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Background briefing

Phasing out 'unabated fossil fuels': the importance of defining 'abatement'

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Contents

Key points

- To achieve our climate goals, total global fossil fuel demand needs to fall substantially, even in a scenario where 'abated' fossil fuels are permitted.
- Fitting Carbon Capture and Storage technology to fossil fuel plants does not automatically mean that carbon dioxide emissions have been 'abated' in line with the Paris Agreement goals. Without a formally agreed definition of what is meant by 'abatement', there is a risk that these goals will be compromised.
- To be Paris Agreement compatible, abated fossil fuels need to be net-zero greenhouse gas emissions on a lifecycle basis. This requires four things:

    1. Carbon dioxide capture rates of more than or equal to 90% of carbon dioxide emitted
    2. Permanent storage of captured emissions
    3. Reducing upstream and end-use fugitive methane emissions to less than 0.5% and towards 0.2% of gas production (and an equivalent for coal); and
    4. Offsetting any remaining emissions through permanent carbon dioxide removal (CDR)

Why does the definition of 'abated' matter?

Ahead of COP28 (in 2023), several influential stakeholders — including the UK, G7 and European Council — called for the phase out of 'unabated fossil fuel'. This was different to calling for the phase out of fossil fuels (which refers to phasing out all fossil fuels) because it would have permitted some continued usage of fossil fuels, so long as they were 'abated'. The final COP28 text emphasised: “transitioning away from fossil fuels in energy systems in a just, orderly and equitable manner, accelerating action in this critical decade, so as to achieve net zero by 2050 in keeping with the science” as well as “accelerating efforts towards the phase-down of unabated coal power”.

The issue is that while 'abated' is generally understood to mean that some form of Carbon Capture and Storage (CCS) technology would be used to capture the emissions, there is currently no formally agreed definition of the standard to which this would be expected to operate either for coal or other fossil fuels. A clear definition is needed for all fossil fuels to avoid ambiguities and to help guide international negotiations, policy development and investment decisions.

It might seem reasonable to assume that 'abated' fossil fuels would have no, or very minimal, levels of associated greenhouse gas emissions. But in fact, fitting CCS technology does not automatically achieve this. If the definition of 'abated' is left open to interpretation, there is a risk that it could inadvertently allow the continued emission of greenhouse gases. This might happen in several ways:

1. **Upstream 'fugitive' emissions of methane associated with the extraction of fossil fuels may continue**. According to the IPCC, emissions of methane that occur during the production and transport of fossil fuels currently account for around 18% of global

greenhouse gas emissions from energy supply, and there is recent evidence and an accumulating literature that this is underestimated by at least 50-100%.

2. **Facilities that capture only a proportion of emissions may be permitted**. For example, plants that capture less than the maximum technically possible and economically effective rates, or situations where CCS equipment is only run intermittently.
3. **The technical and economic limits for carbon capture will evolve**. Improvements in technological capabilities and reductions in operating costs are expected over time as part of the innovation process, therefore expectations of the fraction of carbon to be captured might also rise over time.
4. **Carbon usage or storage mechanisms that are not permanent might be permitted**. Geological storage is thought to last for ten thousand years or longer but where the carbon that is captured is used in products, the storage timescales are shorter. Usage in cement and aggregates is considered to sequester carbon for centuries, plastics for decades while use in fuels stores carbon for only a few days or months.

How should 'abated' be defined?

To be Paris Agreement compatible, abated fossil fuels need to be net-zero greenhouse gas emissions on a lifecycle basis. That is, there should be no net addition of greenhouse gases to the atmosphere.

To achieve this, fossil fuel plants must meet four criteria:

1. The carbon dioxide capture rate must be greater than or equal to 90%;
2. permanent storage must be used for captured emissions;
3. the level of upstream fugitive methane emissions must be less than 0.5% and towards 0.2% of gas production (and an equivalent for coal); and
4. any residual emissions must be offset through permanent carbon dioxide removal (CDR).

It goes without saying that facilities that do not comply with these criteria would therefore be considered as 'unabated'.

Do we still need to reduce fossil fuel use?

It is important to note that fossil fuel abatement is not a get out of jail free card. The IEA's Net Zero Energy Scenario sees significant cuts in demand for all total fossil fuel demand between 2022 and 2050:

- oil supply falls by 78%;
- gas supply falls by 78%;
- coal supply falls by 92%; and
- total fossil fuel supply falls by 83%.

This is necessary because delivering CCS facilities at scale is challenging for both technical and economic reasons.

From a technical point of view, the criteria set out in our proposed definition will not be easy to meet in the short term, but they are technically feasible:

- Our analysis found that there are already some commercially viable applications for capture of greater than or equal to 90%, including: removal of carbon dioxide from raw formation gas (carbon dioxide is an impurity found in natural gas that is removed before the gas is sold as fuel), ethanol, methanol and other chemicals production processes and autothermal production of "blue" hydrogen. Emerging applications that have the potential for a 90% or greater capture rate include cement and lime kilns and gas-fired power plants.
- Fossil fuel production practices in Norway, the Netherlands and the UK ensure fugitive methane levels of less than 0.5%, but this is not common practice.

The IEA's assessment concluded that the current deployment rate of CCS is not on track to deliver its Net Zero Emissions by 2050 Scenario; even if all of the projects that are currently in development are delivered, this would still be "substantially below (around a third)" the required level in 2030.

There is a further question as to whether this is economically feasible; the costs of near total carbon capture may be unattractive compared with the cost of alternative fuels and direct electrification (where this is possible). For example, the cost of building a coal- or gas-fired electricity plant with CCS is almost double what it would be without (although new technologies are likely to bring costs down in future). The cost of CCS varies depending on the source of the carbon dioxide being captured. Industrial processes that produce concentrated carbon dioxide flows will be cheaper than those with more dilute concentrations. Most expensive is capturing carbon dioxide directly from the air.

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Further reading

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