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Questions Addressed

What contribution could NETs (through DACCS, BECCS, and/or other NETs) make to achieving net zero by 2050?

Given the proposed role of NETs in climate change modelling, is there a danger of over-reliance on these technologies in net zero strategies?

In the majority of low-carbon scenarios that meet the Paris Agreement goals, NETs are used to meet net-zero by 2050 by enabling continued CO<sub>2</sub> emissions from fossil fuel consumption, in sectors such as heavy industry and long-distance transport such as aviation/shipping, as well as non-CO<sub>2</sub> emissions from sectors such as agriculture. In the UK's Net Zero Strategy, this framing is again utilised, with NETs used to offset emissions from aviation, as well as non-CO<sub>2</sub> emissions from agriculture. The role of NETs is therefore limited to balancing residual emissions in achieving net-zero, often at large scales.

However, this is not necessarily the only role of NETs. I would argue that further policy formation around NETs requires understanding the *uncertainty* in future NETs deployment, and also the *variety of roles* that NETs could play in a decarbonised future. This submission will attempt to address both of these issues.

**Uncertainty in future CDR potential**

A recent paper which surveyed experts on the feasibility of carbon dioxide removal (CDR) highlighted that there is considerable uncertainty remaining around the feasibility of NETs, with experts providing varied and contrasting views on the feasible scale of CDR by 2030, 2050 and 2100 (Grant *et al* 2021b). Therefore net-zero goals which are heavily reliant on largescale CDR are at risk of failure if CDR is not upscaled successfully.

While acknowledging that *some* residual emissions will remain in 2050 which need to be offset by CDR, the question is really the level of CDR reliance we should be comfortable with, and what sectors should benefit from this CDR.

Robust climate policy should more stringently consider the potential to further eliminate residual emissions from the system, aiming for an absolute-zero or near-zero energy system, and substantial increases in mitigation in the agricultural sector beyond current considerations. Limiting residual emissions further would reduce the reliance on CDR for achieving net-zero, which can improve the robustness of the UK's net-zero strategy. This can essentially 'de-risk' our net-zero strategy against CDR failure.

**The appropriate role of CDR in meeting net-zero**

As mentioned above, CDR is often viewed as a means of offsetting continued emissions from 'hard to decarbonise' sectors. This is not the only role that CDR can play. If CDR is successfully upscaled, rather than being used to enable continued emissions from 'hard to decarbonise' sectors, it can instead be used to operationalise a net-negative economy. This could be important, as achieving net-negative emissions in global North countries such as the UK could improve the chances of meeting the 1.5C target, by unlocking further flexibility for the energy transition in countries with much more challenging contexts, particularly those in the Global South (Mohan *et al* 2021). This

could be justified on the grounds of climate justice, given the substantial historical responsibility for climate change or capacity to mitigate in developed economies (van den Berg *et al* 2019). NETs could also then perform alternative functions such as maximising climate ambition or hedging against climate uncertainties such as the sensitivity of the climate system to emissions, or the potential for tipping points (Grant *et al* 2021a). Critically, this requires that where possible, NETs are deployed *in addition to*, rather than *as a substitute for*, emission reductions (McLaren *et al* 2019).

### **Which sectors should be able to rely on CDR to offset emissions?**

When discussing which sectors should benefit from CDR, a key consideration is what emissions truly count as ‘hard-to-abate’. It is important to realise that those sectors which are deemed difficult to decarbonise due to technical or physical challenges, most notably aviation and agriculture, are simultaneously those sectors in which societal change can do the most to address emissions. This is often neglected in policymaking and modelling, and highlights that we should be cautious in labelling any sector ‘hard-to-decarbonise’, without ensuring that we have considered all possible mitigation options. Recent research has demonstrated how greater focus on demand-side changes can substantially reduce reliance on CDR for meeting the UK’s net-zero goal (Barrett *et al* 2021). In this recent modelling, increased action on societal change can reduce NETs deployment to the extent that only nature-based solutions are required, with no BECCS or DACCS deployment necessary. Note that this modelling still utilises a framing in which the only role of CDR is to balance residual emissions – and so if engineered removals by BECCS/DACCS are able to be deployed, they could be added to this work as an additional strategy to create net-negative emissions.

