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IEA Press Webinar
Special Report on Carbon Capture Utilisation and Storage: CCUS in Clean Energy Transitions

On 24 September 2020, the IEA published its "Special Report on Carbon Capture Utilisation and Storage: CCUS in Clean Energy Transitions". The publication, a part of its ETP family of reports, was followed by a webinar, where the findings of the study were presented and the importance of the CCUS family of technologies underlined. Indeed, having Norway's Prime Minister, **Erna Solberg**, opening the webinar emphasised very clearly the important role that CCUS must have in reaching global climate goals.

Norway is not only a prominent global advocate of CCUS, but is also a lead nation when it comes to deployment. It hosted the world's first commercial CCS project, which opened in 1996 and is still in operation. To reduce the CO_2 content of natural gas extracted from the Sleipner field to a saleable specification, well over 20 million tonnes of CO_2 have been captured and stored safely and securely in an aquifer back under the North Sea.

To underscore her call for countries to step up efforts to recognise CCUS as a viable climate technology, Prime Minister Solberg announced a €2.3 billion budget proposal being put to Norway's parliament. If approved, two industrial capture facilities would be constructed, one on a cement plant in Brevik and, when the necessary support funding was achieved, another on a waste-to-energy plant in Oslo. Coupled with its Northern Lights project[1], these projects would constitute Norway's "Longship" initiative, a full-scale CCS value chain. With her fervent view that CCUS was crucial for the goals of the Paris Agreement to be achieved, she hoped the Longship initiative would encourage more capture projects in countries bordering the North Sea that would also be able to take advantage of the Northern Lights storage location – more projects would drive down costs and improve performance.

The IEA's Executive Director, **Dr Fatih Birol**, then set the context for a global clean energy transition in which CCUS would play an essential role. He listed four reasons for his optimism for a clean energy future:

- The costs of solar energy and offshore wind have reduced substantially. In many countries, solar is now the cheapest source of electricity generation;
- Many clean energy transition technologies require high upfront investment. Globally, banks are now in a period of offering ultra-low interest rates;
- Governments around the world are more committed to a clean energy transition, whether to reduce air pollution, to future-proof the competitiveness of their industries or to address net zero emissions; and
- Many energy companies were stepping up their efforts on clean energy.

Dr Birol felt there were good reasons why CCUS would be playing an important role, pointing to a growing momentum behind CCUS. He said that more than 30 CCUS projects had been announced

[1] In the Northern Lights project, liquefied and pressurised CO_2 would be shipped from industrial capture sites to an onshore terminal on the Norwegian west coast and, from there, transported by pipeline to an offshore storage location subsea in the North Sea for permanent storage. The project is a joint initiative of Equinor, Shell and Total.

recently and, more than that, governments and industry had committed around $4 billion to CCUS in 2020.

CCUS, he said, would have four key strategic roles:

- It would be needed to tackle emissions from the huge existing infrastructure that, if permitted to operate unchecked, would eat up large chunks of the existing carbon budget;
- It can support low-carbon hydrogen production. Along with electrolysers, CCUS was key to producing hydrogen;
- CCUS was critical to reduce emissions from heavy industry and aviation. Today, iron & steel, cement and chemicals production, industries that also rely on provision of high levels of heat, were responsible for around 20% of global energy-related CO_2 emissions; and
- To reach net-zero, CCUS would be essential to remove carbon from the atmosphere.

Next, **Samantha McCulloch**, Head of the IEA's CCUS Unit, presented more detail on the content of the publication. Noting the significant new momentum behind CCUS in recent times, she said this was not only good for technology progress but also very good news for climate goals. For this report, the authors had reviewed in detail a comprehensive range of technologies and applications from within a portfolio of more than 800 clean energy technologies that could support a clean energy transition.

Today, with a little over 20 operating CCUS facilities, the vast majority are associated with natural gas processing, removing from it the excess or unwanted CO_2 to make it saleable. To meet net-zero, the role of CCUS would need to expand massively, to address a much greater range of applications. CCUS will have a contribution in virtually all parts of the global energy system, in power generation, hydrogen production, heavy industry and transport. While much of the CO_2 would need to be stored, some would also be used in a range of applications, e.g. using captured CO_2 with clean hydrogen to create a range of synthetic fuels that may find application, say, as aviation fuel.

