FOREST LITIGATION COLLABORATIVE

Response to the UK Government's Consultation on a transitional support mechanism for large-scale biomass generators

29 February 2024

Joint submission by The Lifescape Project and The Partnership for Policy Integrity, operating jointly as The Forest Litigation Collaborative.

Preliminary comments

The Government's proposal to provide a transitional support mechanism to biomass generators is both premature and misguided. The consultation is premature for the following reasons:

1. As explained in our letter to the Government dated 31 January 2024, the consultation should be deferred in light of the NAO report published on 24 January 2024. The report found that the Government *"cannot demonstrate that its current arrangements are adequate to give it confidence industry is meeting sustainability standards."*[1] This must be rectified before any new contracts are awarded. Specifically, the Government needs to implement the NAO's recommendation that it assess the potential environmental impact of any transitional support before reaching a decision on such support.
2. Ofgem is currently investigating Drax, which stands to be the largest recipient of any transitional support. The results of the Ofgem investigation are expected this year and could have a major bearing on the principle and form of any transitional support mechanism**.** Therefore, this consultation should be deferred until the results of the investigation by Ofgem are published and adequately considered.
3. Crucial evidence underpinning the decision-making on the consultation is currently lacking. The impact assessment of the consultation acknowledges that the *"most significant costs for biomass generators are the cost of the biomass fuel stock itself"* whilst also noting that *"the Government will be seeking detailed information on the costs of biomass fuels to fully understand operational costs."* Such *"detailed information"* is an essential precursor to a proper determination by Government of its preferred options. The current options have therefore been selected on an inadequate and incomplete factual basis.
4. Given that the Government has committed to consulting on a cross-sectoral Sustainability Framework for biomass in 2024, the uncertainty over the future sustainability criteria to be applied under a transitional support mechanism also renders this consultation premature. The new Framework could have a significant bearing on factors that are critical to the decision on a) whether to provide any transitional support, and b) the appropriate form of that transitional support. For example, the Framework could exclude certain types of feedstocks from being used in UK biomass generation, which could then affect the eligibility of certain generators for ongoing support.

[1] The National Audit Office, 'The Government's Support for Biomass' (January 2024), The government's support for biomass (nao.org.uk), paragraph 16. https://www.nao.org.uk/wp-content/uploads/2024/01/Report-the-governments-support-for-biomass.pdf

Committing to new subsidies before defining and consulting on a new Framework will inevitably limit the scope and influence that the new Framework will have and/or result in an inconsistent, incoherent approach.

The consultation is misguided because it, and the proposed transitional support mechanisms, are based on an erroneous underlying assumption that forest biomass is zero or low carbon, or carbon neutral, whether through a misapplication of the IPCC reporting rules or with adherence to the current sustainability criteria. In either case, this assumption is false; there are no criteria that will compensate for the fact that burning wood emits carbon quickly, while trees regrow slowly. This is the central reason why there are no circumstances under which burning forest biomass can be truthfully considered instantaneously "low carbon" or "carbon neutral." This false assumption underpins the whole consultation, rendering invalid the entire premise on which the transitional support mechanism and its preferred options are based. We explain this in greater detail in our response to question 1 below.

As the Government has chosen to proceed with the consultation despite the withdrawal request, Lifescape and PFPI respond to the questions posed as follows.

1. Do you think the government should intervene to create a support mechanism to help biomass generators transition to power BECCS?

We do not support the proposed government intervention to create a support mechanism for biomass generators to transition to power BECCS. This is for the following six reasons:

A. Support for burning wood for energy is based on a false premise that forest biomass has "zero" emissions, is "low carbon," or is "carbon neutral"

The proposed transitional support subsidies are based on the false premise that existing UK biomass generation is "low carbon," "zero carbon", or "carbon neutral." Paragraph 48 of the Impact Assessment makes the claim directly:

"Unabated biomass is a low carbon method of producing electricity, with the burning of biomass feedstock categorised as carbon neutral, it is only the transportation and other administrative processes that cause greenhouse gas emissions."[2]

UK electricity generation from biomass depends primarily on burning wood pellets made from North American and European trees and sawmill residues. The annex to our comments (p. 20) provides a detailed overview of why burning forest biomass is not "low carbon" or "carbon neutral." More briefly here, the treatment of forest biomass for energy as low carbon or carbon neutral stems from two false arguments: first, a misapplication of the IPCC's reporting guidelines; and secondly from the claim that compliance with sustainability criteria will render the energy low carbon / carbon neutral. Taking each of these in turn:

[2] We note that the while the Impact Assessment refers to the "carbon neutrality" of biomass, the consultation itself uses the term "low carbon." Both terms are invalid.

Misapplication of the IPCC reporting guidelines

Under the IPCC reporting guidelines, carbon emissions from biomass harvesting are counted in the land use sector only of the source country. In order to avoid double-counting those emissions, the carbon emitted by the combustion of biomass in a power station is counted as "zero" in the energy sector of the country where that power station is located.

The IPCC 2019 GHG guidance update makes it clear that the bookkeeping convention of treating biomass as "zero" emissions in the energy and waste sectors does not reflect physical reality, so when using inventory estimates (that treat biogenic emissions as zero in those sectors), *"it is necessary"* to refer across to the sectors where the emissions *are* reported:[3]

"The CO_2 emissions from wood biomass burnt are not reported in either the Energy sector (burnt for energy purposes) or Waste sector (burnt or lost without energy recovery). This is to avoid the possibility of double counting these emissions in two or more GHG inventory sectors because they are already included in the AFOLU sector. ***When using inventory estimates to assess the CO_2 emissions arising from energy use, including wood for energy purposes, it is necessary to consider relevant emissions estimated in the Energy and AFOLU sectors****."*[4]

Accordingly, while the UK is allowed to count biogenic emissions as "zero" in the energy sector under IPCC rules to avoid double-counting, treating this accounting convention as if it represents reality contravenes the IPCC's guidance.

Reliance on sustainability criteria

The Government also claims that compliance with sustainability criteria renders forest biomass "low carbon" at the time of its combustion. This ignores the reality that burning wood releases carbon instantly into the atmosphere whilst forest regrowth requires decades to centuries. The process is not simultaneous - there is a significant time lag or payback period (measured in decades or more), before forest regrowth sequesters equivalent carbon as that emitted by burning biomass. This was recognised in the 2014 Bioenergy Emissions and Counterfactual ("BEAC") study commissioned by the Government itself.[5]

As the BEAC study and multiple other studies have also concluded, the cumulative atmospheric CO_2 loading associated with logging and burning forest biomass can exceed cumulative emissions from a same-capacity fossil fuel unit for decades to centuries. This was recognized in the 2016 EU biomass impact assessment to which the UK's own Forest Research contributed extensively,[6] and in the major Joint Reseach Center review from 2021.[7]

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[3] The reference to "relevant emissions estimated in the Energy" sector presumably refers to the "memo" item in IPCC reporting that reports CO_2 emissions from biomass energy but is not included in the national total.

[4] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch12_HarvestedWoodProducts.pdf at page 12.33

[5] Stephenson, A. L. and D. J. C. MacKay (2014). Life Cycle Impacts of Biomass Electricity in 2020 London, UK, UK Department of Energy and Climate Change: 154.

[6] https://eur-lex.europa.eu/resource.html?uri=cellar:1bdc63bd-b7e9-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

[7] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC122719/jrc-forest-bioenergy-study-2021-final_online.pdf

Because the Government assumes biomass is instantaneously carbon neutral, all the modelling done for the impact assessment and ensuing conclusions is inaccurate and cannot be relied upon. The analysis must be redone taking into account the true carbon impact of forest biomass before any options for transitional support can be properly developed.

B. Burning forest-biomass for electricity generation poses risks to the UK's emissions reduction targets and energy security

Burning wood not only increases emissions compared to fossil fuels, but logging forests for biomass fuel is degrading the forest carbon sink. Both factors jeopardise the ability of the UK (and the planet) to reduce the concentration of CO_2 in the atmosphere.

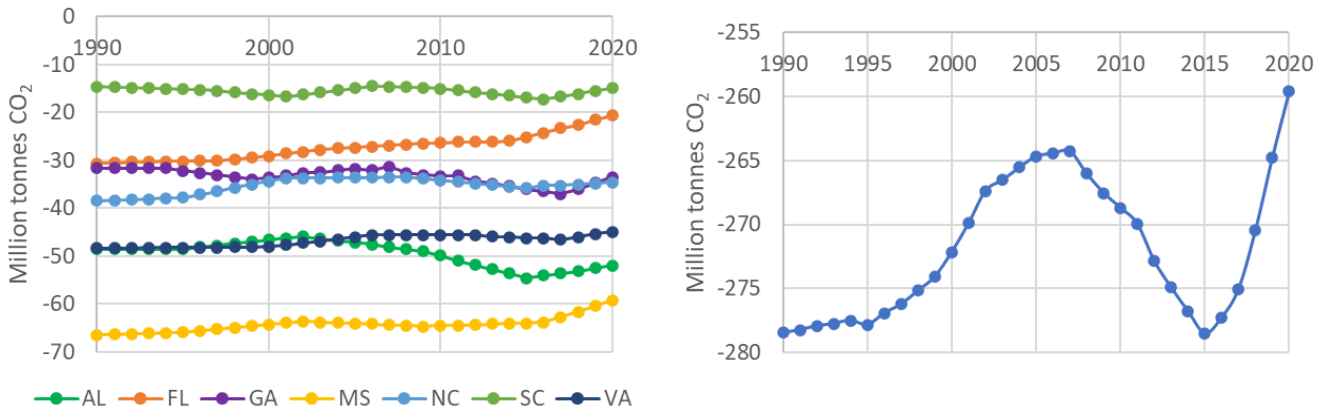

Figure 1. Forest carbon flux by state and summed data for all seven states where the US wood pellet industry is operating.[8] States are Alabama, Florida, Georgia, Missississpi, North Carolina, South Carolina, and Virginia. Recent weakening of the forest carbon sink coincides with rapid growth by the wood pellet industry.

Given the degree to which climate mitigation plans rely on increasing sinks for CO_2, the weakening and even loss of the forest carbon sink is especially concerning. The connection between bioenergy logging and degradation of the sink in Europe was observed by Ceccherini et al (2020 and 2021) using remote sensing[9]. Booth (2022)[10] examines the connection between weakening of the forest carbon sink and the expansion of bioenergy in EU countries since 1990. The European Scientific Advisory Board

[8] Data from U.S. Environmental Protection Agency. Database of State GHG Emissions and Removals, https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals (2023).

[9] Ceccherini, G., et al. (2020). Abrupt increase in harvested forest area over Europe after 2015. Nature 583(7814): 72-77. https://www.researchgate.net/publication/342615330_Abrupt_increase_in_harvested_forest_area_over_Europe_after_2015. **Also**, Ceccherini, G., et al. (2021). Reply to Wernick, I. K. et al.; Palahí, M. et al. Nature 592(7856): E18-E23. At https://doi.org/10.1038/s41586-021-03294-9.

