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Environmental Information Regulations (EIR) request

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Ref: Sent by email from enquiries@theccc.org.uk
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Your request:

Freedom of Information/Environmental Information Request relating to emission figures from energy.

I looked for evidence behind CCC recommendations relating to greenhouse gas emissions from energy, which left me with queries on the calculations, assumptions and data sources used. In particular many recommendations seem to be based on the acceptance that burning biomass 'is' zero carbon, yet I can't find the evidence justifying this. Please provide the calculations, assumptions and data behind:

1. The evidence base for claiming that the burning of biomass, including food, garden waste, cardboard and trees 'is' zero carbon – or can be treated as zero carbon for making recommendations.

2. The evidence base used to advise on Carbon Capture and Storage for different carbon sources.

3. The evidence base behind recommendations for for different types of heat networks and which counterfactuals were used?

1.What is the evidence base for claiming that the burning of biomass, including food, garden waste, cardboard and trees 'is' zero carbon – or can be treated as zero carbon for making recommendations? Many UK policy and investment decisions rest on this factor for their 'green' claims - hence it is vital to have transparent evidence that CCC recommendations are based on sound data and calculations.
Background re IPCC Guidance: The IPCC guidance for International Accounting of biomass burning under the UNFCCC and Kyoto Protocol is to report:

- emissions from sourcing biomass 'fuel' under the Country of origin's land use sector – minus

- emissions/sequestration from replenishing such ‘fuel’

- emissions from burning the ‘fuel’ under the Country where it is burnt as zero carbon - whilst being noted

- emissions captured from capturing and storing under the Country of capture as ‘negative carbon’

However a Chatham House 2017 report (Ref 1.1) disputes assumptions that harvested and burnt trees, food and other biogenic waste are regrown or sequester sufficient carbon in the Countries of origin to be counted as zero carbon emissions in the Countries of burning. For trees, this report quotes Stop Burning Trees (Ref 1.2) that “in reality, it takes 44-104 years (Ref 1.3) to reabsorb the carbon”, even assuming that trees are regrown. It also reports that the UK’s“ continued reliance on imports, mean that an increasing quantity of emissions are likely to be excluded from the international greenhouse gas accounting framework” - where source Countries do not report deforestation or regrowth.
Therefore, taking the IPCC simple guidance at face level, leads to several unintended consequences for the UK. In particular, the acceptance that burning food, cardboard, garden waste and trees can be counted as ‘zero carbon’ is key to many decisions affecting policies and Government support. It allows carbon from incinerating biomass waste to be excluded from Emissions Trading Scheme (ETS) taxes, excluded from carbon emission claims (including those made for investment decisions), carbon intensity figures, justifies UK claims that ‘renewables’ are decarbonising UK electricity and encourages increased incineration capacity.

ETS - The emissions from burning the biomass element of waste (typically about half) are not planned to be taxed or traded under the Emissions Trading Scheme, thus incentivising higher volumes of food, garden waste and cardboard etc to be burnt.

Carbon intensity of incinerated waste for electricity The BBC (Ref 1.4) found that “they 'had to' count biomass emissions as zero” when reporting that burning waste for electricity is as carbon intense as burning coal, whereas including biomass emissions (even as a note) would show that incineration of mixed waste is far worse. My Grid GB (Ref 1.5) reports on carbon intensity and also aligns with official figures to place biomass in the renewables category.

Burning biogenic waste for electricity v landfill - the 2011 energy hierarchy (Ref 1.6) treats landfill of food, cardboard and garden waste as always worse than incineration, whether or not rotting matter has been removed, or methane captured for landfill.

Whereas the CCC is clear (Ref 1.7) that landfilling biogenic waste, such as food, cardboard and garden waste with no mitigation measures undisputably incurs high levels of methane. The CCC is also clear that there are a range of options that it recommends to significantly minimise GHG emissions from landfill.

