Carbon Capture and Storage

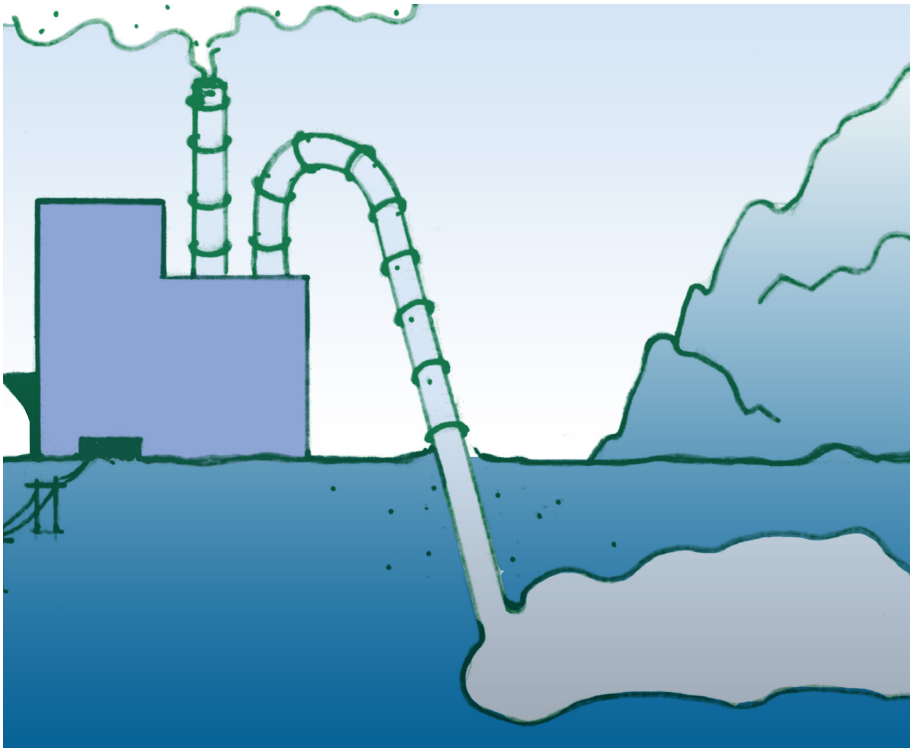
POINT OF INTERVENTION

OVERVIEW

CCS involves extracting CO2 from smokestacks via "scrubbers" and compressing it into a liquid and transporting it by pipeline to a site where it can be pumped underground into saline aquifers, oil or gas reservoirs, or under the ocean, to remain, theoretically, in long-term storage.

CCS was originally developed as an Enhanced Oil Recovery (EOR) technique. This involves pumping pressurized CO2 into older oil reservoirs to recover otherwise inaccessible oil, significantly boosting production. It has been practiced for more than 40 years, particularly in the United States. A recent report from the International Energy Agency's (IEA) CCS Unit describes "Advanced EOR+" as a way to "'co-exploit' two business activities": oil recovery and CO2 storage for profit.[1] The CCS process is costly and technologically challenging. The "capture" and gas compression phases in particular account for as much as 90% of the total cost of CCS.[2]

CCS places a significant "energy penalty" on the facility where it is used. For example, around 30% of the electricity produced at a post-combustion capture facility (the technology used for energy generation with CCS) would be required to power the CCS components,[3] making it a costly process energetically as well as financially. This means that for a coal-fired power station, even more coal would need to be mined and burned in order to produce the same amount of energy with CCS.



CCS technology aims to capture carbon and bury it underground.

REALITY CHECK

It's just a theory **It's being implemented**

ACTORS INVOLVED

Oil companies have proven a strong ally of CCS because it provides a source of subsidised CO2 for use in EOR. Decades of research and billions spent by companies such as Shell and Statoil have resulted in only a few commercial-scale CCS operations, highlighting the extent to which CCS is only commercially viable when used for EOR. This contradicts its alleged purpose.

The Global CCS Institute lists 17 operational, commercial-scale CCS facilities world-wide. Of these, just two are power generation facilities (both coal). Thirteen of them send their captured CO2 for use in EOR. Of the four facilities listed as being under construction, three are for EOR.[4] These statistics clearly show how the motivation for CCS is oil production, which will increase emissions.

Governments and the fossil fuel industry have for many years looked to CCS as a silver bullet for climate change, with the promise of the technology a consistent excuse for delaying serious reductions in fossil fuel use.

IMPACTS

The symbiotic relationship between CCS and EOR undercuts its (theoretical) potential as a serious climate-change response. In North America, carbon captured from the only large-scale CCS-equipped power plants, Petra Nova in Texas, and SaskPower in Saskatchewan (both coal-fired) is transported via pipeline to oil fields where it is injected for EOR. Beyond the extra emissions from the recovered oil, oil industry estimates indicate that about 30% of the CO2 piped to an EOR site will be directly emitted back into the atmosphere.[5]

Scaling up CCS would require massive global infrastructure, and a significant portion of the "stored" CO2 would be likely to escape via leaks.

CCS (and Bioenergy with CCS, see BECCS factsheet[6]) proponents claim that storing CO2 in old oil and gas reservoirs or deep saline aquifers will be effective and reliable. But real-world experience suggests otherwise: the captured carbon could leak out for many reasons, including faulty construction, earthquakes or other underground movements. At such high concentrations, leaked CO2 is highly toxic to animal and plant life.