[10] Booth, M. S. (2022). Burning up the carbon sink: How the EU's forest biomass policy undermines climate mitigation, and how it can be reformed Partnership for Policy Integrity. At https://forestdefenders.eu/wp-content/uploads/2022/11/PFPI-Burning-up-the-carbon-sink-Nov-7-2022.pdf

on Climate Change recently highlighted[11] that Europe's carbon sinks are shrinking rapidly, noting that logging forests for fuel is a major contributor.

In the US, there has been an abrupt weakening of the forest carbon sink in the seven states of the US Southeast that are home to the wood pellet plants that supply most of the fuel burned in the UK (Figure 1). As the upward turn of the values shows, the forest carbon sink became abruptly less negative (thus weaker) in the years that the pellet industry has been showing rapid grwoth. In-depth research confirms these trends. For example, a study focused on Drax's pellet manufacturing facilities in the southern US found that the existence of the pellet mill itself is driving thinning activity, to the overall detriment of forest carbon stocks on a long-term basis.[12]

Moreover, woody biomass would not meet the UK Government's 2018 GHG threshold and therefore should not be eligible for new CfDs, nor any other support that goes beyond 2027 (even if these are one-off contracts awarded outside allocation rounds). The UK GHG criteria for biomass only apply to fossil fuel CO_2 emissions associated with manufacturing and transporting biomass (and trace amounts of non-CO_2 GHGs emitted from biomass combustion). Accordingly, the GHG criteria are not particularly relevant to the climate impact of bioenergy, compared to the far more sizeable biogenic carbon emissions. Nonetheless, back in 2018 the Government acknowledged that allowing new biomass units to qualify using the existing GHG threshold would lead to GHG emissions "significantly above the projected UK grid average for most of the lifetime of any new CfD projects."[13] It therefore set a revised GHG threshold of 29 kg CO2e/MWh for new biomass generator contracts. Drax's declared lifecycle emissions in 2022 were 96 kg CO2e/MWh,[14] more than three times higher than the 2018 threshold. Accordingly, even on the basis of the emissions the Government does count, any extension of subsidies would support biomass electricity generation with fossil fuel emissions that are far more carbon intensive than BEIS deemed appropriate back in 2018. At that time, the Government concluded that "*[a]ny biomass plants offered new 15-year contracts from this point forwards would need to be subject to tightening emissions controls in order to meet the CfD scheme's objectives of supporting low carbon electricity*."[15] There is no evidential or policy basis for now departing from this position.

The consultation states that the Government has committed to a fully decarbonised power system by 2035. Given that burning wood emits more CO_2 than fossil fuels and causes continuing carbon loss from forests logged for biomass, it should have no role in a truly "decarbonised" energy system. The

[11] See an overview at https://www.hs.fi/politiikka/art-2000010119878.html; full report at https://climate-advisory-board.europa.eu/reports-and-publications/towards-eu-climate-neutrality-progress-policy-gaps-and-opportunities/esabcc_report_towards-eu-climate-neutrality.pdf/@@download/file

[12] Buchholz, T., et al. (2021). When Biomass Electricity Demand Prompts Thinnings in Southern US Pine Plantations: A Forest Sector Greenhouse Gas Emissions Case Study. Frontiers in Forests and Global Change 4(42). At https://www.frontiersin.org/article/10.3389/ffgc.2021.642569

[13] Paragraph 162 at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736640/Consultation_document.pdf

[14] Page 49 of Drax 2022 AFR

[15] Paragraph 162 at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736640/Consultation_document.pdf

Government's ongoing support for it jeopardises its attainment of carbon budget 6, the net zero target and its commitments under the Paris Agreement.

C. Sustainability criteria will not render the burning of forest wood "low carbon"

There are no sustainability criteria that are capable of compensating for the fact that burning wood emits carbon quickly while trees regrow slowly, meaning that under no circumstances should burning forest biomass be considered "low carbon" or "carbon neutral." Better compliance with the existing sustainability criteria, or developing new sustainability criteria, will not, therefore, render forest biomass "low carbon."

Sustainability, however defined, is not a proxy for biomass being low carbon or carbon neutral. The IPCC has expressly warned that the IPCC Guidelines "*do not automatically consider or assume biomass used for energy as "carbon neutral", **even in cases where the biomass is thought to be produced sustainably***."[16] It is important to note that the IPCC does not itself define what "sustainable" harvesting means.

The main reasons why sustainability criteria, current or future, do not and will not render forest biomass low carbon are as follows:

a) First, there is nothing in the sustainability criteria to ensure that the forest biomass that complies with the criteria is actually low carbon in the sense that the net carbon impact of biomass combustion is low or zero.

b) Second, the formulas used to calculate the emissions under the GHG criteria for each scheme only account for the fossil fuel-derived lifecycle emissions from growing, harvesting, processing, and transporting biomass, as well as non-CO_2 GHG emissions from biomass combustion. These emissions are a small fraction of the total carbon emitted by manufacturing and burning biomass. None of the the biogenic carbon emitted by burning the wood in the smokestack, from soil disturbance during the harvesting process, from decomposition of forestry residues, roots and stumps left over after harvesting, and from burning wood during the pellet-drying process is counted under the sustainability criteria. The criteria therefore omit the majority of the carbon emitted by forest bioenergy.

c) Third, whilst the "land criteria" generally prohibit the sourcing of biomass which has resulted from direct land use change (i.e. from forestry to agriculture), intensive harvesting and clearcutting (even of forests that have never been previously logged) does not constitute "land use change" and is therefore allowed under the sustainability criteria.

d) Fourth, the criteria do not protect forest carbon stocks because they do not prevent increased carbon emissions from forests. Under the sustainability criteria, increased logging intensity that transfers more forest carbon to the atmosphere could still be counted as "sustainable" as long as some forest carbon sink at the regional or national level was maintained. Figure 1 provides a real-life example of the shrinkage of the forest carbon sink in the US Southeast, which supplies the majority of the so-called sustainable biomass burned by Drax.

[16] https://www.ipcc-nggip.iges.or.jp/faq/faq.html

e) Related to the previous point, there is nothing in the sustainability criteria that mitigates the reality that burning wood emits carbon faster than trees can regrow. Nor will any future sustainability criteria address this problem.

f) The sustainability criteria are often based on what is considered legal in the country from which the forest biomass is sourced. As it is legal in Canada to fell old growth and even primary forests for wood pellet production, this means wood pellets made from these forests qualify as "sustainable" under this aspect of the criteria.

In any case, there is significant doubt as to whether wood pellet suppliers are even adhering to the current sustainability criteria. The National Audit Office report examining the Government's support for biomass (published on 24 January 2024) found insufficient evidence that the current biomass sustainability criteria are being met for wood burned in UK power stations. This means that even if the Government's claims that the criteria ensure carbon neutral/low carbon biomass were accurate (and they are not), bioenergy generation cannot clearly currently be considered carbon neutral/low carbon.

D. The proposed support mechanism does not comply with the advice of the Climate Change Committee nor with the Subsidy Control Act 2022

In a detailed assessment of the UK's progress towards a decarbonised energy system published in March 2023, the Climate Change Committee ("CCC") unequivocally advised that no further subsidies should be given for unabated biomass generation beyond 2027. It stated as follows:

"The Energy Prices Act gave the Government powers to award Contracts for Difference (CfDs) to existing generators. These powers should not be used in a way that extends subsidies for large-scale unabated biomass electricity generation at very high load factors beyond the scheduled expiry of existing Renewables Obligation and CfD support in 2027."

The Government has not provided any justification for contravening the CCC's advice. Nor can there be any justification given that the CCC in its report provides expert analysis and recommendations as to the alternative approaches the Government can take to meet its carbon budget and net zero obligations.

In addition, the proposed transitional support mechanism appears to contravene the requirements of the Subsidy Control Act 2022. Section 13(1) of the Act says a public authority must consider the energy and environment principles before deciding to give a subsidy and must not give the subsidy unless it is of the view that the subsidy is consistent with those principles. Principle A applies to energy generation and stipulates that the subsidy *"shall be aimed at and incentivise the beneficiary in:*

(a) delivering a secure, affordable and sustainable energy system and a well-functioning and competitive energy market, or
(b) increasing the level of environmental protection compared to the level that would be achieved in the absence of the subsidy."

The subsidies proposed by the Government cannot be described as incentivising a sustainable energy system given the clear environmental impacts from the widespread use of forest biomass in UK bioenergy generation. Nor can they be accurately described as incentivising a secure energy system given the Government's own acknowledgement that biomass generation cannot operate without subsidies, uncertainties around the capabilities and deployment of BECCS, and given that the subsidies do not actually *"incentivise the beneficiary"* to do anything more than to remain open and available

for future BECCS generation. Nor are the subsidies aimed at the delivery of an affordable energy system, as the subsidies, past and proposed, involve a vast expenditure of public funds that will result in an increase in the cost of consumer electricity bills.

With respect to b), the subsidies do not aim at or incentivise an increased level of environmental protection, but rather sustain a means of energy generation that is proven to be harmful to the climate and forests.

E. BECCS will not deliver negative emissions, and is unlikely even to be operationalised

We note that the consultation explicitly states that it is not concerned with the deployment of BECCS itself. However, given that the sole purpose of proposed transitional support is to hold the door open for BECCS, it is necessary to comment on this underlying rationale that is a cornerstone of the Government's decarbonisation and net zero strategy.

Our overall position, for the reasons explained below, is that we do not support the deployment of BECCS because it will not deliver meaningful climate benefits simply by storing carbon and will actively undermine climate mitigation by continuing to perpetuate forest degradation. By extension, we do not believe that further public money should be spent on the basis that it is necessary to retain the option of BECCS from 2030.

The premise of "negative emissions" from BECCS is that because the emissions have been captured and stored belowground using CCUS, carbon sequestration by plant growth now represents a net removal of CO_2 from the atmosphere. However, this is untrue for the reasons explained in the annex (p. 20) which provides a detailed overview of why burning forest biomass is not "low carbon" or "carbon neutral," and why adding CCS to biomass plants burning forest biomass will not deliver "negative emissions." In summary, under IPCC GHG reporting rules, BECCS can only deliver negative emissions if the bioenergy is carbon neutral. As explained above, this is not the case where forest or woody biomass is the feedstock.

This is because, in the case of forest biomass, growth and regrowth do not occur quickly. Given that "carbon neutrality" relies on offsetting emissions through time by regrowth, any "neutrality" may not be achieved for decades or longer, whereas the need to reduce atmospheric carbon is immediate and urgent. Thus, while adding CCS to an existing biomass plant could reduce the amount of CO_2 entering the atmosphere at the smokestack, just like adding CCUS to a coal plant would, determining whether BECCS can deliver net removal of CO_2 from the atmosphere requires counterfactual modelling to determine the net carbon balance over time. The BEAC report conducted such modelling and determined that many of the wood sources now used for bioenergy in the UK are not carbon neutral.

Given that forest biomass cannot be carbon neutral or low carbon, BECCS cannot deliver "negative emissions." At *best*, BECCS may reduce the amount of CO_2 entering the atmosphere from bioenergy. In other words, BECCS would simply take some of the carbon that was stored in trees and store it underground instead. The net amount stored might not even be positive, given the large amount of biogenic and fossil CO_2 emitted from the wood pellet manufacturing process that cannot be captured by CCS. Moreover, BECCS will be enormously costly, while the trees were storing the carbon for free. Viewed in this way, it becomes clear that BECCS is a high-cost and high-risk venture for no or little gain.