- Landfill bio-degradable ban

- Landfill ban for all wastes

- Landfill methane capture
- Landfill methane oxidation
- Wastewater GHG improvement
- Composting
- GHG improvement

The CCC makes the point that: "There must be sufficient recycling/composting/AD treatment capacity made available before the ban comes into force, so that significant increases in energy -from-waste are avoided."
However, when it states that "Good progress has been made in decarbonising waste in the past three decades, mainly through landfill taxes reducing waste sent to landfill." it implies, conversely, that it is better to send all biogenic waste to an incinerator rather than landfill.

Flaws in Incineration/Landfill assumptions. UKWIN (Ref 1.8) lists many studies that dispute that all Landfill is worse than all Energy from Waste (ie incineration). For instance:

- Eunomia (Ref 1.9) "it does not take into account the time profile of GHG emissions or the sequestration effect of landfill."
- Dominic Hogg in the study of the Edmonton Incinerator replacement being eligible for funding from 'green bonds' (Ref 1.10) points out that no credit is allocated for fossil carbon sequestered in landfill and that the carbon intensity figures for incineration are grossly out of date and out of line with UK decarbonisation expectations.
- The climate change impacts of burning municipal waste in Scotland - Technical Report (Zero Waste Scotland, July 2021 (Ref 1.11) says "Landfill and EfW impacts are equal when the proportion of food and paper waste in residual municipal waste falls from the main model assumptions by 10.4% from 43.1% to 32.7%.")
- Defra 2014 Energy Recovery for Residual Waste – A carbon-based modelling approach (Ref 1.12). "The different compositions resulted in a wide range of biogenic content, CV and efficiencies required for EfW to be better than landfill" This sets out two ways to account for the way that landfill acts as a partial carbon sink for the biogenic carbon: "► Method 1 - Account for fossil CO2 and sequestered biogenic carbon - "Estimate the amount of biogenic carbon sequestered and include the CO2 produced from the same amount of carbon in the EfW side of the model (or subtract it from the landfill side)" ► Method 2 - Account for all carbon - "Include all carbon emissions, both biogenic and fossil on both sides of the model"

These examples show that the UK's blanket acceptance of the waste hierarchy, with no level for treated biogenic matter and no examination of the fundamental calculations have the unintended consequence of a lock-in to increased high carbon incineration.

Burning wood for electricity - Drax receives subsidies of £982.5m a year in 'renewable subsidies' (Ref 12). Similarly this was reported by The Guardian (Ref 1.14) as more than £7bn in bill-payer-backed subsidies since 2012.

(Ref 1.1) https://www.chathamhouse.org/2017/02/woody-biomass-power-and-heat/2-accounting-biomass-carbon-emissions

(Ref 1 2) https://stopburningtrees.org/about

(Ref 1.3) https://iopscience.iop.org/article/10.1088/1748-9326/aaa512/pdf

(Ref 1.4) https://www.bbc.co.uk/news/articles/cp3wxgje5pwo (How we calculated the emissions section)

(Ref 1.5) https://www.mygridgb.co.uk/dashboard/

(Ref 1.6) https://assets.publishing.service.gov.uk/media/5a795abde5274a2acd18c223/pb13530-waste-hierarchy-guidance.pdf

(Ref 1,7) https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Waste.pdf

(Ref 1.8) UKWIN-2021-Good-Practice-Guidance-for-Assessing-the-GHG-Impacts-of-Waste Incineration.pdf

(Ref 1.9) https://ukwin.org.uk/files/pdf/Eunomia_July_2011_Climate_Change_Impacts.pdf

(Ref 1.10) Dominic Hogg Should the NLWA Incinerator be Eligible for Green Bonds? https://static1.squarespace.com/static/5fac6c36040eba5dc1b46766/t/62582306b13846610205e7dd/1649943305722/Elig

(Ref 1.11) https://www.zerowastescotland.org.uk/content/climate-change-impact-burning-municipal-waste-scotland

(Ref 1.12) https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=19019

(Ref 1.13) £982.5 million in renewable subsidies

(Ref 1.14) https://www.theguardian.com/business/article/2024/sep/09/why-the-uks-biggest-carbon-emitter-receives-billions-in-green-subsidies?CMP=share_btn_url

Background – further IPCC guidance - However, the IPCC also says in FAQ 2-10 (Ref 1.15) that the "approach of not including these emissions in the Energy Sector total [ie for the Country where burnt] should not be interpreted as a conclusion about the sustainability, or carbon neutrality of bioenergy" and "an industry sector – may require additional analytical work and assumptions beyond the scope of the 2006 IPCC Guidelines to attribute all relevant bioenergy emissions"

FAQ 2-10 goes on to list emissions associated with growing bioenergy crop, land-use change, fertilization, transportation, etc. that can be entered at the sub-national entities of interest if additional analysis were to be done. And these support the Chatham House list of factors that would be taken into account in a GHG focussed calculation.

