CARBON CAPTURE AND STORAGE IN NIGERIA

As the world grapples with the realities of climate change, countries across the globe continue to formulate legislation geared towards regulating activities that have negative impacts on the environment on the back of their respective commitments under the Paris Agreement and COP27. Governments are also aggressively encouraging private sector investments in technology that can harness non-fossil energy sources in line with their aspirations to make a full switch to net-zero carbon emitting energy sources and carbon neutral fuels by the middle of the 21st century.

Apart from switching fuels, Carbon Capture and Storage (CCS) is another frontline strategy being considered to accelerate the reduction of the CO_2 levels in the atmosphere. According to the European Commission, "introducing CCS may delay the need to reduce levels of fossil fuel use by at least half a century." Thus, the optimal approach to combating climate change is the adoption of both approaches – a switch to net zero carbon fuel sources, ("*Fuel Switch*") and capturing carbon that would otherwise be emitted into the atmosphere for storage or other industrial uses.

This article gives a snapshot of the 'state of play' of the CCS campaign in Nigeria, which is less popular but equally critical in Nigeria's efforts to combat the global climate change threat[1], and makes

1 *Federal Government of Nigeria, through the office of the Vice President, as part of its commitment to a net-zero world collaborated with the International Finance Corporation (IFC) to identify near term opportunities for Carbon Capture and Storage (CCS) technology in Nigeria.*

recommendations on the policy and legal strategies that can be adopted to better achieve the CCS objective.

What exactly does CCS entail?

CCS refers to the artificial extraction of CO_2 from industrial processes and its permanent storage into suitable geological formations, underground, or into the seabed.[2] Such formations may be onshore or offshore and may include depleted oil and gas reservoirs, deep saline formations and unmineable coal seams. Carbon Capture, Utilisation and Storage (CCUS) on the other hand also refers to the artificial extraction of CO_2 described above, but the key difference being that the CO_2 extracted may also be utilised for other processes instead of being stored underground permanently. The captured CO_2, if not being used on-site, is compressed and transported by pipeline, ship, rail or truck to be used in a range of applications such as the production of fuels and building materials, and enhanced oil recovery, or injected into geological formations deep below the earth's surface for permanent storage.

On one hand, CCS is being promoted as a formidable tool for combatting climate change without having to change behaviour drastically in the short term, however criticism has been levelled as to it being costly, unproven and potentially an unsafe distraction from other, more established greenhouse gas ("GHG") mitigation measures.[3] There is also concern that the CCS technology faces legal obstacles, economic constraints and the long term risk that leakage of CO_2 could potentially unravel previous CO_2 reductions, and cause damage to ecosystems and organisms, including human beings.[4] Globally, experience with the long-term underground/sub-seabed storage of CO_2 through CCS applications is limited. The longest running CO_2 storage project in the world, the Sleipner oil field in Norway, has only been operational since 1996 and is still actively injecting CO_2.

In the upstream oil and gas industry, the very many dry and abandoned wells drilled in the course of exploring for petroleum, or producing wells where the recovery of petroleum has been completed, provides massive real estate for CCS. There is a natural synergy between the practice of plugging and abandoning unwanted wells in the upstream petroleum sector, with the permanent storage of captured carbon. Moreso, the carbon capture in these abandoned wells could generate some revenue for the oil and gas players or the carbon credits gained could be used to offset any liabilities for carbon emissions from their oil and gas operations. For the offshore wells, CCS would be the better option as captured CO_2 can be permanently stored in deep offshore reservoirs that are to be permanently plugged and abandoned. The onshore wells provide a more accessible option for storage and reuse of the stored CO_2, which is suitable for CCS projects.

Industrial applications and potential opportunities

CCS has been described as a cornerstone for industrial decarbonisation with the potential to create growth and jobs, and it is the primary means for the decarbonisation of industrial sectors such as cement, steel and fertilisers. CCS can aid meeting emission reduction targets which cannot be met solely by renewables, and experts argue that CCS could be an investment opportunity of more than $600bn in emerging markets and developing economies in the next 10 years. CCS facilities also require significant

2 Carbon harvest from forests and carbon storage in living forests also have significant potential for CCS on a global scale.
3 Climate Action Network, "Position: Carbon Capture, Storage and Utilisation" 2021.
4 Climate Action Network, "Position: Carbon Capture, Storage and Utilisation" 2021.

engineering, planning, design and construction workforce which ultimately provides long-term employment opportunities.

The long-term significance of CCS is particularly important as an investor will want to know why to invest money into a CCS project and what value and gain exists. Potentially, the benefit may be in the form of carbon credits for removing carbon from the atmosphere. Utilising the captured CO_2 enhances the business case for CCS by providing a dependable long term revenue, and majority of CCS facilities currently in operation worldwide either sell or utilise CO_2 for fertilizer or enhanced oil recovery.

Captured carbon can be put to many more uses, from the manufacture of industrial materials, such as concrete, plastic and foam, to clothes and even diamonds. In the cement and concrete industrial sectors for example, large amounts of CO_2 are released during the firing of limestone and clay that splits the materials into CO_2 and calcium oxide. Thus, an opportunity exists for the development of new technologies that recover and recycle the CO_2 generated in this process. There is also potential for the development of new concrete products that actively absorb CO_2 from the atmosphere and capture it inside the concrete when the concrete hardens.

There are also opportunities enabled by CCS, including the technology for the carbon capture, pipeline technology for transporting CO_2 at scale, storage in saline aquifer at a commercial scale, storage in depleted oil and gas fields, and monitoring technology to ensure the CO_2 stays in the storage.

In the power sector, however, there is debate as to the utility of CCS as some argue that it is unnecessary given that faster, cleaner, safer, more efficient, and cheaper means exist to reduce CO_2 emissions, such as phasing out fossil fuels and replacing them with renewable energy, energy efficiency, and energy conservation.

