

## **Burning Bread: How bioenergy with carbon capture and storage (BECCS) would undermine UK food security**

- The Government is pressing ahead with new plans to finance bioenergy with carbon capture and storage (BECCS) power plants. Such power plants could either burn wood from forests, or energy crops the UK grows to power them.
- Growing enough crops to burn in these power plants could take land away from food production **that would feed over 4 million people every year**. It would be equivalent to burning crops from **enough land to grow wheat for 15 billion loaves of bread** every year.
- The land needed may also impact on the Government's pledge to protect 30% of all land in England for nature.
- At Drax power plant, which plans to adapt two of its wood burning units to capture carbon, this will reduce the amount of electricity produced by 28%, creating a risk of blackouts for 41,000 homes.
- The UK's only alternative to burning energy crops grown in the UK, is for these power plants to continue burning wood from some of the world's most important forests for wildlife. In addition to making climate change worse, relying on forests harms global biodiversity, and undermines energy security by relying on imports.

### **Executive Summary**

The UK burns millions of tonnes of wood in its power stations every year to generate bioenergy. The Government plans to provide even more financial support for this technology, and wants to see it used with Carbon Capture and Storage to offset greenhouse gases from other parts of the economy.

Currently, most biomass comes from wood that is sourced directly from forests (the remainder made up mostly of waste and residues from sawmills).

If the UK continues using biomass to produce energy with or without carbon capture, it could continue burning the world's forests, or it could grow energy crops in the UK, or it could combine both. Existing biomass plants may not be able to burn these energy crops without adaptation, but new BECCS plants could.

BECCS is a technology that remains unproven at any scale and a review of carbon capture and storage projects shows that the ones that have underperformed or failed vastly outweigh those that have succeeded.<sup>1</sup>

---

<sup>1</sup> Bruce Robertson & Milad Mousavian. 1 Sept. 2021. The carbon capture crux: Lessons learned, <https://ieefa.org/resources/carbon-capture-crux-lessons-learned>.

# CUT CARBON NOT FORESTS

New analysis by Cut Carbon Not Forests suggests that using land to grow enough energy crops could significantly undermine UK food security. The energy crops needed could use up to 5% of all the UK's land. This would mean finding enough food for over 4 million UK citizens a year from somewhere else.<sup>2</sup>

Whether the UK turns to domestic energy crops to produce bioenergy or continues to import wood from overseas forests, the Government and bioenergy industry will be causing significant harm to nature and the climate, and to UK food security.

There are already significant concerns about UK food production due to climate change. In 2022, prolonged dry weather and drought is predicted to cut some harvests in half. Given that the UK imports a significant proportion of the food it consumes, we simply can't risk further jeopardising our homegrown food supply.

But the Government appears to be moving full steam ahead on new plans for bioenergy and BECCS. For example, in August, it launched a consultation on its proposals to create new subsidies for BECCS. Such subsidies could be even higher than current biomass subsidies, at around £179 per megawatt hour of electricity produced, or more than three times the cost of new onshore wind or solar. This consultation is ill-judged, poorly timed, and came in the middle of the Conservative leadership contest meaning that ministers may not be aware of its implications.

Instead of relying on BECCS, the Government should deploy genuinely low-carbon renewables like wind and solar, and help people cut energy bills through faster deployment of efficiency measures like insulation.

## **Undermining food security**

The Climate Change Committee estimates that the UK may need to capture up to 35.4Mt CO<sub>2</sub> per year through BECCS by 2050 to meet net zero goals. It argues that BECCS is needed to "mop up" emissions still being released by some sectors of the economy like aviation and industry.

At the moment, bioenergy mostly relies on imports of wood from forests overseas. But the alternative is to grow more energy crops (such as miscanthus, a fast-growing perennial energy crop) in the UK to feed power stations, which would require more land.

Analysis by CCNF shows that the amount of carbon BECCS must capture could require up to 16.8 million tonnes of miscanthus every year. Growing this much miscanthus would require around 1.3 million hectares of land. The UK land area is just over 24 million hectares, meaning this would consume 5% of all UK land. This is corroborated by the Climate Change Committee's own calculations, which suggest that in a "high energy crop planting" scenario the UK may need up to 1.4 million hectares of energy crops.

---

<sup>2</sup> See Annex for detailed methodology.

# CUT CARBON NOT FORESTS

If this land were instead used to grow wheat, it could produce enough to make roughly 15 billion loaves of bread, or enough calories to feed over 4 million people for a year. If all this land were used to grow energy crops, the UK would need to find this much food from somewhere else— a seemingly impossible task at a time when climate change is increasingly impacting crop yields at home and overseas.

This is land that could otherwise be used to grow cereals and reduce dependence on food imports, or to restore natural ecosystems to support wildlife and sequester carbon.

## **Bioenergy is expensive and undermines energy security**

At present, the UK imports over 9 million tonnes of wood pellets made from over 18 million tonnes of green wood per year to burn in power stations. However, the government strives to source more of our energy domestically, as set forth in the UK energy strategy.<sup>3</sup> Continuing to rely on bioenergy, and supporting new BECCS could mean relying more heavily on imports.

