Going carbon negative with Bio-CCS

Carbon Capture and Storage (CCS) combined with biomass, known as Bio-CCS offers the only large scale means of going carbon negative. Carbon negative is a way of reversing the effects of climate change by taking excess CO_2 out of the atmosphere. In practice, with the application of this technology each megawatt of clean energy or industrial product produced, removes CO_2 from the atmosphere.

Bio-CCS is sometimes referred to as geo-engineering; the manipulation of environmental processes affecting the climate. This is a misnomer. Bio-CCS is rather the correction of the geo-engineering that is the excessive extraction and uncontrolled use of fossil reserves. Bio-CCS is the use of nature's own processes to compensate for the environmental damage resulting from fossil fuel use.

Biomass binds CO_2 from the atmosphere as it grows. When biomass rots or is combusted for power production, this carbon is released back into the natural cycle. This cycle is therefore carbon-neutral. If this carbon is instead captured, transported and permanently stored deep underground, for instance in depleted oil or gas fields, this would result in a net removal of CO_2 from the atmosphere. The introduction of sustainable biomass to CCS-equipped fossil power plants and industries, or the use of CCS at biofuel production facilities, will begin to reduce the level of CO_2 in the atmosphere, thereby reversing climate change.

Carbon Negative power plants – Turning on the light to reverse climate change

Biomass can be used at many CCS equipped power plants. It may be blended with coal and combusted in existing coal power plants (co-firing) or with some modifications an existing plant can use only biomass. Biomass may also be gasified for use in natural gas CCS power plants.

The use of biomass in a plant fitted with CCS produces a double climate benefit: Emissions from combustion of fossil fuels are prevented from entering the atmosphere and the CO_2 contained in the biomass is captured, thereby removing CO_2 from the atmosphere.

A 2012 Bellona report[1] estimated the potential role of Bio-CCS in the Romanian electricity sector. A scenario with 10% biomass integration in 2020, rising to just 20% in 2030, would remove 130 million tonnes of CO_2 from the atmosphere. This would only use a fraction of the existing, local biomass available in Romania.

The Drax coal fired power plant in the UK has co-fired biomass for a number of years. The White Rose[2] CCS project, currently in planning stages, would render this a Bio-CCS facility. Depending on the amount of biomass that is co-fired, White Rose can provide carbon negative electricity for up to 630,000 homes.

[1] Our future is carbon negative: A CCS roadmap for Romania (2012) http://bellona.org/ccs/ccs-news-events/publications/article/our-future-is-carbon-negative-a-ccs-roadmap-for-romania.html
[2] http://www.whiteroseccs.co.uk/about-capture-power/about-drax

Going carbon negative with Bio-CCS

Carbon Negative Industries – A true industrial renaissance

CCS is critical should industry survive in a carbon constrained economy. Energy-intensive industries such as steel mills, cement factories, chemical plants and refineries are reaching theoretical efficiency limits and CCS is the only technology that can substantially reduce their emissions. Use of Bio-CCS in industrial processes can leave us with carbon negative products. Bio-CCS is a natural first step at pulp and paper factories, where at-site wood waste is already being used to power production.

Carbon Negative Biofuels – Driving for negative emissions

The cost of CO_2 capture from biofuel production, such as ethanol fermentation, is generally very low, as the CO_2 by-product streams are often of high purity. The pure stream of CO_2 negates the need for additional separation equipment, with only driers and compression units necessary to prepare the CO_2 for transport to a storage site. The Illinois Industrial Carbon Capture and Storage Project[3] in the USA is already producing such carbon negative biofuels. Biofuels production with CCS is the low-hanging fruit for Bio-CCS.

Policy priorities

1. A sustainable biomass supply is the key to realising the benefits of Bio-CCS and going carbon negative. It is of serious concern that current EU policy does not adequately address sustainability challenges such as life cycle emissions or indirect land use change (ILUC). Solid accounting of these effects must be ensured. Unsustainable practices, such as excessive import of biomass from areas with inadequate environmental regulation, must be halted so as not to become locked-in and undercut the overall climate effect. We have the tools to be thorough – let's use them.
2. At present there is no commercial benefit for a company that removes CO_2 from the atmosphere. Bio-CCS needs to be rewarded by accounting for negative emissions in emission trading schemes such as the EU ETS.
3. Bio-CCS is an available technology but still relies on the deployment of conventional CCS to bring down costs and demonstrate viability. National governments must step up their commitments to realising CCS projects and the EU institutions must move from saying to doing what is necessary to balance climate and economy objectives.

Read more in the 'Biomass with CO_2 Capture and Storage (CCS)' report authored by ZEP and EBTP with Bellona here[4].

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[3] http://sequestration.org/
[4] http://bellona.org/ccs/uploads/tx_weccontentelements/filedownload/EBTP__ZEP_Report_Bio-CCS_The_Way_Forward.pdf