Carbon Capture and Storage (CCS) technologies

A Friends of the Earth Scotland briefing

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Friends of the Earth Scotland

Summary

- Friends of the Earth Scotland has deep concerns about Carbon Capture and Storage and its false positioning as a climate solution
- Despite billions in support over the last decade, CCS remains largely unproven and untested at scale.
- Reliance on CCS risks diverting limited resources away from proven actions we know can help achieve our crucial 2030 target, create jobs and improve wellbeing.
- The IPCC states that faster emissions reductions that stick to 1.5ºC pathways can largely be achieved by implementing measures that "result in less CO_2 being produced and emitted".[1]
- CCS is fundamentally unnecessary in the power sector where more cost effective, proven and cleaner options to cut CO_2 emissions exist; such as initiating a swift and just decarbonisation of the economy that focuses investment into wide scale renewable energy.

Overview: What is Carbon Capture and Storage (CCS)?

CCS, sometimes called CCUS (Carbon Capture, Utilisation, and Storage), refers to the proposed removal of Carbon Dioxide (CO_2) usually from large primary sources of carbon such as the generation of fossil fuel power or biomass. It is proposed by some as a key technology to reduce emissions and limit global warming to 1.5ºC. The CCS process has three distinct parts: capture, transport, and storage. In theory CCS technologies are meant to prevent CO_2 from entering the atmosphere, or extract it later. Proponents claim the CO_2 would then be captured and compressed from a gas into a dense liquid, which would then be pumped and transported via pipeline/ship. In proposals for storage, the CO_2 would then be stored permanently by injecting the captured carbon into offshore geological reservoirs (e.g. the depleted oil and gas fields in the North Sea) thousands of meters below the earth's surface.

Scale and cost

The scale of CCS required to cut emissions even on a national level has yet to be demonstrated anywhere in the world. There is a lack of clear evidence that CCS technologies will work as proposed or be able to reduce emissions at the scale we need. Whilst many emission reduction pathways include CCS technologies, strong caution has been urged by the UN's Intergovernmental Panel on Climate Change (IPCC) about relying on CCS in efforts to limit climate warming. They note that *"Carbon Dioxide Removal (CDR) deployed at scale is unproven, and reliance on such technology is a major risk in the ability to limit warming to 1.5°C"*[2]

[1] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

[2] See Appendix 2

Despite receiving billions in funding over the past decade, there are estimated to be only 21 CCS facilities currently operating around the world. However, the majority of these utilise only one part of CCS (e.g. capture but not storage) and are small capacity facilities far from capable of being able to capture or store carbon on an industrial scale. [3]

In Europe alone, despite €587 million in grants given to approximately 63 projects related to CCS, there are still no working CCS plants over thirteen years since funding was awarded.[4]

In the UK, six CCS projects were earmarked to receive millions in additional funding from the UK Government in March of this year. Despite years of research and previous investment, none of these projects have ever managed to become operational. Two of the six projects – Acorn at St.Fergus and Caledonia Clean Energy at Grangemouth - are based in Scotland and have already received millions of pounds through grants from the Scottish Government. [5] Despite this, there is no evidence, recent status updates or the required permits to suggest that they will be able to capture CO_2 in the timescale or quantity required.

Feasibility

Currently, operational CCS projects, excluding those that utilise enhanced oil recovery, worldwide are injecting and storing less than 5 million tonnes of CO_2 combined ($MtCO_2$)[6]. For an idea of scale, Scotland's total annual emissions are 41.6$MtCO_2e$[7]. At the current global emissions rate Gigatonnes (Gt) of CO_2 would need to be captured and permanently stored - an increase in magnitude of 1000.

CCS investment and proposed implementation is a largely unstable pursuit, with EU projects facing a combination of strong public opposition, technical delays and increased funding requirements. A number of these factors have also historically impacted CCS projects in Scotland including the failed projects at Longannet and Peterhead, both of which were advocated for by the fossil fuel industry but relied heavily on government funding.[8] The UK Government has run two £1 billion CCS competitions which dragged out over a combined seven years and resulted in no operational CCS pilot plants.

Limited attention has also been given to the fact that CCS does not remove 100% of the CO_2 it attempts to capture and the extra water and energy requirements that many CCS technologies are estimated to rely on. Depending on the type of CCS deployed, approximately 15-25% more energy is required which means that at present, CCS relies on using more fuel, increasing direct "emissions" from plants where CCS is installed as well as

[3] https://www.globalccsinstitute.com/resources/global-status-report/
[4] https://euobserver.com/investigations/139257?utm_campaign=Twitter&utm_source=Link&utm_medium=AMS
[5] http://www.carboncapturejournal.com/news/uk-awards-42m-for-ccs-research-at-grangemouth/3560.aspx?Category=all
[6] see appendix 3
[7] https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2020/06/scottish-greenhouse-gas-emissions-2018/documents/scottish-greenhouse-gas-emissions-2018/scottish-greenhouse-gas-emissions-2018/govscot%3Adocument/scottish-greenhouse-gas-emissions-2018.pdf
[8] https://sequestration.mit.edu/tools/projects/peterhead.html

increased “indirect emissions” from the extraction and transportation process of the additional fuel.[9]

The risk of investing into unproven, expensive technologies cannot be underestimated. Relying on the false hope of these technologies becoming operational could put the Scottish Government on course to missing crucial climate targets and locking us into a high temperature pathway.

Alternatives

Instead of investing public money in speculative technologies to prop up polluting industries, there are holistic, evidenced and actionable routes to meet the 2030 target of 75% emission reductions which must be prioritised in order to cut emissions in the urgent time scale required. Ultimately, stopping emissions at source is one of the most effective ways to curb emissions. The Scottish Government must abandon the policy of Maximising Economic Recovery of oil and gas and decisively invest in a just transition that benefits the communities most affected by industrial change.

The IPCC highlight that *“Emission reduction pathways with no or limited overshoot include a rapid decline in the carbon intensity of electricity and an increase in electrification of energy end use “*[10]. It is key that a revision of Scotland’s Energy Strategy which includes new renewable energy targets, prioritises the electrification of high polluting industries and maps out the provision of zero-carbon jobs is prioritised.

Scotland should be aiming for 100% domestic generation (not just consumption as per the current target) of renewable electricity by 2030. We also need to see an upscaling in total electricity generation as the transition away from burning fossil fuels in heat and transport will place greater reliance on electrification in these sectors.

Investment into homes that are easier to heat, built at the highest efficiency standards, such as Passivhaus, which reduce heating emissions and support the elimination of fuel poverty should be a priority. There is also significant job creation and skills development potential in rolling out a national programme of retrofitting required to meet the 2030 target.

For more information, contact:

Jess Cowell
Climate Campaigner
jcowell@foe.scot

[9] https://www.eea.europa.eu/highlights/carbon-capture-and-storage-could
[10] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf