steps which can be taken towards unlocking the system as soon as possible.

Friends of the Earth Scotland recommends that the Decarbonisation Study should go further than the original Incineration Review in recognising lock-in to incineration is genuine and recommend steps to unlock the existing waste management system.

2.3 Example of breaking lock in: Germany's Coal Exit Law

Germany's coal phaseout plan is an example of how government can break carbon lock-in¹² which the Decarbonisation Study can draw on to create its own pathway to unlock Scotland from incineration of waste. The aim of the German Government was to phaseout the burning of coal. Whilst the timescales of the phase out does not match the scientific requirement to phase out coal by 2030, the process taken in unlocking from a carbon intensive technology remains a useful example.

The German Government established a multi-stakeholder "coal exit commission" to plan the stages of the phaseout plan for coal-fired power in the country. This included:

- a ban on new plants;
- a shutdown schedule for existing plants; and
- measures to support those affected by the phaseout.

¹¹ Seto et al (2016) Carbon lock in: Types, causes, and policy implications

<https://www.annualreviews.org/doi/pdf/10.1146/annurev-environ-110615-085934>

¹² Clean Energy Wire (2020) <https://www.cleanenergywire.org/factsheets/spelling-out-coal-phase-out-germanys-exit-law-draft>

This planning enabled the government to successfully enact a “coal exit law” in July 2020. The first coal plants went offline later that year. By the end of 2022, capacity will be reduced by 25%¹³.

The coal exit law includes an agreed shutdown schedule for the closure dates of individual plants (see Figure 1 below) and compensation payments for operators and workers. The operators, in return for the compensation payments, will refrain from taking legal action against the shutdown of their installations and from dismissing workers for operational reasons. Operators will only be compensated for shutdowns before 2030. The Government has scheduled three reviews of whether the shutdowns planned for post-2030 could be scheduled earlier. Compensation for operators will total 4.35 billion euros and workers will be compensated a maximum of 5 billion euros.

Figure 1 Plant exit path for phase out of German coal use by 2038

Operator	Power plant unit	Coal region	Capacity in MW	Closure date
RWE	Niederaußem D	Rheinland	297	31 Dec 2020
RWE	Niederaußem C	Rheinland	295	31 Dec 2021
RWE	Neurath B	Rheinland	294	31 Dec 2021
RWE	Weisweiler E or F	Rheinland	321	31 Dec 2021
RWE	Neurath A	Rheinland	294	01 Apr 2022
RWE	Frechen/Wachtberg	Rheinland	120 (of 176)	31 Dec 2022
RWE	Neurath D	Rheinland	607	31 Dec 2022
RWE	Neurath E	Rheinland	604	31 Dec 2022
RWE	Weisweiler F or E	Rheinland	321	01 Jan 2025
LEAG	Jänschwalde A	Lusatia	465	31 Dec 2028 (as of 31 Dec 2025 security reserve)
LEAG	Jänschwalde B	Lusatia	465	31 Dec 2028 (as of 31 Dec 2027 security reserve)
RWE	Weisweiler G or H	Rheinland	663 or 656	01 Apr 2028
LEAG	Jänschwalde C	Lusatia	465	31 Dec 2028
LEAG	Jänschwalde D	Lusatia	465	31 Dec 2028
RWE	Weisweiler H or G	Rheinland	656 or 663	01 Apr 2029
LEAG	Boxberg N	Lusatia	465	31 Dec 2029
LEAG	Boxberg P	Lusatia	465	31 Dec 2029
RWE	Niederaußem G or H	Rheinland	628 or 648	31 Dec 2029
RWE	Niederaußem H or G	Rheinland	648 or 628	31 Dec 2033
Saale Energie	Schkopau A	Central Germany	450	31 Dec 2034
Saale Energie	Schkopau B	Central Germany	450	31 Dec 2034
LEAG	Lippendorf R	Central Germany	875	31 Dec 2035
EnBW	Lippendorf S	Central Germany	875	31 Dec 2035
RWE	Niederaußem K	Rheinland	944	31 Dec 2038
RWE	Neurath F (BoA 2)	Rheinland	1060	31 Dec 2038
RWE	Neurath G (BoA 3)	Rheinland	1060	31 Dec 2038
LEAG	Schwarze Pumpe A	Lusatia	750	31 Dec 2038
LEAG	Schwarze Pumpe B	Lusatia	750	31 Dec 2038
LEAG	Boxberg R	Lusatia	640	31 Dec 2038
LEAG	Boxberg Q	Lusatia	857	31 Dec 2038