Furthermore, the proposed approach to bridging subsidies set out in the consultation does not even appear serious about ensuring the delivery of BECCS. None of the proposed support mechanisms are

designed as a definite precursor to the deployment of power BECCS. There is nothing in the Government's proposal that obliges the facilities receiving these new subsidies to take any concrete steps towards converting to power BECCS, whether by a specific deadline or at all. Consequently, this support mechanism could, in practice, be nothing more than an expensive continuation of current subsidies for unabated biomass generation, with all the negative environmental consequences associated with this.

In addition, there is significant doubt as to whether BECCS will actually materialise, whether in 2030 or at all. There have already been delays to the proposed UK BECCS schedule. Inherent uncertainties as to the deliverability of BECCS include:

1) Lack of CCS operationalisation in the UK and significant issues related to storage in existing projects globally;
2) Lack of precedent for high carbon capture rates from CCS (and systemic over-estimation of capture rates);
3) Lack of transport and storage infrastructure;
4) Uncertainties within the forest-biomass supply chain which make understanding whether any emissions reductions have been achieved highly challenging; and
5) Volatility of feedstock supply.

Moreover, BECCS is likely to be extremely expensive. Recent analysis shows that a bioenergy carbon capture plant could cost at least £43 billion over its 25-year lifetime.[17]

We are also concerned that due to the absence of a proposed sunset clause in any new contractual arrangements, biomass subsidies could be extended beyond 2030, therefore locking UK households into continued higher energy bills to support bioenergy instead of other cleaner technologies that can deliver actual emissions reductions.

F. Concerns with the proposed beneficiaries of the subsidies

Drax, as the UK's largest biomass generator, is clouded in a lack of integrity. As shown in the complaint to the OECD submitted by Lifescape, PFPI and other organisations,[18] Drax claims that burning forest biomass is carbon neutral, environmentally positive and better than burning fossil fuels. These controversial practices discredit the sustainability and carbon claims of Drax and would impact the integrity and credibility of any government transitional support mechanism from which Drax benefited.

2. Do you agree with the success factors we have identified?

We do not agree with the success factors identified because they are not based upon an accurate, scientific assessment of the impacts of burning biomass for energy. Therefore, generators provided

[17] Drax's BECCS project climbs in cost to the UK public, at https://ember-climate.org/insights/in-brief/draxs-beccs-project-climbs-in-cost-to-the-uk-public/

[18] At https://forestlitigation.org/wp-content/uploads/2024/02/2021-10-21_oecd-complaint-against-drax-group-plc_final-updated-2-november-2021.pdf

with transitional support under these terms would be incapable of delivering truly low carbon or carbon neutral energy.

Several of the success factors consider value for money, as laid out at page 13 of the consultation. However, underpinning *all* of these criteria is the premise that burning wood for energy provides low carbon or carbon neutral energy and that BECCS can ultimately deliver negative emissions. **As these conditions are not, and will not be met, none of the other "success factors" have any meaning.** Whilst it is not a position we endorse, it is plausible that fitting CCS to natural gas plants could provide greater climate benefit than continuing to log forests for fuel.

Additionally, affordability and value for money for UK taxpayers can only be assessed if the Government commits to a clear time period for the provision of support, a funding ceiling and a cut-off date.

3. Are there additional factors we should consider?

For the reasons given above, as a minimum, any plan to keep options open for BECCS should ensure that unabated biomass is genuinely carbon neutral. This is one of the essential requirements for BECCS to genuinely deliver "negative emissions." The total exclusion of forest biomass as an eligible feedstock is a necessary step. It is important to note, however, that even if biomass feedstocks were restricted to secondary wood waste and agricultural crops and residues, this would be insufficient to make forest biomass carbon neutral and therefore to ensure BECCS delivers "negative" emissions. To ensure this requires considering full biogenic and fossil lifecycle emissions, land use and land use change associated with feedstocks, and additional harvesting-processing-transporting emissions that are not capturable using CCS and thus decrease net carbon storage. The Government has not done any of the modelling required to determine the carbon balance of such feedstocks in this context.

Additional environmental and sustainability criteria should be at the core of the success factors. These include a) minimal emissions of air pollutants and b) demonstrable adherence to best practices in forest-free feedstock sourcing. This is vital given that the current UK criteria concerning forests have totally failed to protect forests from being logged for biomass, including old growth and primary forests in the US and Canada, as well as Estonia and Latvia.

Another factor to consider is whether the UK can even claim credit for biogenic carbon stored belowground. As pointed out above, BECCS using forest biomass will not deliver negative emissions because there is nothing about moving tree-carbon that was sequestered decades to hundreds of years ago to belowground storage that pulls additional CO_2 from the atmosphere. However, even if BECCS were simply counted as another way to *store* carbon, rather than to remove it from the atmosphere (as would be the case if the UK adhered to the IPCC GHG reporting protocol), arguably the stored carbon should be credited to the country from which the carbon originates. Currently, when the United States ships wood products abroad (sawtimber, panelboard, paper), the US continues to count the carbon stored in those wood products toward its own national GHG inventory. Likewise, the UK does not count the carbon stored in wood products that it imports from other countries. There is as yet no international protocol yet established for determining how biogenic carbon stored using CSS would be handled (the IPCC appears prepared to take on this question in 2027). However, it seems plausible that if the UK continues burning trees that were harvested in the US and then stores that carbon belowground, the US would be entitled to count that stored tree carbon in its own GHG inventory. In this way, it would re-credit some of the carbon that was lost from the land sector when the trees were

harvested (as occurs with harvested wood products). It is premature to make further moves towards BECCS until this fundamental issue is solved in a way that satisfies the international community.

4. Do you agree with the options above being included as preferred options? If no, please articulate why the option is not suitable and provide evidence where appropriate.

None of the preferred options protect forests or mitigate climate change. They are therefore all unsuitable and should be excluded. We have real concerns as to the legality of each of these preferred options in view of the Government's legal obligations to mitigate climate change and reduce carbon emissions.

The selection of the preferred options is flawed because each option is based on the false premise explained in response to Q1 above. This fundamental error undermines the modelling underlying the selection of the preferred options and the conclusions drawn from it. We believe that if the Government re-did its modelling in line with IPCC protocols such that the carbon impact of burning wood was fully acknowledged, policymakers of integrity would recognise that none of the preferred options are acceptable.

Protecting forests as the most important terrestrial carbon sink and upholding the UK's commitments on climate change means that the use of forest biomass for UK power generation must cease. Consequently, generators such as Drax and Lynemouth should receive no further subsidies or other forms of public funding, whether for generation or for operation. If financial support is required for them to cease operating (a "mothballing" option), a payment could be made provided that it is expressly tied to that purpose. We could only support an option that meets the imperative of ceasing power generation using forest biomass as soon as possible. It does not make sense to offer a mothballing option that nonetheless allows the generator to continue operating.

Our position is supported by various bodies close to Government. In addition to the Climate Change Committee, key parliamentary committees have also called upon the Government to cease subsidies for biomass generation. In its Eleventh Session on 25 April 2023, the Parliament's Business, Energy, and Industrial Strategy Committee considered the issue of the Government's financial support for bioenergy and BECCS. They roundly rejected any further subsidies for unabated biomass and also gave very qualified support to the development of BECCS. Specifically, the Committee stated:

"Existing support schemes for unabated bioenergy are due to end by 2027. ***We do not believe that the historic allocation of subsidies to large scale biomass, such as Drax, has represented either value for money or the best use of public funds. We believe that there should be no extension beyond 2027 for taxpayer support for unabated bioenergy plants****, and that the aim should be to phase out such plants in favour of more sustainable alternatives as soon as possible. This could include bioenergy with carbon capture and storage* ***but only in a scenario where viable and functioning carbon capture and storage is in use****. Further subsidy should not be given to unabated biomass.* ***Any future subsidies should only be provided to companies which can evidence the use of local, waste biomass and not companies that rely on imported biomass****."*[15]

(Emphasis added)

Very similar views were expressed in July 2023 at the Eleventh session of the Business and Trade Committee.[16] These views lend considerable support to our assertion that none of the preferred options are appropriate, as each of them involves the ongoing subsidy of unabated biomass generation.

The NAO report of January 2024 also called for an environmental impact assessment of an extension to existing biomass subsidies before such a decision is made. Specifically, it recommended that the Government:

"Commission and then publish an assessment of the potential environmental impact of transitional support to large scale biomass generation beyond 2027, including clarification of how long it expects these subsidies to continue prior to being replaced by government support for BECCS."[17]

Given not only the true emissions generated by biomass generation, but also the enforceability concerns expressed by the NAO, the high cost of biomass generation, uncertainties over the cost of biomass feedstocks and therefore of operating costs, uncertainties over the duration of any support, the considerable public expense of subsidising biomass generators, and uncertainties over whether the UK is even entitled under international carbon reporting protocols to claim ownership of biogenic CO_2 sourced from another country, providing transitional support is a high risk strategy and an enormous waste of money that will hurt deployment of other renewables, even according to the Government's own modelling.

Taking each of the proposed preferred options:

- Option 1 (CfD unconstrained): this is wholly inappropriate because of the high levels of biomass generation that it would subsidise and the high cost to the consumer. Furthermore, as the consultation notes, there will be increasing wind and solar generation by the late 2020s/early 2030s, and a high level of biomass generation could see the taxpayer paying for biomass generation over and above what is needed to meet demand. High levels of subsidised biomass generation are also likely to squeeze out cheaper energy supply from these truly low carbon sources.
- Option 2 (CfD with generation collar): this is a mildly improved version of option 1 in that it seeks to avoid an excessively high level of subsidised biomass generation. However, it retains the flaws of option 1 by giving financial support to biomass generation that emits as much carbon as fossil fuels and drives forest logging that is demonstrably degrading forests in North America and Europe. This option also offers no guarantee that the level of generation would not exceed the level of demand given increased solar and wind generation, nor that it would avoid having a detrimental effect on these forms of generation.
- Option 3 (availability payment): although this would result in lower volumes of forest biomass being burned and therefore do less damage than the other three options to forests and to the climate, we do not support it because it is still ultimately facilitating the ongoing burning of forest biomass for energy. If the Government ignores our views and decides to pursue a form of transitional support, we nonetheless consider that this is the least-worst of the four preferred options.

  For the Government's understanding, however, we wish to point out that it is incorrect to suggest that this option would lead to higher carbon emissions through greater gas generation. As confirmed by the IPCC, burning wood emits more CO_2 per unit energy than fossil fuels, even coal. IPCC emission factors for wood are considerably higher than those for gas, and modelling studies, including the 2014 BEAC study commissioned by the Government, show that net cumulative emissions from wood-burning power plants exceed those from fossil fuel-fired plants for decades to centuries, or even indefinitely.

If the Government were to award any such payments, it would be imperative that they should be conditioned on the delivery of specified outcomes and contractually repayable if those outcomes are not achieved. For example, payments should be refundable if the project doesn't deliver, and they should be predicated on the fulfilment of contractual obligations, project achievement milestones, etc. Any decision to award any such payments must also rectify the failure of the government's Task and Finish group convened for the Biomass Strategy to evaluate the consistency of biomass/BECCS with IPCC GHG reporting guidance and should therefore include a review by climate and carbon accounting experts outside the Government, including scientists most familiar with the IPCC GHG reporting rules. This is necessary to ensure that the lifecycle carbon balance of BECCS takes into account all carbon flux no matter where it occurs, and that the overall process delivers true net negative emissions.

