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A Normative Analysis on the Implementation of Carbon Capture and Storage in order to Achieve Net Zero Emissions in Indonesia

Raphael Bertrand Mayaka, Stephen Ramadhana Rodriguez, Ubaidillah Kamal, Muhammad Adymas Hikal Fikri

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TABLE OF CONTENTS

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ABSTRACT. In Indonesia, currently many people still use fossil fuels as the main energy source, but with the use of fossil fuels, greater carbon dioxide emissions will be released into the atmosphere, ultimately causing climate change (global warming). To overcome this problem, Indonesia is now starting to adopt techniques that have been used by several countries, namely carbon capture. Carbon Capture and Storage or commonly called CCS or some call it CCUS (Carbon Capture, Utilization and Storage) is one solution to climate change which continues to worsen over time. Indonesia itself is currently preparing 15 projects that will develop and use CO2 capture technology. The research method in the research carried out is using a normative juridical approach. The normative juridical approach is carried out by examining legal principles, legal provisions, legislation and legal mechanisms. Based on the normative type of legal research, several normative approaches are also used, namely the Conceptual Approach and the Statutory Approach. ESDM Ministerial Regulation No. 2 of 2023 does not directly provide benefits to society. This regulation focuses on regulations and incentives for business actors in the upstream oil and gas sector to implement Carbon Capture and Storage (CCS) technology. In Presidential Regulation no. 14/2024 states that holding CCS can be based on three things Carrying out CCS or CCUS implementation in Indonesia begins after obtaining a storage permit for CCS implementation schemes based on permits, whereas for CCS implementation schemes based on cooperation contracts begins when the contractor obtains approval for the proposed field development plan or changes. There are a few things that Indonesia should do such as making a new regulation about funding, insentive and public participation.

KEYWORDS. Carbon Capture, Regulations.

A Normative Anaylisis on the Implementation of Carbon Capture and Storage in order to Achieve Net Zero Emission in Indonesia

Raphael Bertrand Mayaka, Stephen Ramadhana Rodriguez, Ubaidillah Kamal, Muhammad Adymas Hikal*

Introduction

In Indonesia, currently many people still use fossil fuels as the main energy source, but with the use of fossil fuels, greater carbon dioxide emissions will be released into the atmosphere, ultimately causing climate change (global warming). To overcome this problem, Indonesia is now starting to adopt techniques that have been used by several countries, namely carbon capture. Carbon capture or carbon sequestration is a technique that has now been discovered to recapture carbon dioxide (CO2) which is then collected and injected into oil wells in order to increase oil production.[2] Carbon Capture and Storage or commonly called CCS or some call it CCUS (Carbon Capture, Utilization and Storage) is one solution to climate change which continues to worsen over time. Indonesia itself is currently preparing

* Raphael Bertrand Mayaka (Universitas Negeri Semarang, Indonesia) Corresponding email: raphaelbm@students.unnes.ac.id, Stephen Ramadhana Rodriguez (Universitas Negeri Semarang, Indonesia) Corresponding Email: stephenramadhana96@students.unnes.ac.id, Ubaidillah Kamal (Universitas Negeri Semarang), Muhammad Adymas Hikal Fikri (Universitas Negeri Semarang)

2 Anih Sri Suryani, "POTENSI DAN TANTANGAN IMPLEMENTASI CARBON CAPTURE AND STORAGE DI INDONESIA," *KAJIAN SINGKAT TERHADAP ISU AKTUAL DAN STRATEGIS BIDANG EKONOMI, KEUANGAN, INDUSTRI DAN PEMBANGUNAN* XVI, no. 1 (2024): 11–15.