The blanket following of the IPCC guidance for burning biogenic material leaves Governments at risk of legal action, such as brought by the Lifescape Project rewilding charity (Ref 1.16) that claims that "adopting the Biomass Strategy fails to properly analyse the extent to which forest biomass energy and bioenergy with carbon capture and storage (BECCS) can make the required contribution to net zero."

(Ref 1.15) https://www.ipcc-nggip.iges.or.jp/faq/faq.html Q2-10

(Ref 1.16) https://www.bioenergy-news.com/news/uk-government-faces-high-court-challenge-against-biomass-strategy/

Q1 a). Has the CCC formally considered the option for the UK Government to require the energy and waste sectors to conduct additional analytical work to ensure that assumptions affecting UK Sectors are based on actual emissions, rather than assumptions about data in land use Sectors in other Countries? Please provide the relevant documentation.

Q1 b). Has the CCC examined research, such as by UKWIN, the Chatham House report, the Stop Burning Trees Coalition and the Lifescape Project, before concluding that policies are sound that accept that burning biomass can be counted as zero carbon? Please provide the relevant documentation.

Q1 c). Did the CCC research into the mitigation of landfill examine the GHG savings of the recommended actions versus incineration or make any recommendations that the waste hierarchy should be reviewed to differentiate between burying or burning biogenic as well as fossil based waste? Please provide the relevant documentation.

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2 What is the evidence base used to advise on Carbon Capture and Storage for different carbon sources?

Background. The Climate Change Committee, 2021 Sixth Carbon Budget (Ref 2.1) recommended CCS for several sectors from headwinds to tailwinds, including the use of 'blue hydrogen' where carbon emissions from gas are captured and stored (Ref 2.2). However it is critical to be quite clear on where carbon capture would be the best solution and to be clear on the carbon emission implications for each recommendation.

- For incineration of waste Veolia (Ref 2.3) is undertaking trials on the feasibility of capturing carbon from incinerating waste and Cory has advanced plans (Ref 2.4) to capture emissions from its Energy from Waste incinerator in South East London. Based on the acceptance that burning biogenic waste 'is' zero carbon the capture of the actual carbon from this element is classified as 'negative carbon'. It therefore enables business profits to be made from the market in carbon credits.
- For electricity from burning wood. In October 2024 Claire Coutino, who, when in Government had signed off BECCs at Drax, changed her belief that BECCs should go ahead. (ref 2.5) "the case for the technology had simply unravelled" and"We cannot go green by burning trees at huge cost to the public. If the widespread burning of forests is part of the solution to climate change, then we have to ask ourselves what problem we are trying to solve."
- For gas powered electricity, Carbon Brief in Reality Check (Ref 2.6) points out the contradiction between extending natural gas consumption via CCUS, contrary to the need to wind-down of domestic production and decoupling energy prices from gas. It reports that the "North Sea Transition Authority (NSTA) – the body responsible for overseeing the oil and gas industry – significantly underestimate upstream emissions of imported gas. A comparison with independent studies suggests that emissions related to LNG from the USA could be 80% to 150% higher than reported by the NSTA."
- For 'blue hydrogen'. Michael Leibriech produced a comprehensive 'Clean Hydrogen ladder' (Ref 2.7) classifying every possible application against 'unavoidable' and 'uncompetitive'. He only examined 'clean hydrogen' and not hydrogen created from natural gas with no CCS. Fertiliser and Methanol were among very few processes that he deemed unavoidable as needing hydrogen, with a few others, such as shipping, steel and chemical feedstock also possible.