The deployment of CCS is ultimately dependent on the viability of the business model, as it is essential for an investor to be able to recover costs incurred to build and operate the requisite infrastructure, and the returns must also be reasonable to attract investment, as well as protections in place against risks, including risks that may not be covered through commercial insurance.

However, to fully unlock the opportunities that can be enabled by CCS, the legal and regulatory regime is crucial as it impacts private investors decision to invest given the potential exposure to long-term storage liabilities. Thus, policies need to be designed in a manner that encourages and is capable of mobilising private investments.

Legal and regulatory considerations

In Nigeria, there is no existing legal framework regulating CCS, however the Petroleum Industry Act, 2021 envisages the need for decarbonisation, and thus provides a legal basis for deploying CCS. The Act requires every concessionaire of a petroleum licences and leases to include an environmental management plan in its field development plan that sets out how the concessionaire intends to mitigate the negative environmental impacts of its operations. To the extent that CCS is an option, it may be indicated in the plan as one of the mitigating measures to be implemented.

The Climate Change Act 2021 (“CC Act”) provides the legal framework for achieving low GHG emissions as well as promoting sustainable economic growth, and sets a target for year 2050-2070, for the

attainment of a net-zero GHG emission in Nigeria. The CC Act however does not make any reference to specific technologies such as CCS, but provides a framework for facilitating the coordination of climate change action needed to achieve the long-term climate objectives of Nigeria, and the nature of CCS situates it within the options available for achieving the long-term climate objectives of Nigeria.

The CC Act established the National Council on Climate Change (the "**Council**") which is required to inter alia, approve and oversee the implementation of the National Climate Change Action Plan, which sets the climate adaptation goals and prescribes the mechanisms for achieving Nigeria's climate change goals. The inaugural meeting of the Council held on February 2023, and the issues discussed include target emissions of the public and private sector, penalties for exceeding this limit, and a carbon tax.[5] The resultant effect of a carbon tax would invariably encourage the use of technologies such as CCS to reduce tax exposure of a company, as well as obtain carbon credits to offset the potential liability of carbon taxes.

The Nigerian Upstream Petroleum Regulatory Commission (NUPRC)[6] has attempted to recognise CCS, and in one of the draft regulations released on acreage management in the upstream oil and gas sector, this draft regulation states that "with the consent of the Commission, the lessee may provide carbon capture and storage services with respect to reservoirs contained in the lease area." When issued, the acreage regulation under reference would create the opportunity for dry wells within a lease area to be used for carbon storage, with the consent of the NUPRC. As stated earlier, the site for carbon storage is critical as the geological composition of the storage area must be such that the top rock is impermeable to ensure the CO_2 does not leak into the environment.

The regulation of CCS is critical to its success, and the International Energy Agency has identified 29 key issues to be contained in a CCS regulatory framework. Two critical issues are the ownership of the pore spaces within the rock where the CO_2 will be stored, as well as long-term liability, i.e., who is liable for potential leakages in the distant future, and whether the project proponents will be liable in perpetuity.

The first step in the regulatory framework for CCS will be to ensure that storage sites are carefully selected to ensure a high degree of safety and security of CO_2 storage, as this also reduces risks posed by leakage of CO_2 over the long term. Another key consideration will be as to who will regulate CCS, as well as the legislation that will contain provisions on CCS. For example, in the United States, the Underground Source of Drinking Water Act was used to regulate CCS, and in Australia there is an offshore framework for CCS based on Oil and Gas Projects and multiple statutes also have provisions regulating onshore CCS.

In developing a legal and regulatory framework for CCS, the following issues should be addressed:

(i) the legal framework for CCS should be preceded by a review of extant laws to ensure that any existing legal barriers to CCS in Nigeria are identified and addressed in new legislation;

[5] *https://www.premiumtimesng.com/news/more-news/581752-climate-change-fg-to-unveil-carbon-tax-system-for-nigeria.html (Accessed on 8 May 2023)*

[6] *The Nigerian Midstream and Downstream Petroleum Regulatory Authority in the recently issued "Midstream and Downstream Petroleum Operations Regulations, 2023," which provides that a licence, permit or authorisation will be required to undertake Industrial Gas Storage and Utilisation. This Regulation could potentially form the basis for carbon capture and storage by licensees, however the provision limits the use of the stored gas to internal consumption or utilization by the licensee.*

(ii) the framework should also be incentive-laden such that from a commercial perspective, developing a CCS project is sensible, and there should be a correlation between the CO_2 being captured and the benefits accruing to the developer of the project;

(iii) the framework should expressly provide for the qualifications that must be met by a project developer for CCS, as well as other key provisions that financiers would typically want in place to ensure certainty;

(iv) the framework should address requirements around situating a CO_2 storage site in a particular location and the minimum environmental standards to be met, as well as compulsory safety measures to be put in place; and

(v) Related to the above, there must be a requirement for all prospective CCS projects to be based upon an integrated risk assessment for CO_2 leakage, to ensure that there are no long-term issues that will be detrimental to the environment.

Conclusion

While in the short-term CCS is costly, in the long term it will steer countries towards a greener economy, and it is a key climate mitigating technology. The installed capacity of CCS worldwide is currently around 40Mtpa, and it is expected to continue to grow.

Efforts for the deployment of CCS in Nigeria are already underway, and where successfully deployed, it will help reduce the carbon intensity of industrial operations, as it is a critical component of meeting the global net-zero ambitions of the Paris Agreement.

Disclaimer: This publication is intended merely to highlight issues around CCS in Nigeria and not to be comprehensive, nor to provide legal advice. Should you have any question on issues reported here or other issues in the Nigerian energy industry, please reach out to one of the contacts provided below.

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