¹³ <https://www.bmu.de/en/topics/climate-adaptation/climate-protection/national-climate-policy/translate-to-english-fragen-und-antworten-zum-kohleausstieg-in-deutschland>

Transition support mechanisms are required to ensure workers in Scotland's waste management sector are supported as their industry shifts to a more circular economy model. As called for by the Just transition Partnership in their response to the Circular Economy consultation¹⁴, workers and their Unions should be involved in shaping how to transition the industry.

Friends of the Earth Scotland recommends that the Scottish Government takes active and deliberate steps to unlocking waste policy from incineration beginning with acknowledging that Scotland is locked-in to incineration and unlocking the system is required to achieve climate goals.

Friends of the Earth Scotland strongly recommends that a schedule to close individual Scottish incinerator plants as fast as possible should be created.

Friends of the Earth Scotland strongly recommends that waste workers and their Unions are involved in shaping transformational changes to the sector.

3. Minimise the number of incinerators to be built

3.1 The risk of over-capacity is greater than a capacity gap

The Scottish Government's Incineration Review shows that, if Scotland's performance matched what has been achieved in those European nations with high recycling rates, Scotland would need no more than half a million tonnes incineration capacity by 2050 (excluding Construction & Demolition waste)¹⁵. With the development of a Circular Economy law and Route Map for waste, Scotland's existing target to achieve 70% recycling should act as a realistic goal for future progress (although the current target will not now be achievable within the original timeframe of 2025).

The Review also shows that incineration capacity based on existing capacity and business as usual pipeline capacity for plants in construction, fully consented and with planning granted will peak in 2028 at just under 3Mt and still be more than 2.5Mt by 2050 – 500% more than the 0.5Mt capacity that should be required. It is clear that Scotland has over-capacity of incineration.

Despite the Incineration Review capacity analysis showing that there is “a risk of long-term overcapacity beginning from 2026 or 2027”, there is also a counter-intuitive and unnecessary level of concern about the “capacity gap” for residual waste in the year of 2025. For one year, about half a million tonnes more waste than planned will be sent to landfill, rather than incinerated. The unnecessary carbon impact created by over-capacity from 2027-2050 are much greater than carbon impact created by the 2025 capacity gap. There is also a risk that focus on reducing this 2025 capacity gap will exacerbate over-capacity in later years.

¹⁴ <https://www.itp.scot/policy/call-for-just-transition-principles-to-be-applied-to-moves-towards-a-circular-economy/>

¹⁵ Scottish Government (2022) [Incineration Review](#) Figure 2, page 23

A rough calculation of the carbon impacts of the 2025 capacity gap and 2028-2050 over-capacity illustrates the much greater scale of carbon impact from over-capacity compared to the 2025 capacity gap (Table 1 below). To do this the following assumptions were made:

- The carbon factor for landfill was taken from the ZWS incineration report (337 kgCO₂e/t). Note this does not include biogenic carbon stored in landfill, which would reduce the factor significantly.
- The carbon factor for incineration was taken from the ZWS report (246 kgCO₂e/t average for all incinerators).
- The carbon factor for recycling was taken from ZWS Carbon Metric¹⁶ (-649 kgCO₂e/t for household and similar waste).
- The capacity gap scenario assumed 0.5Mt was sent to landfill rather than incineration for one year (2025).
- The over-capacity scenario assumed 0.1Mt was sent to incineration rather than recycling for 22 years (2028-2050). This is based on Figure 2 in the Incineration Review which shows that the difference between the "BAU total waste quantities" and "Best efforts total waste quantities" scenarios averages, roughly, about 0.1Mt per year.