A group of eminent scientists (Ref 2.8) asked that "We strongly urge you to pause your government's policy for CCUS-based blue hydrogen and gas power, and delay any investment decision into the Track 1 programme until all the relevant evidence concerning the whole-life emissions and safety of these technologies has been properly evaluated". This questioned the assumptions around the 'blue' hydrogen policy, where emissions would be captured with Studies contradicting assumptions about methane. "this policy would lock the UK into using fossil fuel based energy generation to well past 2050. In particular given declining North Sea gas supplies it would lock the UK into increasing Liquefied Natural Gas (LNG) imports."

• For cement, steel, chemicals, fertilisers. As investigated by Michael Leibreich, these are likely to be the processes benefitting from 'clean' hydrogen, that does not require gas or a small quantity of 'blue' hydrogen with CCS.

(Ref 2.1) The-Sixth-Carbon-Budget-Methodology-Report.pdf

(Ref 2.2) https://www.nationalgrid.com/stories/energy-explained/hydrogen-colour-spectrum

(Ref 2.3) https://www.circularonline.co.uk/news/veolia-launches-feasibility-study-of-uks-first-carbon-capture-tech/

(Ref 2.4) https://www.corygroup.co.uk/media/news-insights/cory-partners-shell-catalysts-technologies-and-technip-energies-advance-carbon-capture-project/

(Ref 2.5) https://www.bioenergy-news.com/news/uk-conservatives-backtrack-on-beccs-support/

(Ref 2.6) https://carbontracker.org/reports/ccus-a-reality-check/

(Ref 2.7) https://www.liebreich.com/the-clean-hydrogen-ladder-now-updated-to-v4-1/

(Ref 2.8) https://www.campaigncc.org/sites/data/files/sites/data/files/Docs/letter_to_sos_-_blue_hydrogen_and_ccus.pdf?utm_source=substack&utm_medium=email

Current plans for CCUS. Based on the advice that CCUS will reduce the UKs carbon emissions, rather than the advice of the scientists above, Government's CCUS £21bn programme has been announced (Ref 2.9), including the Teeside 'cluster'. The map of the Teeside Hynet Cluster Track 1 (Ref 2.10) is clearly for many carbon sources (and uses) including those deemed avoidable or uncompetitive by Micael Leibreich.

This cluster covers:

• Eg Electricity from burning waste
• Electricity from burning Biomass
• Electricity from gas power
• Hydrogen production (from gas)
• Aviation fuel
• Fertiliser (which sells carbon dioxide for commercial uses, such as beer to meat to fizzy drinks, use in hospitals and as a coolant in nuclear power plants)

(Ref 2.9) https://www.gov.uk/government/news/government-reignites-industrial-heartlands-10-days-out-from-the-international-investment-summit

(Ref 2.10) https://www.netzeroteesside.co.uk/

Finance and Returns for CCUS – CCUS has an eyewatering price tag, whilst Carbon Brief's Reality Check (Ref 2.11) report concludes that "the costs of carbon capture technologies were underestimated by 50% or more.." The provision of CCUS is inextricably linked to Returns on Investment or payments from end customers in bills or taxes. The 2018 'Delivering Clean Growth: CCUS Cost Challenge Taskforce Report' (Ref 2.12) looked at Equity and Viable technical solution for investors and noted "Technology available in more or less proven form although performance may need to be proven in integration and at scale." It suggested that there should be a new risk allocation framework with the Government owning, at least initially the risks to reduce the cost of CCUS projects." It also suggested that the high cost of Transport and Storage construction could be shared with electricity consumers.

However there is pressure from the oil and gas industry to focus on financial opportunities rather than maximum GHG savings, according to Carbon Brief's Reality Check reporting that these players see "the provision of the storage component of CCUS as both a diversification opportunity and an enabler for the extension of fossil fuels production - whether produced in the UK or imported as LNG."

