Facilitating Nigeria's Energy Transition through CCUS Development

Event Summary

10 September 2021
10:00-12:00 WAT/11:00-13:00 CET

Partners:

International Energy Agency

Introduction and Welcome

The objective of this workshop and the International Energy Agency's (IEA) work with the Office of the Vice President (OVP) is to help build capacity and to work together on advancing carbon capture, utilisation, and storage (CCUS) in Nigeria. Ambassador Mary Warlick, Deputy Executive Director, International Energy Agency opened the workshop on behalf of the IEA while Ambassador Adeyemi Dipeolu, Special Advisor to the President on Economic Matters in the Office of the Vice President opened the workshop on behalf of the Office of the Vice President. The introductions highlighted how CCUS can support decarbonisation in oil and gas producing countries and be a part of Nigeria's energy transition. National and international collaboration can play an important role in building the enabling environment for CCUS in Nigeria.

Session 1: Potential for CCUS globally and in Nigeria

Global Perspectives on CCUS—Presented by Samantha McCulloch, IEA

CCUS is a suite of technologies with a range of applications. CO_2 can be captured from power and industrial facilities (that use fossil fuels or bioenergy), or directly from the air. CO_2 is transported for use (including enhanced oil recovery (EOR), chemicals or fuel production) or for storage in deep geological formations. The technologies have been in use since the 1970s and in recent years commercial applications have expanded to include biofuel production, power generation and low-carbon hydrogen production. The IEA's May report *Net Zero by 2050* shows that a major boost is required between now and 2030 if the world is to reach net zero by 2050. The push needs to occur across all technologies, including CCUS. Between now and 2030, CCUS primarily supports emissions reductions from existing power and industrial assets (through retrofits) alongside a scale-up in low-carbon hydrogen production. After 2030 deployment will shift towards heavy industry applications and carbon removal in the form of bioenergy with CCS (BECCS), and direct air capture (DAC) with CO_2 storage.

The Strategic Context of CCUS in Nigeria—Presented by Dr. Victor Richard Osu, OVP

A just transition is critical for Nigeria, and CCUS deployment must be considered in the context of Nigeria's energy transition goals which include deep decarbonisation targets by 2050. CCUS could help Nigeria meet those targets and national drivers for CCUS include the Petroleum Industry Act, the Nigeria Economic Sustainability plan, and the 2021 updates to Nigeria's NDC. There are significant potential emissions sources from industry and power generation. Four key activities have been identified by the OVP to support the deployment of CCUS in Nigeria:

- Technical assessments including identifying potential storage resources, EOR activities, and mapping stationary CO_2 sources/emissions clusters

- Legal and regulatory framework development to identify gaps in the existing framework and develop a CCUS specific framework as required
- Stakeholder engagement inside Nigeria, within Africa, and with the broader international CCUS community
- Capacity building via industrial, and research and development based workshops

The OVP aims to optimise and reduce the cost of CCUS development and deployment in Nigeria by ensuring that the government creates an enabling environment that stimulates private investment while providing oversight and guidance.

Session 2: CCUS technologies and developments

Status of CCUS—Tim Dixon, IEAGHG

The IEAGHG, an IEA Technology Collaboration Programme, funds research into the development and deployment of CCUS technologies and supports international collaboration. The IEAGHG has previously worked with Nigeria on CCUS including on a Nigerian paper to the London Protocol submitted by Nigeria in 2016 (LC38/6 2016), on a CCS side event at COP22 with Dr. Felicia Mogo, formerly NIMASA, and has had Nigerian attendees to the IEAGHG CCS schools. Numerous CCUS projects, each with their own unique characteristics, can be found around the world. New projects and ongoing developments show the range of CCUS deployment possible. This is particularly true for new transportation and business models, as shown by Northern Lights in Norway, development of hydrogen projects, and development of direct air capture with storage projects. CCUS-specific regulation and frameworks exist internationally and can serve as examples for Nigeria as the country works to develop its own.

South Africa's Carbon Capture Utilisation and Storage Project—Dr. David Khoza, Council for Geosciences

The majority of South Africa's electricity is produced from coal. South Africa foresees continued use of coal and associated petrochemicals in its medium to long-term development and the industry supports more than 170,000 jobs across the economy. Since South Africa is committed to reducing its CO_2 emissions by 50% in the next 10 years and coal is such an important part of its energy mix, it sees CCUS and other innovative solutions as enablers of a sustainable and just transition. CCUS activities have been supported thus far by the World Bank and the government. A pilot storage site has been selected to be linked to the Secunda coal to liquids plant. In addition to that pilot, South Africa is looking into CO_2 use opportunities including fertiliser production and CO_2 mineralisation to treat acid mine drainage. CCUS provides a solution for a Just Transition wherein South African can reduce its CO_2 emissions, focus on environmental sustainability while continuing to use its natural resources for development.