Table 1. Comparison of carbon impacts of capacity gap and over-capacity scenarios

Scenario	Carbon impact (tCO ₂ e)
Sending 0.5Mt waste to landfill rather than incineration (2025 capacity gap)	45,500
Sending 0.1Mt waste per year to incineration rather than recycling for 22 years	1,969,000

This rough calculation was deliberately conservative – it does not include potential additional recycling beyond the “Best efforts total waste quantities” scenario for example. There is no doubt that the greater climate risk is over-capacity in 2028-2050 than a capacity gap in 2025. Policies which reduce the capacity gap in 2025 at the expense of over-capacity in 2028-2050 (by creating unnecessary incineration capacity) are extremely likely to have a substantial carbon impact.

The statutory biodegradable municipal waste landfill ban is creating precisely the opposite incentive to that which is needed: local authorities are prioritising meeting the 2025 capacity gap over considerations of long-term carbon impacts of over-capacity of incineration. There are solutions to the 2025 capacity gap which do not increase the risk of incinerator lock-in which can be deployed quickly. To immediately reduce emissions, in the short-term, waste could be (biostabilised, if possible and then) landfilled. Longer term, waste prevention and/or recycling measures are required.

Friends of the Earth Scotland recommends that the carbon impact of the 2025 capacity gap be compared to the carbon impact of over-capacity from 2028-2050 to give policy makers a clear indication on how to prioritise the two concerns.

¹⁶ <https://www.zerowastescotland.org.uk/our-work/carbon-metric-publications>

Friends of the Earth Scotland recommends that the Scottish Government explore changes to the 2025 biodegradable landfill ban which would remove incentives for local authorities to burn waste. Instead, local authorities should be required and supported to reduce the carbon impacts of their waste management activity in ways which do not increase incinerator lock-in.

3.2 An indicative cap will not be enough to curb incineration

The Incineration Review suggests that an “indicative cap” could be used to support the decline of incineration capacity over time (Recommendation 5). Such a market-based tool is too vague to produce the desired results, which require a stronger and clearer commitment to reducing capacity fast. It is unclear if the indicative cap is meant as a signal to Government or industry or both.

An “indicative cap” could create a “Tragedy of the Commons” effect where each individual decides to act in their self-interests, leading to a disastrous environmental outcome for all. Each incinerator plant operator or local authority will conclude that their plant should not be the one to close in order to meet the cap each year. The result would be a lack of action to reduce national incineration capacity.

Another problem with this approach that makes it unworkable is that it takes too long to set up. The sooner decisions can be made, the less wasted effort (and money) will be put into incinerators which must close early or be stopped from beginning operations at all. The Incineration Review lists seven separate considerations and/or activities for the Scottish Government (to be carried out with stakeholders) which must be completed in order to create the cap¹⁷. These include improving waste data and modelling regional demand for waste – tasks that will take years to implement. To reduce Scotland’s incineration capacity in the future, the Scottish Government must influence decisions being made today.

Friends of the Earth Scotland recommends that the Decarbonisation Study includes alternative suggestions to the indicative cap (Recommendation 5) suggested in the Incineration Review as an indicative cap is too weak and slow a policy tool to be an effective driver to reduce national incineration capacity. The alternative suggestions should include a schedule to close individual incinerator plants in Scotland.

3.3 Prioritise incinerators for closure

A more detailed exit plan is required which sets dates of closure for individual plants. As detailed in Section 3.3 above, the process adopted in German Coal Exit Law could be used as a template for a phase out of incinerators¹⁸. **Instead of a cap, the Scottish Government should select incinerators for closure based on a set of criteria designed to decarbonise the sector as fast and as much as possible.**

The incinerator phase out plan must align to Scotland’s 2045 climate targets, as incinerators are some of Scotland’s largest point sources of GHG emissions¹⁹. The Decarbonisation Study should establish how much incineration capacity will be

¹⁷ Page 29

¹⁸ It should be noted that whilst the process is a useful example, the unambitious timescales which do not adhere to scientific consensus are not.

¹⁹ <https://theferret.scot/rogues-gallery-climate-polluters-top-20-revealed/>

required by 2045. Figure 2 in the Incineration Review report indicates that this may be about 0.5Mt, if recycling targets are met.