REALITY CHECK

CCS is largely aspirational, although it is an area of intense interest and some limited implementation. High costs and technical issues have led to a wave of high profile project and programme cancellations in recent

years. Even projects that have managed to achieve operation, and been heralded as successful, are plagued with problems.[15] The fact that several Carbon Dioxide Removal technologies rely on CCS, such as BECCS and Direct Air Capture (see DAC factsheet[16]), should also be a serious cause for concern.

> ***The symbiotic relationship between Carbon Capture and Storage and Enhanced Oil Recovery undercuts its (theoretical) potential as a serious climate-change response.***

FURTHER READING

Greenpeace, "Carbon Capture SCAM," http://www.greenpeace.org/usa/research/carbon-capture-scam/

Biofuelwatch, "BECCS: Last ditch climate option or wishful thinking?" http://www.biofuelwatch.org.uk/2015/beccs-report/

ETC Group and Heinrich Böll Foundation, "Geoengineering Map," map.geoengineeringmonitor.org

The Big Bad Fix: The Case Against Climate Geoengineering, http://etcgroup.org/content/big-bad-fix

CO2: THE UNCERTAINTIES OF UNDERGROUND STORAGE

• In 2000, Cenovus Energy began injecting CO2 into the Weyburn oil field in Canada from a coal gasification plant.[7] Residents became concerned after unexplained farm animal deaths and observations of bubbling and oily film on their ponds. Years later, a trail of studies, both proving and disproving the leakage, leave the truth about Weyburn shrouded.[8]

• The Sleipner project in the North Sea, operated by ExxonMobil, Statoil and Total, has been injecting up to 1 million tonnes of CO2 a year from a natural gas processing facility into a sub-seabed saline aquifer. Observations have been reported of oily water, unexplained cracking and damage to the formation related to injections, an oil leak, and unanticipated movement of injected CO2 through the formation. These observations are coupled with a significant discrepancy between the amount of CO2 injected and what has been detected in seismic surveys.[9]

• A joint venture between BP and Statoil in Algeria injected CO2 from gas production into three wells between 2004 and 2011. A seismic study indicated that injection had activated a deep fracture zone,[10] and leakage was found from a nearby well head.[11]

• Leakage, either small amounts over a long time, or an abrupt, potentially catastrophic release, would undermine any "sequestration" gains. Leaks are hard to avoid. In the USA, over 3 million old oil and gas wells have been abandoned and remain unplugged,[12] and many of those penetrate the deeper formations currently in use or considered for CCS.[13]

• Plans for onshore CO2 storage, particularly in Europe, have been met with strong protest over safety concerns, leading to a number of projects being canceled.[14]

SOURCES

1. International Energy Agency, "Storing CO2 through Enhanced Oil Recovery: Combining EOR with CO2 storage (EOR+) for profit," OECD/IEA, 2015, p.6

2. Peter Folger, "Carbon Capture and Sequestration (CCS) in the United States," Congressional Research Service, 2017, p. 12

3. Kurt House et al., "The energy penalty of post-combustion CO2 capture & storage and its implications for retrofitting the

U.S. installed base," Energy & Environmental Science, 2008

4. Global CCS Institute, "Large-scale CCS facilities," 2017, https://www.globalccsinstitute.com/projects

5. Almuth Ernsting and Oliver Munnion, "Last ditch climate option of wishful thinking? Bioenergy with carbon capture and storage," 2015, http://www.biofuelwatch.org.uk/2015/beccs-report/

6. See Geoengineering Monitor, "Bioenergy with Carbon Capture and Storage," Technology Fact Sheet, April 2018.

7. Steve Whittaker et al., "A decade of CO2 injection into depleting oil fields: monitoring and research activities of the IEA GHG Weyburn-Midale CO2 Monitoring and Storage Project," Energy Procedia, 2011

8. For details, see: Almuth Ernsting and Oliver Munnion, 2015

9. Ibid.

10. Anna Stork et al., "The microseismic response at the In Salah Carbon Capture and Storage (CCS) site," International Journal of Greenhouse Gas Control, Vol. 32, 2015

11. Wright et al., "In Salah CO2 Storage JIP: Site Selection, Management, Field Development Plan and Monitoring Overview," Energy Procedia, 2010

12. John Gale, "IEAGHG Information Paper 2014-27; The Trouble with Abandoned Wells," IEA Greenhouse Gas R&D Programme, 2014

13. Taku Ide et al., "CO2 leakage through existing wells: current technology and regulations," 8th International Conference on Greenhouse Gas Control Technologies, 2006

14. The Guardian, "Europe's carbon capture dream beset by delays, fears and doubt," 2015, https://www.theguardian.com/environment/2015/apr/09/carbon-capture-dream-norway-beset-by-delays-fears-doubt-europe

15. Greenpeace, "Carbon capture and storage a costly, risky distraction," 2016, http://www.greenpeace.org/international/en/campaigns/climate-change/Solutions/Reject-false-solutions/Reject-carbon-capture—storage/

16. See Geoengineering Monitor, "Direct Air Capture," Technology Fact Sheet, April 2018.

SaskPower, a failed attempt to greenwash emissions from coal. (SaskPower/Flickr)