Exhaustive analysis identified **four strategic roles for CCUS**.

First, there is a vast quantity of existing energy infrastructure, much of which has only recently been built. If these assets were to continue to operate unconstrained throughout their technical lives, they would emit more than 600 billion tonnes of CO_2 by 2070, around 17 times current annual emissions. This would leave virtually no potential for the construction of new emissions generating assets in any sector – which would be simply unrealistic! While other measures might be taken, e.g. to operate the assets less, to apply energy efficiency measures, to retire them early when economic to do so, only the application of CCUS allows them to continue to operate and to continue to contribute to economic development and energy security objectives while remaining compatible with deep emissions reductions. Consequently, over the next decade, more than a half of CCUS deployment must be dedicated to addressing emissions from these existing assets, requiring retrofits in both the power and industry sectors.

Secondly, CCUS provides a platform for low-carbon hydrogen production. Today, around 75Mt of hydrogen is produced globally, virtually all of it from natural gas and coal – collectively resulting in emissions of 800 Mt CO_2, equivalent to the combined annual emissions of Indonesia and the UK. To reach net-zero emissions, analysis suggest more than 500 Mt hydrogen would need to be produced annually, around 60% from electrolysers and 40% from fossil fuels with CCUS, the latter in countries with access to low cost fossil fuels and geological storage.

Thirdly, CCUS provides a solution to deal with the most challenging emissions, i.e. those from heavy industry and aviation. In many cases, e.g. cement production, CCUS would be indispensable. Exhibiting both fuel emissions and process emissions, the latter inherent and unavoidable, cement today contributes around 7% of energy related CO_2 emissions (a factor of 2½ times higher than emissions from aviation). While other solutions would contribute, CCUS would be needed to reduce an estimated 60% of the emissions from cement production. While no cement plants currently incorporated CO_2 capture, three were at an advanced planning stage, including the Norcem plant at Brevik announced earlier by Prime Minister Solberg.

And, **fourthly**, to achieve net-zero CO_2 emissions, carbon removal from the atmosphere will be necessary. Post-2050, an estimated 3 billion tonnes CO_2 would still be emitted annually, primarily from long-distance transport and heavy industry. To remove these residual emissions will require the intervention of carbon removal approaches and technologies, including direct air capture and storage (DACS) or bioenergy with CCS (BECCS). Both DACS and BECCS could, of course, be part of the portfolio of measures taken in the near term. BECCS is already being demonstrated at scale in the United States. With a capture capacity of 1 MtCO2/year, the Illinois Industrial CCS Project is the largest and only project at present with dedicated CO_2 storage. While several small-scale pilot and demonstration plants are in operation, being highly energy-intensive and expensive compared with other options, DACS is at an earlier stage of development. Accelerated development and deployment of both DACS and BECCS will be needed.

For the four strategic roles for CCUS to be realised, strong and urgent action needs to be taken by both governments and industry. Wrapping up her report, Samantha McCulloch presented four high-level **priorities for governments and industry**:

- Create the conditions to stimulate investment into CCUS. Investment in CCUS needed to 2030 is an estimated tenfold increase over the investment made during the decade to 2020.
- Target the development of industrial hubs with shared CO_2 infrastructure. This could play a critical role in accelerating the scale-up of CCUS by exploiting economies of scale and making it feasible to capture CO_2 at smaller industrial facilities.
- Identify and encourage the development of CO_2 storage. Confidence in the availability of safe, secure and adequate CO_2 storage is a prerequisite for investment in both transport and storage infrastructure and capture facilities.
- Boost innovation for critical CCUS technologies. Innovation will be key to scaling up CCUS in both the short and long term.

Messages from the "Special Report on Carbon Capture Utilisation and Storage: CCUS in Clean Energy Transitions" and the presentations from Prime Minister Solberg, Dr Birol and Ms McCulloch gained excellent coverage in the international press. This exceptional coverage underlined the growing global awareness of concerns over climate change and of the critical role CCUS must play in mitigating those concerns. The UK's Guardian newspaper, for example, led with two articles, one on the report itself and the other describing CCUS.

Finally, **IEAGHG** could also take some plaudits. Information and views provided by IEAGHG staff members for the expert review were explicitly acknowledged by the authors of the report, and many IEAGHG reports were cited throughout.

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