A starting point for designing these criteria should be an analysis of how to ensure incineration capacity required by 2045 has the lowest carbon intensity possible. This may mean, for example, that by 2045 only three small/medium sized CHP incinerators based on plants already operational in 2022, situated at strategic locations across Scotland are required. The criteria for closure then becomes whether a plant has CHP potential, its location, size and age/operational status.

It may be possible to obtain data that supports this approach from plant operators. If operators are unwilling to share this data with government, more generalised data and scientific modelling must be used instead.

Friends of the Earth Scotland strongly recommends that the Scottish Government must reduce Scotland's incinerator capacity in line with our 2045 climate targets. As with all sectors, all possible efforts to reduce the direct emissions from incineration must be made.

Friends of the Earth Scotland recommend that the Scottish Government designs a set of criteria to prioritise closure of incinerators based on minimising overall carbon emissions.

Friends of the Earth Scotland recommends that these criteria are then used to list the order in which existing and planned incinerators should close in Scotland.

4. Removing plastics from the waste stream

Friends of the Earth Scotland's original response to the Incineration Review explains the case for banning the burning of plastic²⁰. As stated in the conclusions of the Incineration Review: "stopping plastic from being incinerated is the quickest and most reliable route to reduce the carbon impact of incineration". A ban on burning plastic would better align Scottish incineration policies with emerging Scottish, UK, EU and global policies to reduce plastic pollution.

A bottle Deposit Return Scheme and Extended Producer Responsibility scheme for packaging, which will soon follow the Single Use Plastic ban in becoming operational policies in Scotland, will remove much of the (recyclable) plastic from the residual waste stream. Client Earth have recently published a report detailing the liability risks of burning plastics²¹. The report examines how existing legal challenges against waste management companies building and operating incineration facilities could escalate in light of growing incinerator build-out and increased climate pressure.

After a report from Reloop concluded that sorting capability for plastic waste has markedly improved in recent years²², in September 2022, the European Parliament

²⁰ FoES (2022) [Incineration Review Response](#), section 3.2

²¹ Client Earth (2022) Plastics on trial: Briefing 4 <https://www.clientearth.org/latest/documents/plastics-on-trial-4-waste-disposal-recycling/>

²² https://www.reloopplatform.org/wp-content/uploads/2022/06/D-HOGG-Reloop_FINAL_June2022-1.pdf

voted to require operators to remove fossil material from mixed waste used for “renewable energy” production²³. The Scottish Government stated one of its five key principles of a circular economy strategy for Scotland would be to “keep pace with the EU, in order to ensure market alignment and uphold our commitment to maintain or exceed environmental standards after the EU exit”²⁴. A ban on burning plastic would meet this aim.

In March 2022, UN member states endorsed a historic resolution at the UN Environment Assembly to forge an internationally binding agreement to end plastic pollution by the end of 2024²⁵. The resolution addresses the full life cycle of plastic, including its production, design and disposal. The resolution to End Plastic Pollution will have knock on consequences for plastic disposal in Scotland.

Friends of the Earth Scotland recommends that, in alignment with national and international policies to end plastic pollution, the Scottish Government should ban the burning of plastic waste.

5. Biostabilisation

Friends of the Earth Scotland recommends that the carbon intensity of biostabilisation be measured in a way which allows it to be compared to alternative waste management technologies.

This should include consideration of biogenic carbon stored in landfill, which is erroneously excluded from the Zero Waste Scotland incineration report on the carbon impacts of incineration.

6. Combined Heat and Power networks

It has been stated many times by the Chair of the Incineration Review, Dr Colin Church, that it is unlikely that all of Scotland’s incinerators will be suitable for combined heat and power (and CCS) developments²⁶. Whilst CHP can reduce the carbon intensity of incinerators somewhat, the Zero Waste Scotland climate impacts of incineration report²⁷ demonstrates that CHP does not reduce the carbon intensity of plants below alternative scenarios such as gas boilers.