It would also be critically important that these arrangements be awarded competitively rather than negotiated bilaterally. There are precedents both for 'regular' payments (Capacity Market – transparent, contestable, auction-based, broadly technology-agnostic) and 'ad hoc' payments being made in this manner. It would also be imperative that the units be required to source biomass from within the UK, so that the UK experiences the full impact of biomass use, instead of outsourcing the worst impacts to other countries.

- Option 4 (regulated margin): this is inappropriate as it is also likely to result in medium to high levels of biomass generation. It is also the most complex option with the greatest level of uncertainty for both the consumer and for operators.

5. Do you prefer one of the options as described above? If so, please provide your reasoning and any evidence to support.

Please see our response to question 4.

6. Do you have views on approaches we should consider as part of our options to ensure generators are not overcompensated?

Although we do not support continued use of forest biomass for electricity generation in the UK nor any associated subsidies, if the Government elects to provide any form of bridging subsidies, they must be premised on the following minimum conditions:

1. A time limit on the duration of any support mechanism, and/or a maximum amount of financial support must be established;
2. A maximum profit margin should be set if options 1 or 2 are selected;
3. Subsidy levels that are reviewed annually on the basis of declared profit margin for the previous financial year; and
4. The support should be refundable if the generator doesn't produce a working BECCS system that actually delivers negative emissions within an agreed period (rather than just storing carbon), failing which subsidies will be withdrawn and must be repaid.

7. Do you have any material comments relating to the mechanics of each option or the outline evaluation as articulated? If so, please provide details.

We are not answering this question.

8. Do you agree that these options should be discounted and non-preferred? If not, please provide rationale and any evidence.

If it was defined differently to entail the closure of the UK's existing large-scale biomass power stations and the actual cessation of power generation from forest biomass, we would advocate for the mothballing option being a preferred option, rather than being discounted and non-preferred. As the Government has chosen to define mothballing as an option under which power stations can continue to generate electricity from forest biomass, we cannot support the option as proposed.

We wish nonetheless to point out that it is incorrect that mothballing would lead to higher carbon emissions due to a higher level of gas generation, as the GHG impact of the forest biomass now being burned by large generators in the UK exceeds that of fossil fuels. This is not, therefore, a valid reason for discounting this option.

9. Do you agree with the eligibility criteria and assessment process set out? If no, how should they be adapted to be more suitable?

We repeat our reasoned opposition, as set out in our answer to Q1, to the provision any form of transitional support. Nevertheless, as we believe the Government is likely to press ahead regardless, we provide the following comments.

The consultation is correct to require, on page 23, that *"[p]rojects must be able to achieve permanent atmospheric CO_2 removal through geological storage once converted to power BECCS. For a project to be credibly 'net-negative' it must remove more greenhouse gases (GHGs) from the atmosphere than it creates throughout its entire supply chain (both domestic and international).*"

However, this does not go far enough because the Government continues to confuse the transfer of tree-carbon to belowground storage with genuine removals from the atmosphere. The transfer of tree-carbon to geological storage should be treated like harvested wood products (HWP) are treated – as storage, not as a removal from the atmosphere. As the 2019 refinement to IPCC Guidance[19] explains:

"Removals: The general term "removals" is defined in the Glossary of the 2006 IPCC Guidelines. In the context of HWP, when referring to CO_2 removals, ***it may be noted that HWP do not directly sequester carbon from the atmosphere****. However, carbon retained in HWP constitutes a pool of carbon that was sequestered originally by the above ground biomass carbon pool of forests and other wood producing land categories. In this respect, the carbon from CO_2 originally sequestered by vegetation is transferred to the HWP pool, similarly to when it is transferred from the above ground biomass carbon pool to the litter and soil carbon pools in the AFOLU sector. The only difference is that transfers of carbon from vegetation to HWP are always the result of anthropogenic activity."*

[19] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch12_HarvestedWoodProducts.pdf at page 12.7

The simplest way to help ensure that BECCS bridging subsidies avoid continuing environmental harm is for the eligibility criteria to disqualify facilities burning forest biomass. However, this will still not guarantee that BECCS delivers "negative" emissions. In addition to prohibiting use of forest biomass, the criteria should add language similar to the following, which is taken from the World Resources Institute (WRI) draft guidance for the revisions of its GHG Protocol that is now underway:

"*Only the CO_2 removed from the atmosphere that is ultimately transferred to storage in a carbon pool is accounted for as a removal. Similarly, only carbon stored in carbon pools* ***that originated from atmospheric CO_2 in the reporting year*** *(i.e., biogenic carbon or technologically removed carbon) is accounted for as a removal*."

While this language is not air-tight and could be improved, it addresses two vital issues:

1. The consultation states on page 23 that up to 10% of fuel burned may be from fossil fuels: "*Projects must use predominantly biogenic feedstock (90% or higher). This is consistent with definition of "biomass" used in previous support schemes, such as the Renewables Obligation, and will ensure a high level of negative emissions*." Adding the WRI language would ensure that no fossil fuel CO_2 that was stored would count towards "negative emissions."
2. More importantly, the provision requiring that only biogenic carbon that "originated from atmospheric CO_2 in the reporting year" be accounted for as a removal would be consistent with how the IPCC counts removals and would help to avoid counting the storage of tree-carbon that was sequestered decades or centuries ago as "removals." The provision would likely restrict eligible fuels to annual crops.

Any eligibility criteria should also add a requirement for counterfactual analysis as part of the lifecycle carbon accounting already required. This is because the act of harvesting biomass *may* trigger additional carbon "removals" from the atmosphere as biomass regrows. Determining whether those removals are additional to the removals that would have occurred if the feedstock had continued growing or had undergone an alternative fate is the objective of counterfactual analysis that should be carried out whenever a bioenergy/BECCS project is considered. This is established as a critical element of bioenergy carbon accounting, even in summaries by bioenergy apologists such as Cowie *et al* 2021[20], which was cited extensively by the Task and Finish group:

"*As described in methodology developed over 20 years ago for the evaluation of climate effects of bioenergy (Schlamadinger et al., 1997), both biogenic carbon flows and GHG emissions associated with the life cycle of the bioenergy system need to be considered (Section 9),* ***and GHG emissions associated with the bioenergy system need to be compared with GHG emissions in a realistic reference situation (counterfactual scenario) where energy sources other than bioenergy are used***."

Additionally, the following conditions should be met:

1. In terms of eligibility criteria, facilities should be required to demonstrate a minimum level of permanent atmospheric CO_2 removals, not just "a" level.
2. Lifecycle analysis and measurement, reporting and verification assessments would need to be examined independently, and Government must devote more resources to evaluating operator compliance with reporting requirements, as concluded in the NAO report.

[20] Cowie, A. L., et al. (2021). Applying a science-based systems perspective to dispel misconceptions about climate effects of forest bioenergy. GCB Bioenergy 13(8): 1210-1231. At https://onlinelibrary.wiley.com/doi/abs/10.1111/gcbb.12844

By encouraging operators to submit a dossier for eligibility by 31 March 2024, the Government appears to have already decided to provide transitional support of some kind. It seems improbable that the Government would invite companies to submit such an eligibility dossier and then perform a U-turn and decide not to provide any such support. This suggests that the consultation is misleading, and the only relevant questions are what type of arrangements should be put in place, and not whether there should be such arrangements.

10. During a transition period from biomass electricity to power BECCS, do you think that the GHG criteria should be strengthened? If so, how? Please provide evidence to support your views.

The GHG criteria have always been a poor metric for the actual GHG impact of burning wood, because they don't include the CO_2 emitted when the wood is burned to produce energy nor the CO_2 emitted by wood-burning and forest processes (such as decomposition of stumps and roots) during the pellet manufacturing process. Only if full lifecycle emissions including these stages are included in the GHG calculation could this standard have integrity. We call on the Government to either alter the GHG criteria to include full lifecycle emissions, both from fossil fuels and biogenic emissions, or simply to stop counting energy from forest biomass as "renewable" in acknowledgement of the overwhelming evidence of its negative climatic, biodiversity and other environmental impacts.

In any case, this question is somewhat confusing, because as noted above, the Government already had a consultation regarding the GHG criteria for the CfD and **decided in 2018 to reduce the threshold to 29 kg CO2e / MWh**.[21] Drax and other operating plants were grandfathered by this policy, which applied to new plants commissioning after April 2021. If transitional support is granted, it is vital that all beneficiaries of such support are required to meet this more stringent 2018 standard, since the harvesting, processing, and transport emissions of biomass are yet another factor that undermines the ability of CCS to store net carbon.

11. As part of the proposed transitional support arrangements for large-scale biomass generators that plan to transition to power BECCS, do you think that we should increase the minimum percentage of woody biomass that must be obtained from a sustainable source? If so, what should the minimum percentage be set at? Please provide evidence to support your views.

"Sustainability" has always been taken as a proxy for biomass being "low carbon" or "carbon neutral," but common sense and IPCC guidance for GHG reporting shows that this is inaccurate, as explained in detail above and in the annex (p. 20).

However, even though it does not mean that the biomass used will be low carbon, we agree that it is still preferable for the minimum percentage of woody biomass obtained from a sustainable source to be increased to 100%, with the meaning of "sustainable source" being properly defined by reference

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736640/Consultation_document.pdf

to scientific analysis. However, this will only have a meaningful effect in terms of protecting forests and the climate if it is accompanied by a complete prohibition on the use of forest biomass.

Even though a large proportion of biomass burned for energy in the UK is forest biomass, a 100% target for sustainable biomass, which requires the total exclusion of forest biomass, would be achievable starting in 2027 given that operators have three years to increase their supply of non-forest sustainable biomass. This should provide sufficient time.

12. Are there any additional sustainability criteria we should consider strengthening specifically as part of the proposed transitional support arrangements?

Notwithstanding our response on question 1, if a support mechanism is to be put in place, effective environmental and sustainability criteria must be at the forefront of how success is evaluated. As it is not possible to develop sustainability criteria that permit the harvesting of forest biomass in the quantities needed to sustain electricity generation at large-scale plants whilst offering genuine protection to forests and the climate, any new criteria must imperatively include a prohibition on the use of biomass sourced directly from forests. New GHG criteria should include full lifecycle GHG and biogenic emissions.

We would in principle support the strengthening of additional sustainability criteria in order to limit the negative biodiversity impacts of sourcing biomass. Once again, however, it is an error to equate "sustainability" with "carbon neutrality." As European Commission staff scientists concluded in a biomass sustainability assessment in 2016, *"[s]ustainable forest management practices … cannot guarantee that an increase in forest biomass for energy will deliver greenhouse gas savings"*.[22]

Rigorous sustainability practices should be included at the outset in any contracts, rather than trying to allow for subsequent changes to contracts to be made. Furthermore, as stated in our answer to Q15 below, it must be written into the contract that no compensation is payable from the Government to operators in the event of sustainability obligations being tightened subsequent to the contract being formed.