Discussion—Moderated by Stig Svenningsen, Norwegian Ministry of Petroleum and Energy

Significant learning-by-doing has contributed to cost reductions of retrofits. Examples of this come from Boundary Dam and Quest, both in Canada.

CO_2 use can be beneficial for the environment, but it depends on the pathway. CO_2-EOR can contribute to emissions reductions since the vast majority of injected CO_2 is stored. Many other large-scale uses of CO_2 result in the CO_2 being re-emitted, but can still support climate goals where these applications are displacing fossil-based pathways (for example, synthetic fuels replacing fossil fuels).

The safety of CO_2 storage has demonstrated through existing projects. Pilots and monitoring have contributed to an improved understanding of subsurface processes, and regulation can help ensure the selection and operation of safe CO_2 storage sites. It was noted that oil, gas, CO_2, and other gases are all trapped naturally underground.

Collaboration is crucial to make CCUS happen, and South Africa provides a great example of international collaboration to develop CCUS. South Africa is happy to collaborate with Nigeria on technology sharing and best practice.

Session 3: Near-term needs and opportunities for CCUS in Nigeria

Session 3 was a panel discussion moderated by Dr. Victor Richard Osu, OVP. The panel consisted of Dr. Felicia Mogo, African Maritime Environment Sustainability Initiative, Iain Macdonald, Oil and Gas Climate Initiative (OGCI), and Brendan Beck, World Bank. Each panellist was given a short time to present their views prior to the discussion.

Dr Felicia Mogo discussed how Nigeria is not able to stop fossil fuel production, making CCUS a key technology to decarbonise those activities. When discussing CCUS with Nigerian stakeholders it is important to consider and emphasis aspects of social equity and a just energy transition. Nigeria is a private sector driven economy, and private sector involvement is critical. Nigeria is ready for CCUS, and development can be stimulated through tax incentives, funding, and partnerships. In Nigeria, offshore development of CO_2 storage may be easier than onshore due to land development constraints. Nevertheless, previous work shows that Nigeria has the right geology, the necessary data to perform technical studies exists, and local expertise can be capitalised on. To continue to develop CCUS in Nigeria, first CO_2 sources and emissions hubs need to be identified. The initial focus should be on oil and gas, but then extend to cement. Source-sink matching can lead to the deployment of CCUS technologies.

Iain Macdonald presented the OGCI's work on identifying emissions hubs and clusters. The OGCI has identified four emissions hubs in Nigeria amounting to ~42 Mt/year of CO_2, three hubs (~13 Mt/year of CO_2) likely have a capture cost below USD 100/tonne CO_2. OGCI has

also identified that Nigeria needs strong policy and regulatory frameworks if CCUS deployment is to succeed. CCUS is about value generation in energy transitions, it can create jobs while decarbonising the economy and open low carbon opportunities in multiple locations.

Brendan Beck presented the World Bank's activities that relate to CCUS including the CCS Trust Fund. The World Bank Group published a "Climate Change Action Plan 2021-2025" that aligns World Bank operations with Paris Agreement climate targets. This report identifies CCUS as an important technology to assist countries meeting climate targets. The International Finance Corporation found that CCUS could be an investment opportunity of over USD 600 billion in emerging markets and developing economies in the next 10 years, creating millions of jobs. CCUS can be an employment generator and a job protector in energy transitions. Since 2009, the World Bank has run the CCS trust fund which is supported by the governments of Norway and the United Kingdom. The trust fund has supported over 9 countries and regions with desktop studies and phase 1 analysis—geological studies, legal and regulatory studies, human capacity. Two countries—South Africa and Mexico—were selected to move into Phase 2. Mexico is focused on capture, while South Africa is focused on storage.

Discussion

To address CCUS costs and business models in a Nigerian context, examples can be taken from the United States and other countries. Capture is the main cost driver for CCUS—transport and storage make up about 30% of total costs—and high purity CO_2 streams are generally easier and cheaper to capture from. Therefore it will be important to focus on sources that are at the lower end of the cost curve. Additionally when costing out CCUS the unabated fossil system should not be considered as a baseline, but rather techno-economic analysis should consider abated system with CCUS versus abated system without CCUS.

Business as usual is no longer sustainable, so the economic value and social value of CCUS should be discussed. Furthermore, carbon trading could bring significant value to Nigeria especially in the context of the EU carbon border adjustment tariff and California's low carbon fuel standard.

Closing remarks and conclusions

Dayo Adeshina, Programme Manager of the National LPG Expansion Plan, and Samantha McCulloch, Head of CCUS Unit, closed the workshop on behalf of the OVP and IEA respectively.