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Carbon Capture and Storage Worldwide: Spotlight on Indonesia and comparative perspectives

Overview

This newsletter provides an overview of carbon capture and storage ("CCS") and carbon capture, utilization and storage ("CCUS") in Indonesia. It discusses Indonesia's first comprehensive regulation governing CCS activities outside of those conducted ancillary to oil and gas operations and compares how CCS/CCUS efforts are progressing in different parts of the world. UMBRA – Strategic Legal Solutions are pleased to be joined in authoring this newsletter by our colleagues at Simmons & Simmons LLP, a global law firm with a long history of supporting transactions and financings in Indonesia and on behalf of Indonesian parties overseas.

On March 3, 2023, Indonesia's Minister of Energy and Mineral Resources ("MEMR") issued MEMR Regulation No. 2 of 2023 on the Implementation of Carbon Capture and Storage, as well as Carbon Capture, Utilization and Storage in Upstream Oil and Gas Business Activities ("MEMR Reg 2/2023"), which sets out a regulatory framework for CCS and CCUS operations ancillary to upstream oil and gas business activities. On January 30 of this year, the Government issued Presidential Regulation No. 14 of 2024 on Carbon Capture and Storage Implementation ("PR 14/2024"), to provide a framework to govern CCS operations outside of oil and gas working areas in specially designated Carbon Storage Permit Areas. Despite the absence of the 'utilization' aspect of CCS in PR 14/2024, the regulation provides clarity on various crucial aspects of CCS implementation, including licensing requirements, the CCS project lifecycle, and potential business schemes. Furthermore, PR 14/2024 appears to foster CCS by encouraging foreign entities to engage in CCS activities in Indonesia and exploring the possibility of carbon trading, cross-border transportation, and foreign emission storage.

Nevertheless, further implementing regulations for PR 14/2024 will still be necessary to provide additional details on key aspects of CCS, such as incentives, certification of carbon storage capacities, royalties, and other pertinent matters. Currently, the MEMR is discussing the drafting of a new regulation regarding permits for carbon storage locations, aiming to provide additional legal certainty for CCS/CCUS projects.

Further to the discussion on Indonesia, we explore how CCS/CCUS is being implemented in the United States, Australia, various countries in Europe, North America, the Middle East, and other Asian countries, offering a comprehensive view of global perspectives.

Background

CCS and CCUS are technologies designed to mitigate climate change by capturing carbon dioxide ("CO2") emissions from sources like power plants and industrial facilities before they enter the atmosphere. CCS involves the storage of captured CO2, typically underground in geological formations, while CCUS goes a step further by finding ways to utilize the captured CO2, for example, in enhanced oil recovery or as a feedstock for producing synthetic fuels and chemicals. These technologies are crucial to the global effort to reduce greenhouse gas emissions and to achieve carbon neutrality, as they offer a pathway to significantly lower emissions from the hardest-to-decarbonize sectors of the economy.

In the United States, CCS and CCUS technologies have seen significant development, supported by federal policies, research funding, and incentives aimed at reducing the country's carbon footprint. The United States has several operational projects, with many more in various stages of planning and development, showcasing a strong commitment to leveraging these technologies for climate change mitigation. Similarly, in Europe, countries like Norway have been pioneers in CCS, implementing large-scale projects and investing

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in new technologies to secure a sustainable, low-carbon future.

Other countries, including Canada and Australia, are also advancing in the field of CCS and CCUS, integrating these technologies into their climate strategies to meet their Paris Agreement commitments. These international efforts underscore the growing recognition of CCS and CCUS as vital tools in the global fight against climate change.

For Indonesia, a country with significant CO2 emissions from its energy and industrial sectors, adopting and widely implementing CCS and CCUS technologies will serve a crucial role in Indonesia's initiatives to reduce CO2 emissions from oil and gas and refining operations, coal-fired power plants and other industrial sources. The country's vast geological formations offer promising storage sites, and there is potential for utilizing captured CO2 in enhanced oil recovery and other industrial processes. By investing in CCS and CCUS, Indonesia can make substantial progress towards its carbon neutrality goals, while also supporting its economic development in a sustainable manner.