### **Further implications of uncertainty in the feasibility of NETs**

When exploring the policy implications of uncertainty in CDR, we must remember that the climate responds to *cumulative emissions on the road to net-zero*, rather than simply the date of net-zero. Given uncertainty in CDR, there is the possibility that we will miss our net-zero target if CDR fails to be deployed. This could lead to greater emissions around the mid-century than anticipated. In order to safeguard against this, and remembering the importance of cumulative emissions, recent research has shown that the best way to respond to potential uncertainty in CDR is to maximise the level of action in the current decade, through accelerated renewables build-out and an increased pace of fossil fuel phaseout (Grant *et al* 2021b). This has relevance for the UK, as research for WWF has highlighted that the UK could go further than its current NDC for 2030 (Grant 2020). Greater action on the road to 2030 would help hedge against the possibility of CDR deployment failure in the future.

### Summary

- Experts still suggest that the feasibility of largescale NET deployment is highly uncertain, and the non-negligible potential for deployment failure in NETs should be accounted for in policymaking, by reducing reliance on CDR for meeting the net-zero goal.
- It is critical to interrogate the role of NETs to provide carbon dioxide removal (CDR) in low-carbon futures. NETs can do more than simply offset emissions from other sectors but can be deployed as a separate climate strategy to achieve net-negative emissions, alongside aggressive action to phase out fossil fuels and reduce non-CO<sub>2</sub> emissions.
- When considering which sectors should be deemed ‘hard-to-abate’, it is important to ensure that behavioural change is not excluded as a possible abatement strategy. Providing policies, infrastructure and societal norms to shape behaviour can reduce demand for the most polluting goods such as red meat and aviation and reduce reliance on CDR for net-zero (this CDR could then be deployed elsewhere to maximise ambition, as suggested above).

- An uncertain future CDR resource should provide an incentive to do all that we can in the present to reduce emissions. There is evidence that the UK could go further and faster over the 2020s with a more ambitious NDC, and this should be considered as a matter of urgency by the UK Government.

## References

- Barrett J, Pye S, Betts-Davies S, Eyre N, Broad O, Price J and Norman J 2021 *The role of energy demand reduction in achieving net-zero in the UK*
- van den Berg N J, van Soest H L, Hof A F, den Elzen M G J, van Vuuren D P, Chen W, Drouet L, Emmerling J, Fujimori S, Höhne N, Köberle A C, McCollum D, Schaeffer R, Shekhar S, Vishwanathan S S, Vrontisi Z and Blok K 2019 Implications of various effort-sharing approaches for national carbon budgets and emission pathways *Clim. Change*
- Grant N 2020 *Setting an ambitious and feasible NDC for the UK* Online: [https://www.wwf.org.uk/sites/default/files/2020-11/WWF\\_NDC\\_report.pdf](https://www.wwf.org.uk/sites/default/files/2020-11/WWF_NDC_report.pdf)
- Grant N, Hawkes A, Mittal S and Gambhir A 2021a Confronting mitigation deterrence in low-carbon scenarios *Environ. Res. Lett.* 13 Online: <https://doi.org/10.1088/1748-9326/ab6b35>
- Grant N, Hawkes A, Mittal S and Gambhir A 2021b The policy implications of an uncertain carbon dioxide removal potential *Joule* 5 1–13
- McLaren D P, Tyfield D P, Willis R, Szerszynski B and Markusson N O 2019 Beyond “Net-Zero”: A Case for Separate Targets for Emissions Reduction and Negative Emissions *Front. Clim.* 1 1–5 Online: <https://www.frontiersin.org/article/10.3389/fclim.2019.00004/full>
- Mohan A, Geden O, Fridahl M, Buck H J and Peters G P 2021 UNFCCC must confront the political economy of net-negative emissions *One Earth* 4 1348–51 Online: <https://doi.org/10.1016/j.oneear.2021.10.001>

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