# Written evidence submitted by Greenpeace UK

Greenpeace is an international environmental organization with a longstanding interest in a clean energy system, publishing analyses and evidence for at least 3 decades. The author of this evidence gave evidence to the Climate Assembly on Greenhouse Gas Removal technologies[1].

Greenpeace would like to make 3 overarching points about Greenhouse Gas Removal technologies

1. The prospect of negative emissions technology can delay immediate action
2. Technological uncertainty remains considerable about the delivery of CCS, a central component of GGR technologies
3. There are especially problematic aspects about the large-scale use of BECCS

## 1. The prospect of negative emissions technology may delay immediate action

There is little doubt that delivering zero greenhouse emissions is hard, and also little doubt that some unpopular short term action may be required to deliver it, including for example changes to building standards and transport policy. Under these circumstances it would be a convenient political response to delay action if it were possible to point to an easier path where new technologies at later points in time removed the need for those short-term unpopular measures. Researchers from the University of Lancaster who looked at this concluded that:

> "research has identified debatable and poorly communicated assumptions made in climate modelling over the last decade about massive future use of GGR techniques, and has shown that these have already undermined the need and urgency felt by policy makers to accelerate mitigation efforts"[2]

Effects causing the undermining of mitigation included the belief that they would perform better than they actually will do, the rebound effect of land use change caused by land dedicated to GGR, or the prospects of leakage are included.

There is no complete solution to this problem but there are some things that are might help. One is rigorous and critical appraisal of GGR techniques. This would not just be on cost per tonne of carbon removed and technology capability (although those are important), but on the wider impacts of any GGR technique including land, biodiversity, economic displacement and community disruption. It should also be made clear in any climate action plans, both corporate and state, what separate targets there are for fossil fuel emissions reductions, biosphere emissions reductions and increased carbon removal. And documenting of both gross emissions and gross removals.

## 2. Technological uncertainty remains considerable about the delivery of CCS

Both of the main techniques flagged in the call for evidence rely on Carbon Capture and Storage for their success. And yet there is a long history of this technology failing to deliver as initial research was begun in 1991[3] and project proposals were already being made by late 1990s. Yet so far, an

[1] https://www.climateassembly.uk/about/meetings/weekend-5/dr-douglas-parr-policy-director-greenpeace-beware-thinking-greenhouse-gas-removal-technology-will-save-us/index.html
[2] http://wp.lancs.ac.uk/amdeg/files/2020/02/Briefing-note-FINAL.pdf
[3] https://ieaghg.org/about-us/what-do-we-do

unambiguously successful project has not materialised despite much fanfare and many billions being thrown at the technology across the world.

Even recent CCS projects have thrown up reasons for doubt about their long term, widespread availability. The huge Gorgon gas LNG project in Western Australia is run by Chevron, and as is frequently the case, the extracted natural gas also contains significant percentages of CO2. The proposal was to separate the CO2 and re-bury it. However, although the developer promised to put back at least 80% of the CO2 beginning in 2016, it was actually 2019 before reburial started and the amount sequestered has been a fraction of what was promised. Problems arose from geo chemistry in the sub-sea formation, pipe blockages and risks from fracture in the geological formation. One expert commentator observed that the experience "implies that CO2 storage will be more 'expensive, slow and difficult' than was hoped"[4]

The Al Salah project in Algeria run by BP and Equinor was also supposed to reinject CO2 but was halted after a few years again over fears of formation fracture, and slight ground level lifting. As one expert further explains:

> "BP engineers on the project had earlier described the storage geology at In Salah as 'very similar to that of the North Sea', where the company also hopes to develop large CCS projects. We have long been told by specialists in CCS that injection of CO2 into depleted fossil fuel formations held no risks because the geology had already proved itself by retaining the gas or oil for hundreds of millions of years. The experience at In Salah and at Gorgon suggests that this does not provide sufficient security."[5]

It is also worth noting that more broadly that there remains substantial risks associated with reliance on CCS for a climate strategy, and by extension any negative emissions strategy. As Climate Action Network International describe it:

> "Despite billions in public support over the past decade, there are 51 largescale CCS projects across the globe, of which 19 are operating and most are pilot-scale projects that demonstrate only a part of CCS (e.g., capture but not storage). … Collectively, currently operational CCS projects (excluding Enhanced Oil Recovery operations) are injecting and storing less than 5 million tonnes of CO2 (MtCO2) per year. The International Energy Agency (IEA), which counts only two large-scale CCS projects operating in the power sector with a combined capture capacity of 2.4 million tonnes of CO2 per year, notes the technology remains well off track to reach the 760 MtCO2 by 2030 and about 2.8 Gt CO2 by 2050 storage rate outlined in IEA's own Sustainable Development Scenario."