MEMR Reg 2/2024, the first regulation on CCS and CCUS in Indonesia, focuses primarily on CCS and CCUS in oil and gas working areas. Despite the lack of comprehensive regulations, by December 2023, there were 15 CCS/CCUS projects in Indonesia undergoing study or at the preparation stage with projected investment values up to USD1.1 billion and the potential to store around 4.3 gigatons of CO2. The Government has also signed a letter of intent for the first cross-border CCS with Singapore in February 2024.

Recognizing the increased interest in CCS and its potential role in achieving the Nationally Determined Contribution ("NDC") target and Net Zero Emission target, in January 2024, the Indonesian Government issued PR 14/2024.

PR 14/2024, as the umbrella regulation on CCS, defines CCS as activities involving the capture, transportation, injection and storage of captured CO2 into an injection storage area (Zona Target Injeksi/"ZTI"). It sets out procedures for carrying out CCS activities in (i) oil and gas working areas and (ii) Carbon Storage Permit Areas.

CCS and CCUS in oil & gas working area

In oil and gas working areas, contractors that are party to cooperation contracts (production sharing contracts or "PSC") can carry out CCS and CCUS activities by preparing a CCS/CCUS implementation plan and obtaining approval from:

a. The MEMR, if the plan is part of the initial field development plan; or
b. Special Working Unit for the Organization of Offshore Oil and Gas Business Activities (Satuan Kerja Khusus Pelaksana Kegiatan Usaha Hulu Minyak dan Gas Bumi/"SKK Migas") or the Aceh Oil and Gas Organizational Body (Badan Pengelola Migas Aceh/"BPMA") if the plan is part of the advanced field development plan.

CCS/CCUS implementation in oil and gas working areas may potentially be easier because contractors only

need to amend the PSC to include the CCS/CCUS implementation (with the approval from the MEMR) and no other licenses are required.

Unlike CCS in Carbon Storage Permit Areas, MEMR Reg 2/2023 expressly allows CCUS in oil and gas working areas in order to improve the oil and gas production through enhanced recovery of advanced oil, gas, or coalbed methane.

Injection and storage of carbon emissions from third parties outside of the oil and gas working area is also allowed based on an agreement between the contractor and such third parties which must obtain an approval from SKK Migas/BPMA. The third parties may also utilize the CCS/CCUS operating facilities.

CCS in carbon storage permit areas

CCS implementation is carried out in the designated Carbon Storage Permit Area, which consists of: (i) open areas; (ii) mining business license areas; and/or (iii) mining working areas. MEMR establishes the Carbon Storage Permit Areas and then offers it to business entities or foreign entities (in the form of permanent business establishments) through limited selection or auction. Limited selection is only conducted if the Carbon Storage Permit Area is proposed by business entities or foreign entities and such entities will get the right to match.

The winner of the limited selection/ auction will:

a. Obtain Exploration Permit and carry out exploration of ZTI – Exploration Permit (which can be owned by business entities and foreign entities) is valid for 6 years and can be extended once for 4 years maximum. If the exploration proves that there is a potential commercial carbon storage capacity, then the Exploration Permit holders may submit a plan for ZTI development and operation to MEMR along with a certification of carbon storage capacity.
b. Obtain Storage Operation Permit – once MEMR approves the plan for ZTI development and operation, the exploration permit holders (can only be business entities) apply for Storage Operation Permit which is valid for 30 years maximum and can be extended for 20 years maximum.
c. Carry out CCS in its Carbon Storage Permit Area – the captured carbon can be sourced from processing activities at oil and gas upstream facilities, oil and gas refineries, power plant activities, industrial activities, and other emission generating activities domestically and internationally.