Drax power station plans to add carbon capture to two of its units that burn wood. Drax's plans show that the plant would produce around one third less electricity (because some electricity needs to be used to capture the carbon). This could mean a drop in electricity production equivalent to that used by 41,000 homes.

BECCS will also cost billpayers dearly. Drax power plant currently receives around £2 billion per year in subsidies for burning wood. It is estimated that a new BECCS power plant may cost around £31 billion over its lifetime, requiring a subsidy of £179 per megawatt hour of electricity produced. For comparison, new onshore wind and solar receive subsidies for less than one third of that, at around £50-55 per megawatt hour.

## **BECCS will harm nature and the climate**

At present, most bioenergy used to generate electricity is wood that comes directly from forests. Cutting down trees and burning them for electricity worsens climate change by increasing carbon dioxide in the atmosphere that cannot be cancelled out by tree regrowth within the time frames relevant for climate change.

Many of these trees are being cut down from some of the world's most important forests for wildlife. These include the legally protected forests of Estonia, Canada's Boreal forest, and the North American Coastal Plain, which is a Global Biodiversity Hotspot.

Growing energy crops is not necessarily low-carbon. Growing these crops can mean displacing food crops to somewhere else or cutting down trees. This has a carbon impact as well, and can mean that bioenergy crops actually have a higher carbon footprint than is assumed.

---

<sup>3</sup> Department for Business, Energy & Industrial Strategy. 7 Apr. 2022. Policy paper: British energy security strategy, <https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy>.

# CUT CARBON NOT FORESTS

## Annex: Methodology

### **BECCS and food security**

In its Further Ambition scenario the CCC thinks the UK would be capturing 35.4MtCO<sub>2</sub> per year by 2050 using BECCS. (<https://www.theccc.org.uk/publication/sixth-carbon-budget/>)

This would mean generating 37.2MtCO<sub>2</sub>, assuming a 95% capture rate (this is a generous assumption).

The ratio of carbon to CO<sub>2</sub> is 1:3.67  
([https://energyeducation.ca/encyclopedia/C\\_vs\\_CO2#:~:text=Carbon%20has%20an%20atomic%20mass,3.67%20kg%20of%20CO2.](https://energyeducation.ca/encyclopedia/C_vs_CO2#:~:text=Carbon%20has%20an%20atomic%20mass,3.67%20kg%20of%20CO2.))

This means 37.2MtCO<sub>2</sub> would require 10Mt carbon.

The carbon content of miscanthus is estimated, at the upper end, to be 60% ([https://www.terravesta.com/wp-content/uploads/2021/04/Terravesta\\_miscanthus\\_carbon\\_report.pdf](https://www.terravesta.com/wp-content/uploads/2021/04/Terravesta_miscanthus_carbon_report.pdf)), meaning 16.8Mt of miscanthus would be required.

Miscanthus has a yield of 12.8 tonnes per hectare.  
(<https://pubs.rsc.org/en/content/articlelanding/2018/ee/c7ee03610h#cit10>)

16,893,733 tonnes of carbon/12.8 = 1,319,822 hectares of land

This is 5% of all land in the UK.

Wheat has a yield of 7.8 tonnes per hectare.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1094493/Agriculture-in-the-UK-27jul22.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1094493/Agriculture-in-the-UK-27jul22.pdf)

From the same area of land, you could generate 10,294,611 tonnes of wheat.

Assume that one kg of bread is 0.85kg of wheat ([https://www.transportenvironment.org/wp-content/uploads/2022/03/202203\\_Food\\_not\\_Fuels-1.pdf](https://www.transportenvironment.org/wp-content/uploads/2022/03/202203_Food_not_Fuels-1.pdf))

This means one 750g loaf is 637g wheat  
637g is 0.000673 tonnes

15,296,598,811 loaves of bread (15 billion loaves of bread).

UK diet 2500 calories per day.

1 750g loaf of bread 234 calories

<https://www.nutracheck.co.uk/CaloriesIn/Product/32/Sunblest+Medium+White+Sliced+Bread+750g>

# CUT CARBON NOT FORESTS

10 loaves feed 1 person for 1 day

3650 loaves 1 person for a year

This means it's enough land to feed 4,190,848 for one year.

## **BECCS energy production**

In its planning application for new Bioenergy Carbon Capture and Storage Drax says that the net capacity of two of its units with BECCS will be 931 MW, 461.5 MW per unit.

<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010120/EN010120-000268-6.3.15.2%20Drax%20BECCS%20ES%20Vol%203%20Appendix%2015.2%20Proposed%20Scheme%20GHG%20Emissions%20Calculation.pdf>

The current capacity of each unit is 645 MW, combined 1290 MW. This means that the total capacity reduction is 359 MW. This means that with BECCS, these two units will produce around 28% less electricity.

Average household electricity use is 8 kWh per day. <https://usave.co.uk/energy/how-much-energy-does-the-average-uk-household-consume/>, which is 70 MWh per year.

The maximum operation of any power station per year is 8000 hours. Drax is reducing its capacity by 359 MW (see above). This means a total potential reduction of 2.8 TWh per year. This is equivalent to the electricity required by 40,981 households per year.