13. Do you have any comments on the proposed amendment to the definition of an eligible generator to specify that generating stations that are already generating electricity are eligible generators?

We do not support the proposed amendment to the definition of eligible generator to include generating stations that are already generating electricity.

The purpose of the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 was to make provisions for Electricity Market Reform (EMR) and implement measures to reform the electricity market to encourage low carbon electricity generation.[4] The current large-scale biomass generating stations are not providing low carbon electricity due to their use of forest biomass, as explained above.

[22] https://eur-lex.europa.eu/resource.html?uri=cellar:1bdc63bd-b7e9-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

Given that the combustion of forest biomass emits as much if not more CO_2 per unit of heat or electricity generated than burning fossil fuels, expanding the definition of eligible generator to specify that generating stations that are already generating electricity are eligible generators would only perpetuate the Government's financial support for high-emissions electricity generation. This is contrary to the purposes of the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 and the EMR, fails to protect forests or mitigate climate change and does nothing to move the UK towards a truly decarbonised energy system.

14. Do you have any comments on the proposed amendment to the definition of an eligible generator to specify that biomass conversion stations are an eligible generating station?

We are opposed to the addition of biomass conversion stations to the list of eligible generating stations.

The consultation states (p.10) that "*[b]ased on our current evidence and understanding of the power BECCS project pipeline, we believe the most mature, reliable and cost-effective options for delivering power BECCS on CB6 timescales will involve converting existing biomass power plants to operate with CCUS. This is because conversion requires less time, cost and engineering effort than building a new power BECCS plant from scratch".*

However, like all the other modelling conducted for this consultation, the *"current evidence and understanding"* assumes that burning trees is climate-friendly and that adding CCS will deliver actual negative emissions, when it is not even clear whether it will be able to store net carbon. The cost-benefit analysis of building new plants versus retrofitting old plants may look different if the modelling made conservative assumptions about the types and amounts of feedstocks that could be deployed to actually deliver negative emissions. The modelling should be redone.

Further, it appears from Drax's 2022 AFR that the company itself is unclear on costs and whether the economics work. For example, page 79 of Drax 2022 AFR states "*the business is approaching a pivotal point in relation to options for BECCS development, and the risks relating to physical execution are becoming more important. Whilst work continues to ensure an economic business model can be established for UK BECCS…".* It is also clear that Drax will add a lot of new infrastructure to enable CCS. The 2022 AFR, at page 130, states:

"Internationally, as outlined in our Trading Update in December 2022, management made progress on the objective to deliver 4Mt of negative CO2 emissions annually from 2030. Opportunities under consideration include ***two new-build 300MW BECCS power units****, each capable of producing 2TWh of renewable electricity from sustainable biomass and each capturing over 2Mt of CO2 annually.*"

"New build power units" does not sound like "conversion" but something closer to entirely new infrastructure. Furthermore, old plants – especially Drax – are run-down and extremely inefficient. Drax's 2022 AFR reports that the current *"end of station life"* is projected as 2039, just 15 years from now. Leaving aside the incredible amount of forest destruction this plant would drive if it were allowed to continue operating for another 15 years, it should be immediately apparent that this is not a plant that is fit for the future.

Drax's power generation is particularly inefficient, operating at around 38 – 39%,[23] which in practical terms means that were CCS to be deployed there, it would drastically increase the cost of carbon storage associated with every megawatt of electricity generated compared to using CSS with coal or gas. Drax reports emissions from burning biomass as "biologically sequestered" CO_2. In 2020 the plant emitted 13,273 kt of biogenic CO_2[24] and generated 14.1 TWh of electricity from biomass.[25] Expressing these emissions as a rate per GWh of electricity generated from biomass, emissions can be seen to be 20% higher (at 941 tonnes per GWh in 2020) when electricity is generated from biomass than from when they were burning coal (784 tonnes of CO_2 per GWh in 2012).[26] The cost of adding CCS to a biomass plant would therefore be greater than that of adding it to a same-size coal plant. Likewise, whilst we do not endorse natural gas power generation, depending on its efficiency, a combined cycle natural gas plant can emit between 350 to 490 tonnes of CO_2 per GWh,[27] meaning that Drax emits at least double the CO_2 per megawatt-hour that a combined cycle plant emits. The need to store more CO_2 per MWh of electricity generatate would considerably increase the cost of adding CCS to a biomass plant versus adding it to a gas plant.

15. Do you agree with the government's proposal to enable the Secretary of State to issue a direction to a CfD counterparty to modify any section 10 contract to reflect updated sustainability objectives?

Whilst we repeat our opposition to any transitional support, if the Government presses ahead with its proposed bridging subsidies, we would consider it sensible to allow for sustainability objectives to be updated in any section 10 contract. In that case, it would be essential in taxpayers' interests to ensure that operators are expressly excluded in any contract from claiming compensation for any increased costs said to arise from higher sustainability standards.

16. Do you have any comments on the proposal to make amendments to Contracts for Difference legislation consequential to the design of the support mechanism?

Given that we are opposed to any transitional support mechanism, we do not propose to answer this question.

[23] Drax's 2012 AFR at page 30 states, *"The technology is performing to guarantee with all units achieving an overall baseload efficiency (that is, the ratio of energy out to energy in when operating at full capacity) approaching 40% at full load. This represents a 5% improvement on original baseload efficiency of 38% and annual savings of 1 million tonnes of CO2 emissions allowances and approximately half a million tonnes of coal."* Biomass burns less efficiently than coal, thus the plant is currently operating at around 38 – 39% efficiency.

[24] P.50 Drax 2020 AFR https://www.drax.com/wp-content/uploads/2021/03/Drax_AR2020.pdf

[25] P. 22 Drax 2020 AFR

[26] As reported at page 58 in the 2022 AFR https://www.drax.com/wp-content/uploads/2023/03/Drax_AR2022_single_pages.final_.pdf).

[27] Tables A.III.1 and A.III.2 at https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_annex-iii.pdf

Annex to FLC consultation response

Forest Litigation Collaborative
November 27 update, 2023

This document lays out the science case for why the treatment of biomass as "low carbon" and BECCS as delivering negative emissions is unfounded. It was originally published in November 2023 as "The Case Against Negative Emissions."

Contents

A. Biomass and BECCS are climate frauds

1. Biomass and BECCS (biomass energy with carbon capture and storage) are at the core of climate mitigation plans around the globe. New information is rapidly emerging about the risks of CCS,[1] but few are calling out the fact that just as burning forest biomass isn't carbon neutral, BECCS won't deliver the negative emissions if it relies on burning forest biomass (EASAC is a notable exception[2]).
2. Burning wood for energy is the largest source of renewable energy in the UK (Figure 1).[3]
3. But although renewable energy is supposed to reduce CO_2 emissions, burning wood for heat and electricity emits more CO_2 than coal per unit energy, and logging forests for fuel destroys ecosystems and increases climate-warming CO_2 emissions. Research commissioned by the UK government in 2014[4] shows net CO_2 emissions from burning wood can exceed those from fossil fuels for decades, and the EU's 2016 impact assessment on forest biomass[5] concluded that carbon lost from logging for bioenergy might never be restored. In reality, burning forest biomass for renewable energy is undermining our ability to reduce emissions.

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[1] https://www.ciel.org/reports/deep-trouble-the-risks-of-offshore-carbon-capture-and-storage-november-2023/

[2] https://easac.eu/news/details/look-before-you-leap-european-science-academies-caution-against-subsidies-for-bioenergy-with-carbon-capture-and-storage-beccs

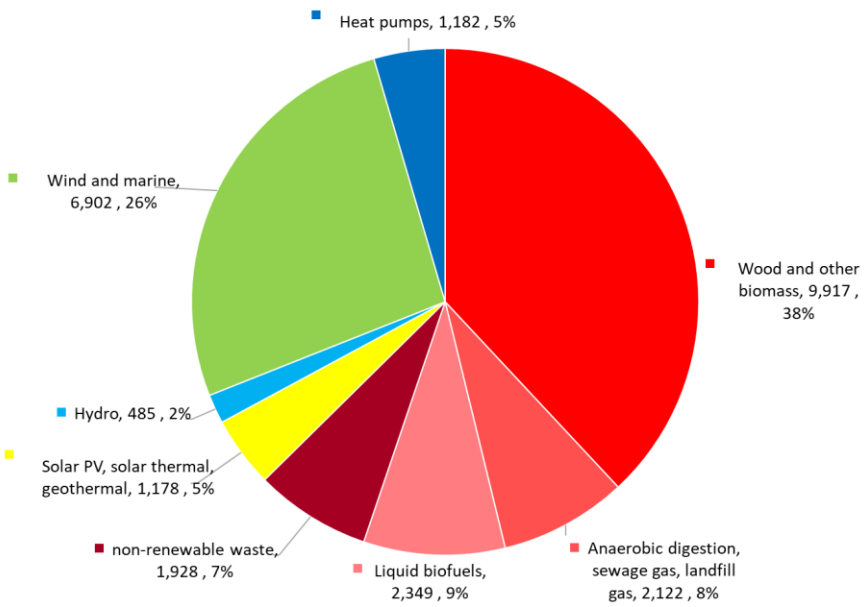
[3] DUKES Table 6.1 at https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

[4] https://www.gov.uk/government/publications/life-cycle-impacts-of-biomass-electricity-in-2020

[5] https://eur-lex.europa.eu/resource.html?uri=cellar:1bdc63bd-b7e9-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

4. In the UK, the government has been largely passive in the face of an abundance of evidence submitted to show that Drax, the largest wood-burning power plant in Europe and now a major manufacturer of wood pellets, is increasing CO_2 emissions and destroying forests. The government has received evidence from the U.S.[6] showing that the wood pellet industry is logging wetland hardwood forests in the US Southeast, and a BBC investigation[7] has shown that Drax wood pellet manufacturing operations are using wood from ancient and biodiverse forests in Canada. Such forest destruction is a major driver of climate change.

Figure 1: 2022 UK renewables on energy input basis, kilotonnes oil equivalent



5. Drax's own annual report[8] shows it got more than £3 million pounds per day in publicly funded renewable energy payments in 2022. Now Drax claims[9] it's going to use carbon capture and storage with biomass to deliver "negative emissions" that will cost billions in public funding – and still policymakers seem credulous.

6. This is reflected in UK's long-awaited Biomass Strategy,[10] published in August 2023, which signals that not only does the government intend to continue supporting biomass as providing "low carbon" energy, but they are doubling down by promoting biomass energy with carbon capture and storage – BECCS – for removing CO_2 from the atmosphere (often referred to as "negative emissions.").