CCS activities

Apart from carbon capture and storage, other activities of CCS are:

a. Carbon transportation – carbon transportation is conducted through pipes, trucks, ships and/ or other methods by business entities or Storage Operation Permit holders using a Carbon Transportation Permit. The permit is valid for 20 years maximum (for pipe transportation) or 10 years maximum (for other transportation methods) and can be extended for 10 years maximum for every extension. Oil and gas contractors that transport carbon within one working area or from one to another working area do not need a Carbon Transportation Permit.
b. CCS closure – CCS can be closed for several reasons, e.g.: the ZTI's carbon storage capacity is full, no further carbon is being injected, the Storage Operation Permit/ PSC expires, a safety incident or force majeure events occurs, or because the CCS activities are no longer economical based on the economic study by the contractor or by the Storage Operation Permit holders as applicable. The plan for CCS closure must be approved by MEMR.
c. CCS monitoring – monitoring is done throughout the CCS implementation and until 10 years after. If there is any leakage resulting in increased greenhouse gas inventory, such leakage must be offset by the contractors or Storage Operation Permit holders.
d. Measurement, Reporting, and Verification ("MRV") – contractors and Storage Operation Permit holders must conduct MRV to ensure the quality, credibility, reliability, completeness, accuracy, and correctness of the carbon stored in ZTI. The MRV result is reported to the Minister of Environment and Forestry through the Climate Change Control National Registry System (Sistem Registri Nasional Pengendalian Perubahan Iklim/"SRN PPI"), indicating that the MRV is similar to the MRV for carbon trading. Despite the absence of carbon credit ownership stipulated in PR 14/2024 and MEMR Reg 2/2204, the MRV provisions raise questions on whether the carbon units generated from CCS for carbon trading – Greenhouse Gas Emission Reductions (Sertifikat Pengurangan Emisi Gas Rumah Kaca/"SPE-GRK") – belong to the contractors and Storage Operation Permit holders

as the parties required to conduct MRV and report it to the SRN PPI.

It is interesting to note that PR 14/2024 prioritizes carbon storage for domestic carbon sources by allocating 70% storage capacities for domestic carbon storage. The remaining 30% can be utilized for foreign carbon storage with the condition that such foreign carbon emitters invest in Indonesia and/or are affiliated with investments in Indonesia. Such allocation arrangement can be adjusted with an approval from the President if national policies exist. To accommodate foreign carbon storage, PR 14/2024 also allows cross-border transportation of carbon through bilateral cooperations.

Foreign carbon emitters may seek to claim the emission reduction resulting from the CCS activities associated with its carbon, e.g.: foreign carbon storage and cross-border carbon transportation. Consequently, these provisions indicate that international carbon trading may be possible for those activities. However, it is important to note that although PR 14/2014 may allow international carbon trading for CCS/CCUS activities, carbon trading falls under the authority of the Ministry of Environment and Forestry and currently it can only be conducted if several requirements are met, including the achievement of the NDC target for sub sectors (e.g.: energy) or sub sub sectors (e.g.: power plants and industries). Consequently, international carbon trading for CCS/CCUS activities may also need to wait for the achievement of such NDC target. MOEF is currently preparing a regulation on international carbon trading that hopefully could shed more light on this requirement.

Business schemes of CCS

CCS activities can be monetized through: (i) storage fee payment, (ii) carbon trading using SPE-GRK, and (iii) replacement of operation costs (including CCS/CCUS costs) for joint utilization of facilities (only for CCS/CCUS in oil and gas working area). The storage fee payment is subject to royalties, but PR 14/2024 does not state further the royalty amount. Both PR 14/2024 and MEMR Reg 2/2014 only mention that tax and non-tax incentives will be available to contractors, Exploration Permit Holders, Storage Operation Permit holders, and Carbon Transportation Permit holders, without detailing further the forms of incentives available.

It is also important to note that all goods and equipment purchased by contractors[1] and used directly for CCS/CCUS will become state assets while holders of Storage Operation Permit can retain ownership of the goods and equipment for the CCS activities.

