

biofuelwatch

Carbon capture from biomass and waste incineration: Hype versus reality

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Executive Summary

Bioenergy with Carbon Capture and Storage (BECCS) has been gaining traction in the debate around climate change mitigation, with governments developing funding and business frameworks to incentivise such projects. BECCS is misleadingly classified as a 'carbon removals technology', based on the false assumption that biomass energy is carbon neutral and that capturing and storing CO2 from burning wood or other biomass makes it 'carbon negative'.

Carbon credits and offsets from "carbon removals" including BECCS featured in the Climate COP27 discussions and the European Commission will be putting forward a proposal for a Carbon Removal Certification Framework at the end of November 2022, which is expected to include support for BECCS, too. Meantime, the EU and governments including in Sweden, the Netherlands and the UK have started putting BECCS subsidy mechanisms into place.

Operators of waste incinerators are taking advantage of the push for BECCS by developing carbon capture projects and claiming those are or could be 'carbon

negative' as long as more than half of the mixed waste burned is biogenic rather than from fossil fuels.

An important criticism of the discourse around BECCS is that it is being used to legitimise further fossil fuel burning. As shown in our report, carbon capture has from the start been developed to further fossil fuel industry interests. Carbon capture itself is derived from a process used to remove toxic hydrogen sulphide and CO_2 from fossil gas so as to allow more gas to be burned for energy. The first carbon storage project was set up with the sole aim of recovering additional oil through a process now known as Enhanced Oil Recovery (EOR). Today, 73% of all carbon captured worldwide is used for EOR, which means that it results in more overall CO_2 emissions than would have been the case without carbon being captured. We then look at existing carbon capture projects across different sectors and show that almost all of them involve capturing highly pure CO2 streams, for example from ethanol fermentation, and that there is only one commercial-scale power plant with carbon capture – a coal plant in Saskatchewan, Canada, which has been beset with problems and is not expected to break even financially throughout its operational life, despite the CO_2 being sold to an oil company for EOR.

The report then looks at the literature around the technical challenges of capturing carbon from biomass (and by implication mixed waste) combustion. The fundamental problems with carbon capture from power and heat plants using amines (the only proven technology in this context) are a) high energy requirements, b) amine degradation, b) corrosion caused by amine particles. Capturing carbon from biomass and waste combustion plants poses additional challenges because flue gases have a very different composition to those from coal or fossil gas plants an standard levels of sulphur oxide and particulate emissions interfere with the functioning of the amine solvents.

The main section of the report looks at the 17 projects involving carbon capture from biomass plants or waste incinerators which have either captured some CO_2, mostly during small-scale trials, or which haven't so far but which have attracted funding for trials. In addition, we included a proposed BECCS project at an Indonesian pulp mill, with a finance plan involving carbon credits. We found projects involving carbon capture from biomass plants in Canada, Denmark, Indonesia, Japan, Netherlands, Sweden and the UK, and projects involving carbon capture from waste incinerators in Denmark, France, Japan, Norway, Netherlands and Sweden.

The most successful of those projects in terms of total amount of CO_2 captured appears to have been carbon capture from a waste incinerator in Duiven, Netherlands, with 42,000 tonnes reported captured in 2021, still less than 11% of the incinerator's total CO_2 emissions and, furthermore, the operators reported problems with corrosion at the end of that year.

All CO_2 captured from biomass plants and waste incinerators so far has either been vented to the atmosphere,sold to greenhouses in order to make flowers and other produce grow quicker or, in the case of a waste incinerator carbon

capture project in Japan, used to fertilise algae grown for anti-wrinkle skin cream. Both CO_2 use in greenhouses and in algae farming are subsidised as 'carbon capture and utilisation', even though they are of no benefit to the climate.

The lack of experience with large-scale carbon capture from such plants does not prevent some companies from claiming that they will soon be capturing very large quantities of CO_2. Drax Group in the UK 'promises' to scale up carbon capture at their biomass power station by more than a million times, and Stockholm Exergi more than 2,000 times.

Investment in biomass and waste incineration carbon capture is primarily driven by public subsidies and, for example in the case of Drax Group, by the prospect of future subsidies ostensibly granted for 'BECCS' will be decoupled from any requirement to actually capture carbon. In Indonesia, Marubeni Corporation is the first to put forward a BECCS project in expectation of carbon offsets. Those are subsidies that could and should otherwise be spent on real solutions to the climate crisis, including home insulation, low-carbon renewable energy and investment in recycling.

The report goes on to illustrate the contradictions between the very limited actual experiences with carbon capture from biomass or waste incineration with hyped up claims made about such projects.

Finally, we discuss the one bioenergy sector with genuine and realistic plans for BECCS: Ethanol, and specifically corn ethanol production in the USA. Although there are only two such projects at present, 34 are in the advanced development stages, attracted by generous financial incentives, including though pieces of legislation enacted during 2022. In connection with those plans, a large new network of CO_2 pipelines is being developed, against community opposition and protests driven by safety concerns. The amount of CO2 that can be captured from an ethanol plant is small compared to direct and indirect greenhouse gas emissions from ethanol production. In sthis context, government support for BECCS serves as a lifeline for ethanol producers who cannot expand their US ethanol market in the face of competition from electric vehicles. Once again, the discourse around BECCS serves specific economic interest groups, with no potential benefits in terms of real climate change mitigation.

Biofuelwatch provides information, advocacy and campaigning in relation to the climate, environmental, human rights and public health impacts of large-scale industrial bioenergy.