And so despite very considerable political and economic support, it has not been possible to deliver CCS at meaningful scale.

### 3. There are especially problematic aspects about the large-scale use of BECCS

BECCS is the most common 'placeholder' for negative emissions technologies in models of future emissions, despite there never having been even a working prototype. Thus its delivery, cost and practicability remain speculative. In global climate models BECCS is seen to operate at considerable scale. As Carbon Brief describes it[6]

---

[4] https://www.carboncommentary.com/blog/2021/7/30/the-struggles-to-make-ccs-work
[5] https://www.carboncommentary.com/blog/2021/7/30/the-struggles-to-make-ccs-work

> "Integrated assessment models (IAMs) that generate energy and emission pathways to limit warming to 1.5C have generally relied on large amounts of bioenergy with carbon capture and storage (BECCS) to provide the required negative emissions. Many deploy BECCS on a massive scale, allocating a land area up to five times the size of India to growing the biomass needed by 2100."

Delivering land at this scale is completely implausible given the need to end habitat destruction and deforestation, whilst in fact needing to dedicate more land to nature to tackle the biodiversity crisis. Even just looking at UK, under the Climate Change Committee's Balanced Net Zero pathway[7], meeting biomass demand for BECCS would require converting up to 700,000 hectares of UK land (more than four times the size of Greater London) to grow energy crops, in addition to imports. This at a time when UK is looking to onshore more food production and set aside 30% of land area for nature[8].

Thus BECCS is not a substitute for rapid deep emissions reductions.

Further, BECCS cannot even be assumed to be carbon negative. Burning biomass is not carbon neutral, and some impact on the atmosphere will remain however efficient the capture of carbon emissions at the smokestack of a BECCS plant. This arises for 3 reasons:

1. Lifecycle emissions including supply chain emissions in cultivating biomass growth (e.g. fertiliser or pesticide use), processing and transporting wood pellets, including that from soil degradation/damage during harvest. These will not be captured by BECCS plant;
2. In the absence of biomass harvesting there is very likely to be carbon sequestration on the land as the ecosystem matures. Thus there is carbon capture on the land when harvesting does not take place that is 'lost' in the event of that harvesting ('foregone sequestration'[9]). This would also occur irrespective of any capture of emissions at smokestack of a BECCS plant.
3. Carbon debt, arising from the pulse of carbon from biomass combustion that is not recaptured on the land for many years until by regrowth has taken place. This 'carbon debt' issue has repeatedly been pointed out by European science advisory Councils (EASAC)[10] who say that most biomass should not be used as substitute renewable fuel to impact atmospheric carbon levels on reasonable timescales:

   > *"accounting rules and public subsidies have led to an industry that is reducing even further our chances of meeting Paris Agreement targets….*EASAC finds it highly significant that the only scenario with neutral or positive biodiversity impact that has short-term carbon impacts is burning fine woody debris from coniferous forests (typically twigs and low-diameter branches). And even then, JRC state that enough of this material should be left onsite to maintain soil carbon and fertility."

Although these 3rd set of emissions would be captured by a BECCS plant the others remain and could be a substantial fraction of the CO2 captured. For these reasons Chatham House has expressed profound scepticism about the role of BECCS[11].

---

[6] https://www.carbonbrief.org/analysis-how-natural-climate-solutions-can-reduce-the-need-for-beccs
[7] https://www.theccc.org.uk/publication/sixth-carbon-budget/
[8] https://www.gov.uk/government/news/pm-commits-to-protect-30-of-uk-land-in-boost-for-biodiversity
[9] https://www.researchgate.net/publication/271224456_The_Burning_Question_Does_Forest_Bioenergy_Reduce_Carbon_Emissions_A_Review_of_Common_Misconceptions_about_Forest_Carbon_Accounting
[10] https://easac.eu/media-room/press-releases/details/easac-welcomes-that-the-jrc-report-strengthens-the-case-for-shorter-payback-periods-on-woody-biomass/
[11] https://www.chathamhouse.org/2020/01/net-zero-and-beyond-what-role-bioenergy-carbon-capture-and-storage

In conclusion, negative emissions technologies, and the prospect of them, can act as a corrosive influence on the need for immediate, deep emissions cuts to tackle climate change. Most NETs rely on Carbon Capture and Storage which has a lamentable history of performance, and even recent failures give little confidence it can be made to work despite enormous levels of political and economic support given over the years. BECCS in particular has serious problems associated with delivering negative emissions, suggesting that any 'net zero' climate action plan that relies on BECCS is not a good plan.

*November 2021*