CCS/CCUS implementation in other countries

Indonesia is one of the first countries in the Asia-Pacific region to introduce regulations on CCS. This may provide tailwinds for other jurisdictions to implement in time to come. We provide a brief update on the status as of the date of this article of CCS/CCUS implementation for other countries below.

United States

The United States has established itself as a leader in both CCS and CCUS technologies, underpinned by a comprehensive yet evolving policy, legal, and regulatory framework. This framework is designed to support the CCS/CCUS industry across all stages, from research and development to deployment, by addressing a wide range of needs including technical support, financial incentives, regulatory clarity, and environmental justice. The United States' pioneering role in these technologies is supported by significant legislation, such as the Utilizing Significant Emissions with Innovative Technologies Act (USE IT Act), Bipartisan Infrastructure Law (BIL), and Inflation Reduction Act (IRA), which collectively allocate substantial funding and incentives towards carbon management efforts. The rapid expansion of the CCS/CCUS industry in 2023, with dozens of new facilities announced, signals a significant increase in capture capacity and a pathway towards cost reduction.

However, the regulatory environment for CCS/CCUS in the United States is characterized by its complexity and the need for further development. The Environmental Protection Agency (EPA) plays a central role at the federal level, with states having the option to assume primary enforcement authority. This creates a dual-level regulatory approach that introduces variability and complexity, as state laws and regulations governing CCS/CCUS facilities differ significantly. The lack of a centralized system for regulatory approvals and the absence of clear, consistent guidelines across states make the development of CCS/CCUS projects more challenging. These challenges underscore the need

1. *Article 1 point 29 of PR 14/2024, Contractor is a business entity or permanent establishment that is determined to conduct exploration and exploitation in a working area based on a cooperation contract with SKK Migas or BPMA.*

for enhanced policy clarity, streamlined approval processes, and improved regulatory coordination to support the growth of the CCS/CCUS industry effectively.

In conclusion, the United States demonstrates strong leadership and commitment to advancing CCS and CCUS technologies as essential tools in the fight against climate change. However, addressing the challenges presented by the current regulatory environment is crucial for maintaining momentum in CCS/CCUS deployment. As countries like Indonesia seek to develop their own CCS/CCUS frameworks, lessons from the United States experience can provide valuable insights. These include the importance of a supportive policy and regulatory environment, the need for significant investment in technology and infrastructure, and the critical role of effective community engagement. Navigating these complexities will be key to maximizing the potential benefits of CCS and CCUS in achieving global carbon neutrality goals.

Several countries alongside the United States have developed notable CCS and CCUS activities, supported by advanced regulatory regimes. These countries have recognized the importance of CCS/CCUS in achieving their climate and energy goals, leading to significant investments in technology, infrastructure, and regulatory frameworks.

Australia

Australia has significant potential for CCS/CCUS, given its large geological storage capacity and substantial fossil fuel resources. The Gorgon CCS project is one of the world's largest, aiming to reduce greenhouse gas emissions by injecting CO2 into deep underground formations. Australia's CCS/CCUS regulatory framework includes measures under the National Greenhouse and Energy Reporting (NGER) scheme and the Clean Energy Regulator, which oversees carbon offset mechanisms and provides guidance for CCS projects.