As stated in FoES original Incineration Review response (Section 3.3), financing the retrofitting of CHP to incinerators exacerbates lock-in and is a poor use of public funding meant for climate mitigation projects. The Decarbonisation Study should explore if CHP will be a technically and economically viable strategy for plants once

²³ <https://zerowasteurope.eu/press-release/zero-waste-europe-approves-parliament-resolutions-on-red-iii/>

²⁴ <https://www.gov.scot/publications/consultation-delivering-scotlands-circular-economy-route-map-2025-beyond/>

²⁵ <https://www.unep.org/news-and-stories/press-release/historic-day-campaign-beat-plastic-pollution-nations-commit-develop>

²⁶ For example, the stakeholder session held on 30th August

²⁷

<https://www.zerowastescotland.org.uk/sites/default/files/The%20climate%20change%20impact%20of%20burning%20municipal%20waste%20in%20Scotland%20Technical%20Report%20July%202021.pdf> Figure 15

the timescales for retrofitting, the marginal carbon saving expected, and the phase out of most of Scotland's incinerators as suggested by FoES are considered.

Claims that heat offset from incinerators will alleviate the energy crisis are completely unrealistic. The NESS incinerator, due to begin burning waste this year, has recently begun retrofitting a heating scheme to the plant²⁸. This will cost £10m, with £5.787m paid for by the Scottish Government in the form of a grant from its Low Carbon Infrastructure Programme and the European Regional Development Fund. This initial phase of the scheme will heat 300 homes and four public buildings (although not before the end of 2023 at the earliest). This is an average cost of £32,895 per building.

Five months later an additional £5.617m grant was awarded by the Scottish Government from its Heat Network Fund to expand the network to 500 homes and four more public buildings²⁹. The second phase will not be completed until 2026 – four years after the plant starts operating and not nearly soon enough to help people struggling to pay heating bills this winter.

The Heat and Power Plan for the plant states that if the maximum heat export is achieved (10MW), the plant efficiency will be 46%³⁰. This is far short of the 70% efficiency claimed to be possible by Dr Colin Church, the Incineration Review Chair³¹.

This example demonstrates that the reality of CHP does not live up to the hype: it is expensive, slow to retrofit and offers limited savings in efficiency.

Friends of the Earth Scotland advises that Combined Heat and Power will only be required for an extremely limited number of incinerators, where it is not in conflict with the national phase out plan or risk exacerbating lock-in. In such cases, operators should be held to promises of retrofitting CHP, which should be 100% privately financed.

7. Carbon Capture and Storage

Friends of the Earth Scotland's original response to the Incineration Review explains that CCS is a completely unsuitable solution for decarbonisation of incinerators³². In summary, there are technical, economic, environmental and social concerns about CCS use for Scottish incinerators. Since responding to the Incineration Review call for evidence in February 2022, the evidence against CCS has grown.

²⁸ <https://www.aberdeency.gov.uk/news/work-starts-next-week-heat-network-provide-low-cost-energy-homes-torry>

²⁹ <https://www.aberdeency.gov.uk/news/scottish-government-grant-awarded-second-phase-torry-heat-network>

³⁰ <https://www.aberdeency.gov.uk/ness-energy-project/sepa-permit-application> Heat and Power Plan, page 21, Table 8

³¹ <https://news.stv.tv/scotland/scotland-tonight-could-burning-rubbish-be-the-solution-to-soaring-energy-bills>

³² See section 3.6 of [FoES original response](#)

7.1 CCS is increasingly claimed to be panacea by the waste industry

It remains the case that there is not a single operational carbon capture and storage plant in the UK or the EU. However, the number of incinerator operators claiming that their emissions can be abated through CCS has grown. Viridor is the largest waste operator in the UK and manages the biggest incinerator in Scotland: the Dunbar Energy Recovery Facility.

Viridor's Roadmap to decarbonisation states: "We believe that by 2035 it should be possible to have implemented CCS at our four key EfW operations"³³. The 2021 report by Eunomia, written for Viridor, on which this claim is based shows that Dunbar is expected to be the first of Viridor's incinerator to be CCS operational with an operational start date of 2031³⁴. The Dunbar facility opened in 2019, so even if CCS was retrofitted to the plant in 2031, the plant will have been emitting carbon for 12 years (over a quarter of its expected lifetime).