7. In the EU, policymakers are similarly taking a big gamble on BECCS for climate mitigation. In addition to the Carbon Removals Legislation, which is laying the groundwork for more BECCS projects, modelling shows[11] the EU climate plan is counting on BECCS delivering 250 million tonnes of CO_2 removals *per year* by 2050. As discussed further below (section I), the EU is already funnelling hundreds of millions of euros into BECCS projects that like the "unabated" biomass projects before them, will deliver climate mitigation only on paper, and not in reality.[12]

8. Policymakers holding up biomass energy as low carbon or carbon neutral and BECCS as delivering negative emissions variously rely on two flawed and repeated arguments:

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[6] https://www.nrdc.org/sites/default/files/global-markets-biomass-energy-06172019.pdf

[7] https://vimeo.com/795555785/c6e9420ff6

[8] Page 192 at https://www.drax.com/wp-content/uploads/2023/03/Drax_AR2022_single_pages.final_.pdf

[9] https://www.drax.com/about-us/our-projects/bioenergy-carbon-capture-use-and-storage-beccs/

[10] https://www.gov.uk/government/publications/biomass-strategy

[11] https://www.pfpi.net/wp-content/uploads/2023/01/PFPI-EU-Land-Sink-Target-report-Nov-23-2021.pdf

[12] See https://forestdefenders.eu/wp-content/uploads/2022/11/PFPI-Burning-up-the-carbon-sink-Nov-7-2022.pdf

- The use of "sustainability criteria" will ensure that forest biomass burned for energy produces carbon neutral or low carbon energy (see e.g. the UK Biomass Strategy or the criteria in Article 28 of the Renewable Energy Directive), being the foundation for creative "negative emissions" via BECCS; and/or
- The zero-rating of burning biomass in the energy sector under IPCC carbon reporting mechanisms.

In the rest of this briefing, we explain why these two approaches are flawed.

B. Background on how the IPCC counts emissions from bioenergy and BECCS

9. First, it's helpful to discuss the basic concepts of carbon neutrality, negative emissions, and how to properly account for bioenergy emissions.

10. Carbon neutrality is not well-defined. The Intergovernmental Panel on Climate Change (IPCC) [13] defines carbon neutrality as "Condition in which anthropogenic carbon dioxide (CO_2) emissions associated with a subject are balanced by anthropogenic CO_2 removals." The term is seen as analogous to "net zero" emissions in many contexts.

11. The simplest conception of a carbon neutral process is that it has no net impact on the amount of CO_2 in the atmosphere. In the case of biomass, this generally implies that CO_2 emitted by burning wood or other plants and organic material is so quickly offset by some other process – usually assumed to be regrowth – that there is no net impact on the concentration of CO_2 in the atmosphere. Importantly, simply regrowing the biomass isn't sufficient. Leaving aside achieving full carbon neutrality, for a biomass project to even reduce net emissions compared to other ways of generating energy, net emissions in the biomass scenario (taking into account forest carbon uptake) must be less than the net emissions in the counterfactual scenario where an alternative energy source is used and the source forest continues to be managed for other uses or is left unmanaged. Such an assessment requires assessing forest carbon dynamics.

12. Negative emissions, which constitute removing CO_2 from the atmosphere and thus, in theory, reducing its concentration, requires some way to pull CO_2 from the atmosphere. For BECCS, plant growth is the means by which CO_2 is collected from the atmosphere. The CCS component concentrates smokestack emissions of CO_2, then stores the concentrated CO_2 belowground in geological formations that, in theory, lock it up in perpetuity.

13. It is important to note that simply reducing the amount of CO_2 entering the atmosphere does not constitute "negative" emissions. The key distinction between using CCS with coal and using it with biomass is that with coal, CCS is simply preventing smokestack emissions from entering the atmosphere. Using CCS with biomass does the same thing – but then, *in theory*, biomass regrowth occurs, capturing more CO_2 via photosynthesis, and drawing down the concentration of CO_2 in the atmosphere. The timing of biomass regrowth is thus obviously important.

14. Countries that have signed the Paris Agreement are bound by its provisions, which include Article 4(1)(a) requiring GHG emissions reporting using the protocols set by the United Nations Framework Convention on Climate Change (UNFCCC).

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[13] IPCC WG III report, page 1797 at https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf

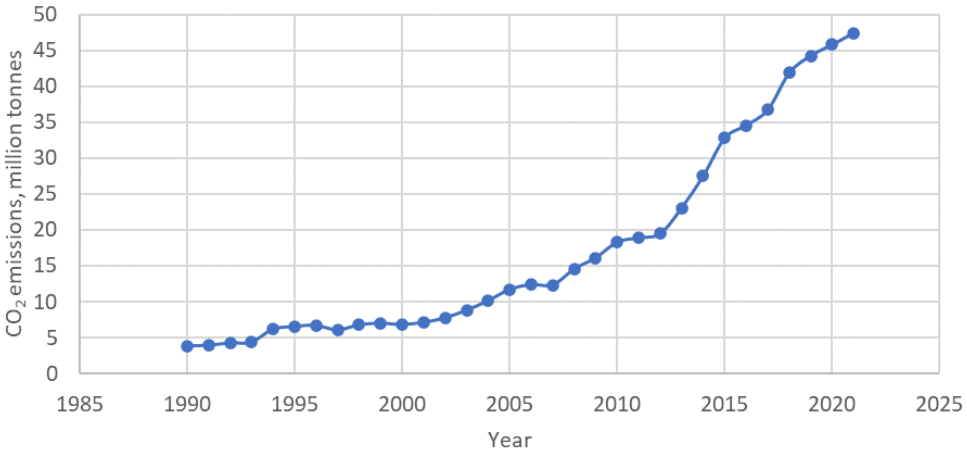
15. The IPCC sets the rules for GHG emissions reporting in Guidelines that were published in 2006 and partially updated in 2019. If countries want to claim they are reducing emissions, their emissions reporting needs to comply with the IPCC guidelines.

16. The IPCC guidelines count all carbon stock changes on land in the Agriculture, Forestry, Other Land Use ("AFOLU") sector. Another name for this sector is Land Use, Land Use Change, and Forestry ("LULUCF"). Here it's just referred to as the "land sector".

17. Forests are the biggest sink for CO_2 in the land sector, but they are also emissions sources. Changes in forest carbon stocks include the growth of vegetation as well as carbon loss, including from harvesting.

18. To avoid double-counting of this carbon loss in a national inventory, CO_2 emissions from biomass use in the rest of the economy (e.g., consumption of food/feed, use of biomass for energy) are not counted. Due to their importance and magnitude, emissions from the burning of biomass are reported as a "memo" item in the energy sector. However, they are not added to the total, to avoid double-counting, under the assumption that the full impact it reflected in the land sector of the inventory of the country of production. As Figure 2 shows, bioenergy emissions in the UK in 2021 were more than 47 million tonnes.[14]

Figure 2: CO_2 emissions from biomass in the UK, million tonnes



19. As the 2019 update to the IPCC Inventory Guidelines explains,
"Carbon dioxide (CO_2) emissions from the combustion of biomass or biomass-based products are captured within the CO_2 emissions in the AFOLU sector through the estimated changes in carbon stocks from biomass harvest, even in cases where the emissions physically take place in other sectors (e.g., energy). This approach to estimate and report all CO_2 emissions from biomass or biomass-based products in the AFOLU sector was introduced in the first IPCC guidelines for national greenhouse gas emissions (IPCC 1995), reflecting close linkages with data on biomass harvesting, and for the pragmatic reason to avoid double counting."[15]

20. The approach means that the land CO_2 impact of biomass traded (produced in one country but used in another) is supposed to be counted only in the land sector of the country where it was produced. E.g., CO_2 emissions from using palm oil (e.g., for food) or imported wood pellets for bioenergy are not

[14] https://di.unfccc.int/detailed_data_by_party
[15] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_2_Ch02_Stationary_Combustion.pdf

counted in the country of use, as all the resulting biogenic emissions (including any deforestation or peat fire of clearcuts) are supposed to be reported and accounted for by the country of origin.

C. A simple example of forest carbon flux calculations

21. The mechanics of how emissions from the land sector are counted are relevant for understanding how to calculate the carbon impact of bioenergy. The inventory reporting methods for the land sector do not measure actual emissions and removals of CO_2 from the atmosphere (fluxes of gases), but instead estimate these based on changes of carbon stocks on land.

22. Carbon enters ecosystems as CO_2 fixed by photosynthesis, and leaves ecosystems mostly as CO_2 when biomass is oxidized (burns or decomposes), or in the form of harvested biomass (crops and wood cut and removed).

23. In most countries, the basis for estimating stock changes in forest is the national forest inventory of the country, which estimates the standing stock and growth of the country's forests periodically. Changes in forest carbon stocks measured by forest inventories are converted to the forest carbon flux (emissions and removals), which is the difference between stocks year-to-year. The underlying equation is:
Forest carbon flux in year x = (carbon stock in year x-1) – (carbon stock in year x)

24. This approach means that when carbon is sequestered in the forest (removed from the atmosphere) this is counted as a negative number. When net carbon is emitted to the atmosphere, it is shown as a positive number.

25. So, for example, if a forest had a carbon stock of 1,000 tonnes in 2019, 1,030 tonnes in 2020, and 1,040 tonnes in 2021, the flux for 2020 would be -30, and the flux in 2021 would be -10. The sink is lower (less negative) in 2021 than 2020, meaning there is less atmospheric CO_2 embodied in the newly added forest carbon stocks that year, and thus more CO_2 left in the atmosphere.

26. Adapting this example to illustrate how logging and burning forest wood for energy could change the flux, if the forest under the management regime of 2019 – 2020 removed 30 tonnes of carbon from the atmosphere, and then logging was intensified in 2021 so that an additional 20 tonnes of carbon was logged and taken out of the forest to be burned for energy, the reduction in the forest carbon sink (from -30 in 2020 to -10 in 2021) would reflect the carbon removed from the forest by logging.

27. The IPCC rules treat reductions in forest carbon stocks as if the forest carbon was instantaneously emitted to the atmosphere ("instantaneous oxidation"). However, this is an accounting convention, since harvesting forests reduces the biomass stock on land but does not translate to instantaneous emissions there and then.

28. Just as the IPCC's accounting convention of treating forest carbon loss as "instantaneously oxidized" in the land sector does not reflect physical reality, the accounting convention of counting wood as having "zero" emissions in the energy sector also does not reflect physical reality. Nevertheless, it is this categorisation of emissions as "zero" that has led many policymakers to treat biomass as a carbon-neutral energy source.

29. Carbon dioxide is a global pollutant, so the convention of treating biomass as having zero emissions when burned has no significance regarding its actual impact on the atmosphere. As the IPCC notes in its FAQ [ref] at Question Q2-10[16]:

30. "The overall IPCC approach to estimating and reporting bioenergy greenhouse gas emissions at the national level requires complete coverage of all IPCC sectors, including the AFOLU and Energy sectors. All CO2 emissions and removals associated with biomass are reported in the AFOLU sector. Therefore, CO2 emissions from biomass combustion used for energy are only recorded as a memo item in the Energy sector; these emissions are not included in the Energy sector total to avoid double counting. The approach of not including these emissions in the Energy Sector total should not be interpreted as a conclusion about the sustainability, or carbon neutrality of bioenergy." [Emphasis added]

31. The 2019 refinement of the IPCC guidelines is even more explicit, stating[17] the need to consider wood energy use emissions as reported in both the land sector and the energy sectors: "*The CO_2 emissions from wood biomass burnt are not reported in either the Energy sector (burnt for energy purposes) or Waste sector (burnt or lost without energy recovery). This is to avoid the possibility of double counting these emissions in two or more GHG inventory sectors because they are already included in the AFOLU sector. When using inventory estimates to assess the CO_2 emissions arising from energy use, including wood for energy purposes, it is necessary to consider relevant emissions estimated in the Energy and AFOLU sectors.*"

D. The need for counterfactual modelling to assess the net carbon impact of bioenergy

32. The IPCC approach for reporting emissions from the land sector only considers recent years. It is not forward-looking. The loss of forest carbon from harvesting may be offset over time, but forests don't regrow instantaneously. This means that if carbon reporting is being done properly, it is generally not possible to conclude that forest biomass is "carbon neutral" in its year of use, using IPCC reporting.