Enabling attractive Returns on Investment, Claire Coutino, Conservative Sec of State in (Ref 2.13)

said in Dec 23: "We will make this vision a reality through the development of a commercial and competitive CCUS market" where Carbon Pricing is key.
Myles Allen in The Conversation (Ref 2.14) suggests charging say 5p per kWh for using CCS, rather than enabling profits for investment providers.
(Ref 2.11) https://carbontracker.org/reports/ccus-a-reality-check/
(Ref 2.12) https://assets.publishing.service.gov.uk/media/5b5039beed915d438094e06a/CCUS_Cost_Challenge_Taskforce_Report.pdf
(Ref 2.13) https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-a-vision-to-establish-a-competitive-market/carbon-capture-usage-and-storage-a-vision-to-establish-a-competitive-market
(Ref 2.14) https://theconversation.com/getting-carbon-capture-right-will-be-hard-but-that-doesnt-make-it-optional-241515

So, whilst Performance remains a risk and current analysis is that there is a small need for capturing (clean) hydrogen one of the main expectations for income is the trading of 'negative emissions' from biomass burning.

Q2. Did the CCC differentiate between sources of carbon to make its recommendations regarding CCS? In particular did it study research, such as these mentioned, to advise on which are truly unavoidable, which truly competitive and which justify capturing emissions from hydrogen produced by gas? Please provide the relevant documentation.

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3 What is the evidence base behind recommendations for different types of heat networks and which counterfactuals were used?
The CCC recommended in 'UK Heat and Buildings Strategy' March 2022 (Ref 3.1) for heat delivered by 'low carbon district heat networks' to be 50 TWh in 2035 rising to 80 TWh in 2050. In 'Progress in reducing UK emissions – 2023 report to Parliament' p164 (Ref 3.2). It defines low carbon heating systems (P166) as "Low-carbon heating systems should produce close to zero greenhouse gas emissions across their lifecycle. The time taken to deploy an option at scale matters – earlier deployment will minimise additional emissions from fossil fuel combustion".
It says that "The Government should increase support for the (mostly known) locations where district or communal heating will be the best option for low-carbon heat. These networks could use either electrical or waste heat; with potential scope for a limited role for hydrogen in the longer term."
It does not elaborate, in the case of heat networks, how the CCC determines which type of heat network is low carbon, or the methodology and assumptions that should be used to calculate this.
The document with assumptions for the Sixth Carbon Budget (Ref 3.3) at the 'Fuel costs and CO2 tab' has figures for
- Heat networks - electricity-based
- Heat networks - gas to hydrogen peaking

There are no entries for Heat Networks from incineration, sewers, data centres etc and no indication of what heat source is used for the electricity case (ie whether large Air Source Heat Pumps, Ground Source Heat Pumps, Aquifers). It refers to a 2015 analysis for 'Heat from low carbon heat networks', again implying that all heat networks are 'low carbon', for whatever heat source and whatever distribution cost/CO2.
My recent analysis (Ref 3.4) of the basic assumptions that justified taking heat from the replacement Edmonton incinerator shows that, usually heat networks that require long pipes are

not lower carbon than taking just electricity from incinerators. Flaws in the calculations for that project included:

- that the embodied carbon and fuel prior to connection to the heat network of satellite energy centres can be disregarded
- that there are no lower carbon alternatives to individual gas boilers
- that the electricity grid would have the carbon intensity of about ten years ago
- that all the heat that is claimed will be exported is used to genuinely displace alternative heat solutions
- carbon lost due to demand flexibility is zero.
- carbon emissions from energy used to pump hot water, eg uphill can be disregarded.

Without carbon assessments of this level, per proposal, the blanket assumption that large scale heat networks must crowd out alternative heat solutions will have the unintended consequence of delaying our route to decarbonise the UK.