After Viridor's report was published, the UK Government announced that the Scottish cluster was not successful in the first round of funding³⁵. This is the first setback to retrofitting CCS to the Dunbar incinerator but it is unlikely to be the last. It is not clear that the Dunbar incinerator would be part of the Scottish CCS cluster – there is no mention of it in the Scottish Cluster³⁶ or Acorn websites. The Eunomia report acknowledges that the Dunbar plant could only be included in the second phase of CCS development for incinerators as it is not geographically close enough to the rest of the Scottish cluster to be incorporated into it directly, instead relying on its proximity to a port hub (Section 4.2.2).

7.2 CCS plans usually fail

A new report published by the Institute for Energy Economics and Financial Analysis in September 2022 found that "the 90% emissions reduction targets generally claimed by the industry has been unreachable in practice"³⁷. The study is based on 13 leading CCS case studies (comprising of 10 operational plants, 2 that have failed and 1 suspended plant) which represents 55% of the total nominal capture capacity operating globally. A key finding of the report was that failed and underperforming projects considerably outnumbered successful experiences (10 of the 13 projects, comprising 90% of the total capture capacity, failed or underperformed by large margins) – this should be accounted for in the Scottish Decarbonisation review. The successful plants mainly existed in the natural gas processing sector – a very different operating environment and scale to the waste sector.

In August 2022, Copenhagen was forced to abandon its commitment to become carbon neutral by 2025 due to a lack of CCS funding for its flagship incinerator plant, the Amager Resource Centre³⁸. The project failed to secure state funding and, according to Energywatch.dk, it does not have the necessary equity capital to secure

³³ <https://www.viridor.co.uk/our-ambition/decarbonisation/> Step 3. Carbon capture

³⁴ Eunomia (2021) <https://prod-cms.viridor.co.uk/media/zyzmtjv0/eunomia-report-ccus.pdf> Page 27, Table 5.2

³⁵ <https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-phase-1-expressions-of-interest/october-2021-update-track-1-clusters-confirmed>

³⁶ <https://www.thescottishcluster.co.uk>

³⁷ <https://ieefa.org/resources/carbon-capture-remains-risky-investment-achieving-decarbonisation>

³⁸ <https://www.climatechangenews.com/2022/09/16/copenhagens-failure-to-meet-2025-net-zero-target-casts-doubt-on-other-city-pledges/>

private investment. This example underlines both the risk of relying on CCS to reduce emissions and the threat incinerators pose to Net Zero targets.

Friends of the Earth Scotland strongly recommends that the Decarbonisation Study excludes CCS as a viable solution for reducing emissions from any of Scotland's incinerators.

8. Taxation policy options

Friends of the Earth Scotland's response to the original Incineration Review laid out our concerns relating to an incinerator tax, a waste carbon tax or including incinerators in a UK ETS as policy mechanisms for reducing the carbon impact of incineration (Section 3.4). In summary, these options would, on their own, not address the root causes of waste production, it would be slow to become effective and the burden of cost falls to Local Authorities.

If a tax or inclusion in the UK ETS is recommended, this should only be considered as a complimentary policy to an immediate ban on burning plastics (to counteract the long time scales involved in setting up and implementing such policies).

Friends of the Earth Scotland recommends that strategies for decarbonising incineration in Scotland do not rely on tax or market mechanisms alone.

Summary of main recommendations

This document sets out Friends of the Earth Scotland's concerns and recommendations regarding the Scottish Government's study of how to decarbonise incineration. Our main recommendations include:

- *Scotland's incineration capacity must reduce in line with our climate targets: emissions from incineration must reduce to 75% by 2030 and net zero by 2045, at the least, relative to 1990 levels. As with any sectors, all possible efforts to reduce the direct emissions from incineration must be made.*
- *The creation of a phaseout **schedule to close individual incinerator plants** in order of greatest decarbonisation potential.*
- ***Waste workers and their Unions** are involved in shaping transformational changes to the sector.*
- *The Scottish Government **bans the burning of plastic waste immediately.***
- *CHP is an unnecessary cost and risk of lock-in for plants which will be phased out. Any incinerators which it is necessary to operate after 2030 should, however, be CHP. **Public financing of CHP for incinerators should not be permissible for plants identified for phased out.***
- ***CCS is excluded as a viable solution** for reducing emissions from Scotland's incinerators.*