33. Assessing the net carbon impact of bioenergy requires counterfactual accounting that projects the impact into the future. In fact, predicting the carbon impact of *any* energy project, not just bioenergy, requires modelling the impacts of a scenario where the project is executed, versus one in which it is not – i.e., contrasting the project scenario with a counterfactual scenario. This is true for coal – for example, we ask, how much will carbon emissions increase over a business-as-usual scenario if we build a coal plant? – and it is likewise true for a biomass power plant.

34. Smokestack and other direct emissions of biogenic CO_2 warm the atmosphere as effectively as fossil fuel CO_2. But, unlike coal, because biomass has the potential to grow back over time and take up CO_2 from the atmosphere, its emissions are often evaluated in the context of a lifecycle modelling approach that considers regrowth of the fuel, which is taken as offsetting some of the previous CO_2 emissions from burning the fuel.

35. The convention is to assign biomass regrowth to offsetting the emissions from bioenergy, although in fact there is no reason to assign this benefit specifically to the operator of the power plant burning the biomass, or to the country where the power plant is located. They generally don't own the land from which the biomass is sourced, and if the fuel is sourced from a different country (e.g., the US or Canada, like the pellets that Drax imports), that other country gets to claim the forest carbon sink benefit of regrowing forests under the IPCC's carbon reporting protocol.

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[16] https://www.ipcc-nggip.iges.or.jp/faq/faq.html

[17] Page 12.33 at https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch12_HarvestedWoodProducts.pdf

36. In biogenic carbon accounting models that seek to determine the future carbon impact of bioenergy projects, the net carbon emissions impact of bioenergy is generally calculated as the total CO_2 emissions from fuel sourcing and burning, *minus* CO_2 that the model assumes will be sequestered as biomass regrows.

37. However, as explained above, a counterfactual is also required. The correct way to analyse the impact of the bioenergy project is to assess the emissions of the bioenergy scenario against a scenario where the forest is *not* logged to provide fuel but instead undergoes some other fate, and energy is generated in some other way (this could include solar or wind, it doesn't have to be fossil fuels). Many bioenergy scenarios simply involve intensifying harvesting in a forest that is already being logged for other products, so the counterfactual scenario is not "let the forest grow" but instead, "continue logging at the present intensity."

38. The *difference* between the bioenergy and no-bioenergy scenarios represents the net carbon impact of the bioenergy scenario.

39. The net carbon impacts of bioenergy scenarios change over time. Because burning wood usually emits more CO_2 per unit energy generated than burning fossil fuels, emissions in the bioenergy scenario typically exceed those of the alternative scenario in the first period, but can be slowly drawn down, under the assumption that the forest would grow faster due to the bioenergy-driven harvest than it would otherwise do. **If** this condition is met, this reduces the relative net carbon impact of the bioenergy scenario over time and, if maintained long enough, it *may* reduce the net impact to zero. However, this takes decades to centuries (even theoretically), and may not happen at all. There are many forests where increased harvest cannot expect to increase subsequent growth, or more likely to reduce it. In such cases, wood-based bioenergy will *permanently* have a higher CO_2 intensity than fossil alternatives, with no compensation.

40. In fact, the assumption that forest carbon stocks fully recover after harvest is increasingly unlikely to be met. Changes in species composition, soil carbon loss from harvesting, other disturbances, shortened rotation periods, climate change, and a host of other factors conspire to ensure that forests regenerating after cutting hold less carbon than previously. These uncertainties are meaningful for the ability of models to predict actual bioenergy carbon impacts. In all cases, such uncertainties, if realised, worsen the carbon impact.

41. Under this approach, many studies show that net emissions from burning forest biomass can exceed those from the no-bioenergy scenario for decades to centuries– even when the no-bioenergy scenario relies on coal-burning to provide energy.

42. For example, biomass sourcing scenarios for the US Southeast were found to have emissions significantly greater than zero at year 40 in a UK government-commissioned study from 2014. The study analysed net carbon emissions of wood pellets manufactured in the US Southeast using the Biomass Emissions and Counterfactual (BEAC) model, which characterises the carbon impact of burning various types of forest biomass by comparing their lifecycle emissions to emissions of counterfactual scenarios. This model and the summary report are still available on the government's website.[18]

[18] https://www.gov.uk/government/publications/life-cycle-impacts-of-biomass-electricity-in-2020

E. The misuse of IPCC rules to justify treatment of bioenergy as "low carbon"

43. By relying on the IPCC rules to justify treatment of bioenergy as "low carbon", policymakers are doing the very thing that the IPCC has warned against, using the bookkeeping convention of treating imported wood as if it has zero emissions as if it represents physical reality.

44. But given that emissions occur and are counted under national inventories, if one wishes to argue that biomass energy has "low" emissions or is "carbon neutral," this requires evaluating the projected impact over time using counterfactual modelling that counts all lifecycle GHG emissions associated with growing, harvesting, producing, transporting, and burning the biomass, and makes projections about how regrowth over time may offset some of these emissions, comparing this to an alternative scenario. National GHG inventories created under IPCC rules are not a substitute for such forward-looking modelling.

45. Since the IPCC reporting framework is intended to provide full accounting of all sectoral emissions and sinks at the national level, or potentially at lower geographic levels, it is an inappropriate tool for assessing the GHG impact(s) of particular projects such as biomass power plants. This is supported by the answer to the IPCC FAQ Q2-10 which states that:

46. "While individual methodologies and emission factors provided in the IPCC Guidelines may be relevant for estimating CO2 emissions from the use of bioenergy at an individual facility or industry, the IPCC Guidelines as an overall framework for a national GHG inventory do not provide an analytical approach for assessing the full bioenergy emissions at sub-national entities such as industry sectors. A complete coverage of bioenergy emissions at the sub-national level – for example for an industry sector – may require additional analytical work and assumptions beyond the scope of the 2006 IPCC Guidelines to attribute all relevant bioenergy emissions (e.g. those associated with growing bioenergy crop, land-use change, fertilization, transportation, etc.) to the sub-national entities of interest." [Emphasis added].

47. Any reference to the IPCC inventory accounting convention of counting biomass emissions as zero in the energy sector is thus wrong in at least two ways: it violates the IPCC's own warning to not treat the convention as representing reality, and it inappropriately applies a framework intended for national-level reporting to the biomass energy sector, violating the IPCC's instructions here, as well.

F. The misuse of IPCC protocols to falsely claim that BECCS will deliver "negative emissions"

48. BECCS can only deliver "negative emissions" if biomass burning is truly carbon neutral. The premise of carbon neutrality is that plant regrowth sequesters equivalent carbon as was released by burning the fuel, offsetting those emissions so that ultimately there is no addition of CO_2 to the atmosphere. The premise of negative emissions from BECCS is that because the emissions have been captured and stored belowground using CCS, they no longer need offsetting, so carbon sequestration by plant regrowth now represents a net removal of CO_2 from the atmosphere.

49. Regarding use of forest biomass as fuel, one issue is immediately apparent: regrowth does not occur quickly, so there no net removal of CO_2 from the atmosphere during the regrowth phase for decades or longer. Thus, while adding CCS to an existing biomass plant would theoretically reduce the amount of CO_2 entering the atmosphere at the smokestack, just like adding CCS to a coal plant would, it can not deliver "negative emissions," at least not in timeframes relevant for meeting legislated emission reduction targets. As is true for unabated bioenergy (i.e. without CCS), determining the potential future impact of BECCS projects requires counterfactual modelling.

50. The inability of BECCS to deliver negative emissions is apparent from the IPCC 2006 Guidelines approach to calculating BECCS impacts. The approach is designated as a "Tier III" protocol.[19] Chapter 2, Equation 2.7, "Treatment of CO_2 capture," states that for a source category, "s", $Emissions_s = Production_s - Capture_s$

EQUATION 2.7
TREATMENT OF CO_2 CAPTURE

$$Emissions_s = Production_s - Capture_s$$

Where:

s = source category or subcategory where capture takes place

Captures	= Amount captured.
Productions	= Estimated emissions, using these guidelines assuming no capture
$Emissions_s$	= Reported emission for the source category or sub-category

51. If the source category is taken to be the energy sector, bioenergy emissions are counted as zero. However, for a complete picture of the GHG impact of BECCS at the national level, this convention is not a problem, because the land sector emissions are included, thus the full impact of BECCS can be assessed. Viewing equation 2.7 considering national all-sector reporting, the "production" term would be zero, the "capture" term would be non-zero, thus the resulting emissions would be "negative" *in the energy sector* – but over in the land sector, the loss of carbon from logging the trees burned for energy would be counted as an emission. Summing the "negative" energy sector emissions thus calculated under equation 2.7 with the emissions counted in the land sector produces a net impact at the whole system level of **zero *at best* – not "negative" emissions**.

52. "At best" because emissions from **BECCS will only be zero if production and capture of GHG's are equivalent** – in other words, if CCS captures 100% of the CO_2 that was produced in the land sector by logging the biomass. In practical terms this would require that the *only* carbon lost from the land sector due to logging is carbon embodied in wood removed from the forest (this never occurs – e.g., there is soil carbon loss from disturbance), *and* 100% of that wood is burned with no loss, *and* 100% of the CO_2 emissions from burning that wood are captured by CCS. In this case, the production and capture terms in equation 2.7 would be equivalent, making emissions zero. In all real-life cases, however, emissions from BECCS would be positive.

53. It is never appropriate to report energy sector GHG emissions of burning biomass in isolation, because of the impacts of bioenergy on land sector carbon. As the 2019 update to the IPCC Inventory Guidelines explains, "*Carbon dioxide (CO2) emissions from the combustion of biomass or biomass-based products are captured within the CO2 emissions in the AFOLU sector through the estimated changes in carbon stocks from biomass harvest, even in cases where the emissions physically take place in other sectors (e.g., energy).*"[20] In other words, you can't just ignore the emissions, even if they happen halfway around the world. This concept is well-understood for liquid biofuels and palm oil.

54. It is incorrect to count the storage of biomass carbon as a removal of CO_2 from the atmosphere. The majority of the carbon in a mature tree has already been captured and removed from the atmosphere and represents the carbon stock. Thus, the act of burning a tree and storing the CO_2 belowground

[19] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

[20] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_2_Ch02_Stationary_Combustion.pdf

using BECCS simply represents a **transfer** of carbon from one non-atmospheric pool (the tree) to another non-atmospheric pool (geological storage). **This transfer in no way constitutes "negative" emissions/removal of CO_2 from the atmosphere.**

G. Illustrating how transfers of forest carbon stock do not constitute "negative emissions"

55. The following section, which was provided by a colleague, illustrates the fallacy at the heart of claims that burning forest wood with BECCS will deliver "negative" emissions.