Europe and North America

1. Norway: Norway is a global leader in CCS/CCUS, with the Sleipner and Snøhvit projects being among the first and most well-known CCS projects in the world. The Norwegian government has also launched the Longship project, which includes capturing CO2 from industrial sources and storing it under the North Sea. Norway's regulatory framework for CCS is comprehensive, covering the entire value chain from capture to transport and storage of CO2. The country's commitment to CCS/CCUS is driven by its aim to reduce emissions while continuing to utilize its natural gas resources.
2. Canada: Canada has several operational CCS projects, including the Quest project in Alberta, which captures CO2 from oil sands operations, and the Boundary Dam power station in Saskatchewan, the world's first post-combustion coal-fired CCS project. Canada's regulatory environment supports CCS/CCUS through policies like the carbon pricing mechanism and investment in research and development. Provinces like Alberta and Saskatchewan have also implemented specific regulations and policies to facilitate the development of CCS/CCUS.
3. United Kingdom (UK): The UK government has committed to developing CCS/CCUS as part of its clean growth strategy, aiming to establish CCS in multiple industrial clusters. The UK's regulatory framework includes the Carbon Capture and Storage (CCS) Directive, which sets out the legal framework for the environmentally safe geological storage of CO2. Additionally, the UK has announced significant funding for CCS/CCUS research, development, and deployment.
4. Netherlands: The Netherlands is actively pursuing CCS/CCUS to reduce emissions from its industrial and energy sectors. The Port of Rotterdam CCS Initiative (Porthos) is a notable project aiming to capture and store CO2 from industrial sources in the Rotterdam port area. The Dutch government supports CCS/CCUS through policies that include subsidies for low-carbon technologies and a regulatory framework that facilitates CO2 storage in depleted gas fields in the North Sea.

These countries demonstrate a strong commitment to CCS/CCUS through their regulatory frameworks, financial incentives, and ongoing projects. By addressing technical, legal, and financial challenges, they are advancing the deployment of CCS/CCUS technologies as crucial tools for reducing greenhouse gas emissions and achieving climate targets.

Middle East

1. Saudi Arabia: Saudi Arabia has also shown interest in CCS and CCUS technologies as part of its broader strategy to diversify its economy and reduce its carbon footprint. The country's Vision 2030

and its National Transformation Program outline ambitious plans to modernize its economy, part of which involves investing in cleaner energy technologies, including CCS/CCUS, to mitigate the environmental impact of its substantial oil and gas industry.

One of the most notable CCS/CCUS projects in Saudi Arabia is at the Uthmaniyah CO2-EOR Demonstration Project, operated by Saudi Aramco. This project captures CO2 from the Hawiyah Natural Gas Liquids Recovery Plant and then uses it for enhanced oil recovery (EOR) operations, demonstrating the potential for CCS/CCUS in increasing oil recovery rates while storing CO2 underground.

Saudi Arabia's interest in CCS/CCUS is also evident in its participation in international initiatives and research collaborations aimed at advancing these technologies. The country is a member of the Clean Energy Ministerial CCUS Initiative, which works to accelerate the deployment of CCS/CCUS worldwide. Additionally, Saudi Aramco, the state-owned oil company, has been active in researching and developing CCS/CCUS technologies, including efforts to reduce the cost of carbon capture and to explore novel uses of captured CO2.

While Saudi Arabia's regulatory framework for CCS/CCUS is still developing, the government has taken steps to support the deployment of these technologies through research funding, pilot projects, and international collaboration. The country's significant investments in CCS/CCUS reflect its recognition of the importance of these technologies in achieving its environmental goals and in the transition towards a more diversified and sustainable energy sector.

2. United Arab Emirates (UAE): Although not traditionally considered part of Asia, the UAE merits mention due to its significant investment in CCS/CCUS within the Asian context. The Al Reyadah project, the world's first commercial-scale CCUS facility applied to the iron and steel industry, captures CO2 for enhanced oil recovery. The UAE's interest in CCS/CCUS is aligned with its broader energy diversification and climate mitigation goals, supported by regulatory initiatives to facilitate technology deployment.

Asia

Several Asian countries have also been developing CCS and CCUS activities, alongside establishing related regulatory regimes to support these technologies. These efforts are part of broader strategies to meet climate goals and manage emissions from industrial and energy sectors.