(Ref 3.1) https://www.theccc.org.uk/wp-content/uploads/2022/03/CCC-Independent-Assessment-The-UKs-Heat-and-Buildings-Strategy.pdf?form=MG0AV3

(Ref 3.2) https://www.theccc.org.uk/wp-content/uploads/2023/06/Progress-in-reducing-UK-emissions-2023-Report-to-Parliament-1.pdf

(Ref 3.3)
https://view.officeapps.live.com/op/view.aspx?src=httpswww.theccc.org.ukwp-contentuploads202012Assumptions-Log-Development-of-trajectories-for-residential-heat-decarbonisation-to-inform-the-Sixth-Carbon-Budget-Element-Energy.xlsx&wdOrigin=BROWSELINK

(Ref 3.4) Carbon Effects of a heat network from an incinerator rather than just electricity Sydney Charles Aug 2024 https://docs.google.com/document/d/1wLwJevRzuf8Vb0Ki-DYzOEQdXkRg9PQa/edit

Q3.a) Did the CCC differentiate between small communal heat networks and large district heat networks in terms of whole life carbon when making its recommendation? Please provide the relevant documentation.

Q3.b) Did the CCC use counterfactuals of individual gas boilers, individual Air Source Heat Pumps or another and calculate whole life carbon for these when making its recommendation? Please provide the relevant documentation.

Our response:

Thank you for your request. We have handled your request under the Environmental Information Regulations 2004 (EIR).

Question 1: The evidence base for claiming that the burning of biomass, including food, garden waste, cardboard and trees 'is' zero carbon – or can be treated as zero carbon for making recommendations?

Under the Climate Change Act (2008) we are required to follow international carbon reporting practice for determining emissions, as per the UK's national emissions inventory. The guidelines for this are set through the international process by the UNFCCC/IPCC.

Our 2018 report, Biomass in a low-carbon economy, includes more information and supporting research on our biomass recommendations.

1a) Has the CCC formally considered the option for the UK Government to require the energy and waste sectors to conduct additional analytical work to ensure that assumptions affecting UK Sectors are based on actual emissions, rather than assumptions about data in land use Sectors in other Countries? Please provide the relevant documentation.

The CCC does not hold any documentation on this.

1b) Has the CCC examined research, such as by UKWIN, the Chatham House report, the Stop Burning Trees Coalition and the Lifescape Project, before concluding that policies are sound that accept that burning biomass can be counted as zero carbon? Please provide the relevant documentation.

The CCC does not hold any documentation on this.

1c) Did the CCC research into the mitigation of landfill examine the GHG savings of the recommended actions versus incineration or make any recommendations that the waste hierarchy should be reviewed to differentiate between burying or burning biogenic as well as fossil based waste? Please provide the relevant documentation.

The CCC does not hold any documentation on this.

Question 2: The evidence base used to advise on Carbon Capture and Storage for different carbon sources?

The evidence used in deciding our assumptions on carbon capture and storage (CCS) use are set out in the Sixth Carbon Budget Methodology Report.

2a) Did the CCC differentiate between sources of carbon to make its recommendations regarding CCS? In particular did it study research, such as these mentioned, to advise on which are truly unavoidable, which truly competitive and which justify capturing emissions from hydrogen produced by gas? Please provide the relevant documentation.

The modelling approach for CCS and the differences assumed for sources from different sectors can be found in the Sixth Carbon Budget Methodology Report.

Question 3: The evidence base behind recommendations for different types of heat networks and which counterfactuals were used?

The evidence base behind our recommendations for different types of heat network are set out in the Sixth Carbon Budget Methodology Report.

3a) Did the CCC differentiate between small communal heat networks and large district heat networks in terms of whole life carbon when making its recommendation? Please provide the relevant documentation.

We did not differentiate between small communal heat networks and large district heat networks in terms of whole life carbon.

3b) Did the CCC use counterfactuals of individual gas boilers, individual Air Source Heat Pumps or another and calculate whole life carbon for these when making its recommendation? Please provide the relevant documentation.

We did not use counterfactuals of individual gas boilers/air source heat pumps and calculate whole life carbon.

Information disclosed in response to this EIR request is releasable to the public. In keeping with the spirit and effect of the EIR and the government's Transparency Agenda, this letter and the information disclosed to you may be placed on the CCC website, together with any related information that will provide a key to its wider context. No information identifying you will be placed on the CCC website.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. If you are not content with the outcome of the review, you may apply directly to the Information Commissioner for a decision. In keeping with our transparency policy, the information released to you will be published on www.theccc.org.uk. Please note that this publication will not include your personal data.

Kind regards,

Climate Change Committee