56. Some British Columbia trees burned in the UK can easily be older than the province as we know it. Claiming their cumulative removals as current GHG removal can only be through an accounting procedure and cannot reasonably be based on a narrative that these trees were grown from the outset to remove carbon in and for the UK in the 2020's to reduce climate change. But the same applies to plantations established for the paper industry 50 years ago: none of that was for the UK to claim.

57. On ownership of removals: It is clear that when the forest grows, the resulting removals (i.e., increase of carbon stock in the forest) is "owned" by the US or Canada. It is reported and claimed by those countries and may allow those countries to emit more fossil fuel CO_2.

58. It is also clear that once the forest is logged, the wood is burned and its carbon stored using CCS in the UK, the same removals would be claimed by the UK as theirs, and theirs only (as a removal happening in the year of CCS).

59. But this raises a question: exactly what element of the intervening chain of events would trigger the transfer of right/ownership/claim from the US to the UK?

60. The growth of the forest in the US was a real, physical removal of carbon (although it may or may not have been "anthropogenic"), taking place over an extended period of time (many decades if we just consider the trees cut, but possibly millennia if we consider the age of the "forest", since the time of the last glacial). Whatever the period, the cumulative removal of this long time in North America is claimed by the UK at the moment of storing it belowground somewhere. But what makes this possible?

61. Thought experiments: Assume that Drax does not buy the harvested wood, but buys the forest (in its entirety, with standing timber). Could Drax (or the UK) claim the carbon in the standing trees as their own "removals" or "negative emissions", just because all that carbon has been removed from the atmosphere, and they now own it? It's doubtful. Even by the "standards" of the voluntary carbon markets, just owning a stock of carbon would not entitle one to claim the past removals that created that stock. So they bought all that carbon removed from the atmosphere, but cannot claim any of it as "removal" let alone theirs (if the asset is in another country).

62. Let's say Drax harvests that wood and ships it to the UK, where it is piled up in a neat heap. The forest carbon is now physically in the UK, but could the UK claim the "removals", just by transferring tons of wood (and having caused a corresponding reduction in the US forest carbon stock)? Hardly. Under some alternative IPCC approaches to harvested wood product accounting it could be claimed, but it is not straightforward and would not result in net removals. E.g., if both the US and UK follow the production approach, then the US could use the carbon in the stockpile to reduce the debit it took after the harvest of the forest itself (so part of the accounted emissions would be delayed as long as the C is in the stockpile, and the US would continue to "own" this benefit under the production approach). But this would not result in ANY removal: The US would only count lower emissions than would be the case if the wood had been "lost" (perhaps burned, or just unaccounted for). And even that relative benefit (emissions reduced compared to instantaneous oxidation) would accrue to the US (as producer), not the UK. The math would be different under other HWP approaches, but the

essence remains that there would be no net "removal" anywhere. Just sitting on the stockpile of imported wood would hardly be claimable as "negative emissions", even if in accounting terms it is deductible from the harvest emissions the US has to account for.

63. Then Drax decides to burn the stockpile, actually causing emissions. Again, no claims on "removals" can be made by anyone. Drax/UK don't count the emissions because the US has counted them (or so they assume), but no "removals".

64. Then Drax decides to pump the CO_2 into the ground (instead of releasing it as they would), and all of sudden "removals" appear in the UK. A miracle has happened.

65. It appears that owning the trees (with all the carbon intact) is not sufficient to claim any carbon benefit (let alone "negative emissions"). Even killing them and taking them home is not enough to make it claimable. You need to burn them. Unless you do this, they are nothing. This is the absurdity of assigning the carbon benefit of land to the energy sector: the act of burning entitles them to claim the removals that not even the owner of the forest can claim. Only burning the trees in a power plant can validate the removals that made them be.

H. Why "sustainability" is not a proxy for carbon neutrality

66. The UK's biomass sustainability criteria, and those of the EU's Renewable Energy Directive, do not ensure biomass is "low carbon" or carbon neutral. The EU's criteria were deconstructed in another report.[21] This brief section focuses on the UK's criteria.

67. The UK's Biomass Strategy[22] states that biomass will only be considered "low carbon" if it complies with the UK's sustainability criteria (see e.g. p.6 and p.19). However, there is no provision in these criteria that would ensure forest biomass that complies is thereby low carbon or carbon neutral, in the sense of ensuring that the net carbon impact of its combustion is low or zero.

68. There is no single uniform set of sustainability criteria in the UK; different Government support schemes (in particular, the Renewable Obligation ("RO") and Contract for Difference ("CfD") schemes) have different criteria, though they are broadly similar. The schemes are summarised in a Table 2.1 at pages 24-27 of the Biomass Strategy. However, the schemes do not ensure compliant forest biomass feedstocks are low carbon.

69. GHG emission criteria: as set out in Table 2.1, the various schemes each set their own specific threshold as to the percentage savings of GHG emissions that must be achieved for compliance. However, the formulas used to calculate the GHG emissions of bioenergy under the criteria for each scheme **only account for the fossil fuel-derived lifecycle emissions** from growing, harvesting, processing, and transporting biomass, as well as non-CO_2 GHG emissions from biomass combustion, without taking into account the biogenic CO_2 emissions from manufacturing and combusting the biomass.[23]

70. Direct land use change: As regards the land criteria, as set out in Table 2.1, sourcing biomass where there has been direct land use change (conversion of forest to some other kind of land use, like agriculture) is generally forbidden under the schemes. This is a necessary but not sufficient requirement

[21] https://forestdefenders.eu/wp-content/uploads/2021/05/RED-II-biomass-Paper-Tiger-July-6-2020.pdf

[22] https://www.gov.uk/government/publications/biomass-strategy

[23] See for example, the GHG emissions formula used in the Renewable Heat Incentive scheme: Schedule 3, The Renewable Heath Incentive Scheme Regulations 2018 (Statutory Instrument 2018, No. 611).

to avoid loss of forest carbon. It is important to note that clearcutting a forest of any kind, even a forest that has never previously been cut, does not constitute "land use change."

71. Protection of carbon stocks: as set out in Table 2.1, the relevant schemes are summarised as requiring "*No sourcing from high carbon stock areas. Source from permitted sourcing only*". "*High carbon stock areas*" is not defined, but it likely means areas such as old-growth and/or unmanaged forests. While biomass sourced from these areas would certainly not be low carbon, this is simply ruling out one worst-case scenario: again, it is a necessary but not a sufficient condition. This condition does not ensure that forest biomass is low carbon because it does not require assessing carbon flux from harvesting and burning biomass.

72. Further details of what constitutes the land criteria can be found in individual pieces of legislation, but in all cases, the provisions do not ensure that biomass is "low carbon" because none of the provisions require an actual assessment of carbon flux.

73. For example, the RO requires that "at least 70% of the woody biomass was obtained from a sustainable source."[24] This is defined in the RO legislation[25] as including several criteria, but none of these consider the carbon dynamics of forest harvesting other than a requirement that "the productivity of the area is maintained, in particular by adopting plans to avoid significant negative impacts on productivity. There is also an optional requirement that woody biomass be grown in an area that was managed "consistent with" the Forest Europe Sustainable Forest Management Criteria. The only provision there relevant to carbon dynamics was the exhortation that "*Forest management practices should safeguard the quantity and quality of the forest resources in the medium and long term by balancing harvesting and growth rates, and by preferring techniques that minimise direct or indirect damage to forest, soil or water resources.*"[26]

74. The UK Timber Standard[27] also contains provisions that are invoked in some sustainability schemes. The only provision of the Timber Standard relevant to forest carbon dynamics is a requirement (provision S6(e)) that harvest levels should not exceed "the long-term production capacity of the forest based on adequate inventory and growth and yield data."

75. Whereas harvesting sustainability usually at a minimum means that logging should not remove more wood each year than the forest produces (thus allowing stocks to remain at least constant), this provision states that harvest levels should not exceed "long term production capacity" of the forest – a weaker provision because unlike the amount of wood grown each year, which can in theory be measured, the "long term production capacity" of the forest is undefined.

76. Under this provision, and also under similar provisions like that of the Forest Europe Sustainable management criteria requiring "balancing harvesting and growth rates," it would be possible to greatly reduce the carbon sink of a forest, and still meet the criteria. The example above at section C explains why.

77. Both scenarios preserve a net carbon sink (-30 and -10), meaning that harvest levels did not exceed production, and thus both scenarios would be treated as equally "sustainable" under the UK's criteria.

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[24] The Renewables Obligations Order 2015, Schedule 3 para 3 (Statutory Instrument 2015 No 1947)

[25] https://www.legislation.gov.uk/uksi/2015/1947/schedule/3

[26] Annex 2 of the Resolution L2, Pan-European Operational Level Guidelines for Sustainable Forest Management, available at: https://foresteurope.org/wp-content/uploads/2016/10/MC_lisbon_resolutionL2_with_annexes.pdf#page=18

[27] https://assets.publishing.service.gov.uk/media/5a7bfdafed915d01ba1ca71a/Timber_Standard_for_Heat_and_Electricity_under_RO_and_RHI_-_10-Feb-2014_for_pdf_-_FINAL_in_new_format.pdf

However, the forest sink would have removed less carbon from the atmosphere, and the atmosphere would contain more CO_2, for the year when logging was intensified.

78. From this it can be seen that a simple requirement to ensure harvesting does not exceed production is not sufficient to ensure that biomass from such harvesting is "low carbon."

I. Applying the reasoning here to a BECCS project in Europe, the Stockholm Exergi plant

79. The EU is already funding BECCS projects – but they suffer from the same misleading claims and inadequate analysis that DESNZ exhibits in the UK Biomass Strategy. For example, the EU has allocated €180 million in public funding to the Stockholm Exergi biomass plant[28] – without a single analysis showing the project can actually deliver negative emissions. The project writeup makes the extraordinary claim that it will "remove" 7 million tonnes of CO_2 from the atmosphere in the first ten years of operation.

80. This comes back to the old problem – that they want to treat biomass as *actually* having "zero" emissions, based solely on the accounting convention of *counting* biomass as zero in the energy sector.

81. The fact that burning one tonne of green wood emits slightly more than one tonne of CO_2 makes this easier to explain. What they will actually be doing at the Swedish plant is taking 7 million tonnes of green wood (over ten years) – which had *already* sequestered atmospheric CO_2, and *presumably was already counted as doing so in the national greenhouse gas inventory* – burning it, capturing the 7 million tonnes of CO_2, and storing that belowground, then claiming they have actually "removed" that CO_2 from the atmosphere, when in fact all they have done is prevented it from entering the atmosphere. There has been no net change. Previously, the carbon was embodied in the trees, and was thus not in the atmosphere. Now, the CO_2 is held belowground, so is still not in the atmosphere. **But there has been no new "removal" of CO_2 from the atmosphere.** They have simply taken stored carbon and moved it into a different kind of storage.

82. Thus, they are committing the first deadly sin of carbon inventories – **they are double-counting the removal of the carbon**. It was already counted as part of the carbon sink when it grew – now they want to count it again as a new "sink" just because they have burned it and stored the CO_2. This is a carbon accounting gimmick.

[28] https://climate.ec.europa.eu/system/files/2022-07/if_pf_2022_beccs_en.pdf