1. China: China, as one of the world's largest emitters of CO2, has been actively pursuing CCS and CCUS technologies as part of its climate change mitigation strategy. The country has several CCS projects in various stages, from pilot to fully operational, focusing on capturing emissions from coal-fired power plants and industrial processes. China's 14th Five-Year Plan (2021-2025) emphasizes the development of CCUS technology and includes it as a key area for cutting carbon emissions. The government has also issued guidelines and policies to promote the research, development, and application of CCUS technologies.
2. Japan: Japan has been a proponent of CCS/CCUS technologies as part of its energy and climate policy, aiming to achieve carbon neutrality by 2050. The Tomakomai CCS Demonstration Project is a notable example, capturing CO2 from a hydrogen production unit and storing it in offshore geological formations. Japan's approach to CCS/CCUS is integrated into its broader strategic energy plan, which includes support for technology development, international cooperation, and the creation of a regulatory framework to facilitate CCS/CCUS projects.
3. South Korea: South Korea has shown interest in CCS/CCUS as part of its Green New Deal and 2050 Carbon Neutral Strategy. The country is focusing on developing CCS technologies, particularly for its steel and cement industries, which are significant sources of CO2 emissions. South Korea's government has been working on establishing a legal and regulatory framework to support CCS/CCUS deployment, including safety standards and incentives for technology development and deployment.
4. India: While still in the early stages compared to other countries, India recognizes the potential of CCS/CCUS in its climate and energy strategy. The country has several pilot and research projects focusing on carbon capture technologies. India's Ministry of Petroleum and Natural Gas has expressed interest in exploring CCUS for its oil and gas sector. The development of a comprehensive regulatory framework for CCS/CCUS in India is anticipated as part of its

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broader efforts to transition to a low-carbon economy.

5. Singapore: The government of Singapore has regularly funded the development of emerging low-carbon energy technologies, positioning Singapore to benefit early when these technologies ultimately reach commercial viability. Due to the nascent development of CCS/CCUS technology in Singapore, there is no specific regulation or guideline dedicated to CCUS as of the date of this article.

That said, Singapore has actively collaborated with other nations to enhance its CCUS capabilities. For example, Singapore and Australia signed a memorandum of understanding (MoU) in 2020 to promote cooperation on low-emission technologies, including CCUS, as a key solution[2]. In 2024, Singapore and Indonesia signed a Letter of Intent (LOI) to work together on cross-border CCS[3]. With the LOI, Singapore and Indonesia affirmed the importance of CCS as a decarbonisation pathway, and the potential of CCS to enable sustainable industrial activities and generate new economic opportunities. A working group comprising Singapore and Indonesia government officials will work towards a legally binding bilateral agreement that will enable the cross-border transport and storage of carbon dioxide between Singapore and Indonesia.

6. Thailand: At present, there is no specific law in Thailand that regulates activities related to CCS. In light of this, the Department of Mineral Fuels (DMF) has been working on a legal framework to incorporate CCS-related activities. This is evident from the recent public review of the proposed amendment to the Petroleum Act, B.E. 2514 (1971) ("Draft Petroleum Act"), which seeks to add "carbon business" as another regulated activity, akin to traditional petroleum concessions.

The Draft Petroleum Act characterizes "carbon business" as the exploration for a carbon storage site or the storage of carbon at such a site. It defines "carbon" as carbon dioxide in the form of gas or supercritical fluid, which is either a by-product or captured from other sources and transported for storage at a carbon storage site.

Neither the existing Thai laws nor the Draft Petroleum Act explicitly state the classification of "carbon" as defined in the Draft Petroleum Act, that is, whether it should be considered as "waste," "resource," or some other type of substance. However, a study has shown that the way carbon is classified can significantly influence the legal framework for CCS. As such, it is worth keeping a close watch for developments in this area. C

2. *https://www.mti.gov.sg/Newsroom/Press-Releases/2020/10/Singapore-and-Australia-Conclude-MOU-For-Cooperation-On-Low-Emissions-Solutions*
3. *https://www.mti.gov.sg/Newsroom/Press-Releases/2024/02/Singapore-and-Indonesia-sign-Letter-of-Intent-to-collaborate-on-carbon-capture-and-storage*