15 projects that will develop and use CO2 capture technology. Of the 15 projects, 8 projects are expected to be implemented between 2026 and 2035. It is estimated that these projects will be able to reduce 2.5 million tonnes of carbon dioxide per year, which is then expected to increase to 7.9 million tonnes of carbon dioxide per year 2030 and is finally expected to increase to 8.6 million tons of carbon dioxide per year in 2031. The Indonesian government itself is committed to addressing the impacts of climate change by setting emission reduction targets and preparing action plans to ensure these targets are met. In 2010, Indonesia voluntarily pledged to unconditionally reduce greenhouse gas (GHG) emissions by 26% under a business-as-usual scenario by 2020. In nationally determined contributions (NDCs) submitted to the Framework Convention for Change UN Climate in 2016, Indonesia committed toreducing GHG emissions by 29% under a business-as-usual scenario by 2030 without conditions and up to 41% on the condition that international support for funding, technology transfer and capacity building is provided.[3]

However, behind the advantages there are disadvantages that can seriously hurt a country's finances. This is because the funding required to carry out CCS/CCUS is very large, especially for the fishing part which covers 50% to 80% of expenses,[4] then based on a study carried out by ERIA, the cost of capturing carbon dioxide can reach 45.92 USD and the cost of storing carbon dioxide can reach 15.93 USD. Meanwhile in Indonesia. To consolidate all this, the Ministry of Energy and Mineral Resources (ESDM) issued Minister of Energy and Mineral Resources Regulation No.2 of 2023 concerning the Implementation of Carbon Capture and Storage, as well as Carbon Capture, Utilization and Storage in Upstream Oil and Gas Business Activities. This regulation paves the way for the implementation of the first wave of CCS/CCUS in Indonesia. With the implementation of CCS/CCUS, the hope of achieving Net Zero Emissions by 2060 will be increasingly achievable.

In order to discuss topics or issues that were published at the same time as the Indonesian Government's commitment regarding Carbon Capture and Storage in the ratification and implementation of the Republic of Indonesia Minister of Energy and Mineral Resources Regulation No.2 of

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[3] Asian Development Bank, *Carbon Dioxide-Enhanced Oil Recovery in Indonesia* (Mandaluyong: Asian Development Bank, 2019), https://doi.org/http://dx.doi.org/10.22617/TCS190600.

[4] Jonas Grafström, "Survival and Cost Development of Carbon Capture and Storage Firms between 2018 and 2021," 2022.

2023, thus recognizing the urgency and importance of the Government's participation in the Paris Agreement to the United Nations Framework Convention on Climate Change, which is envisioned referring to development with low greenhouse gas emissions so that climate resilience is 2050.

Next, as a final stage in the management section, 'utilisation' which is described more generally as CCUS, is a leading technology that has become the main focus in dealing with greenhouse gas emissions in recent years, considering the increasing issue of CO2 emissions.[5] CCUS is also known as a technology that is widely cited as one of the many important innovations in solutions for reducing carbon emissions, combating climate change, and transitioning towards a carbon-neutral future.[6] According to the International Energy Agency (IEA), CCUS technology will contribute to the clean energy transition in many ways and efforts. First, CCUS will reduce carbon emissions from existing energy infrastructure and industrial facilities which, otherwise, would carry approximately 600 billion tons of CO2 gas predicted over the next five decades. Second, CCUS will reduce carbon emissions from heavy industrial waste in its sector, which now contains 20% of total global CO2 emissions. Moreover, CCUS outlines a cost-effective technology roadmap that will enable rapid expansion of low-carbon hydrogen production, making it critical to meet current demand well into the future. Thus, hydrogen demand is projected to increase sevenfold by 2070 in the context of sustainable development scenarios. Also, by integrating CCUS technology, up to 40% of hydrogen needs will be produced from fossil fuels and can be made carbon-free.[7] Therefore, it can be said that CCUS acts as an important technology to mitigate large amounts of emissions from energy infrastructure and heavy industry, so that it can act as a technology that

5 Sean M Jarvis and Sheila Samsatli, "Technologies and Infrastructures Underpinning Future CO2 Value Chains: A Comprehensive Review and Comparative Analysis," *Renewable and Sustainable Energy Reviews* 85 (2018): 46–68.

6 Paolo Gabrielli, Matteo Gazzani, and Marco Mazzotti, "The Role of Carbon Capture and Utilization, Carbon Capture and Storage, and Biomass to Enable a Net-Zero-CO2 Emissions Chemical Industry," *Industrial & Engineering Chemistry Research* 59, no. 15 (2020): 7033–45.

7 International Energy Agency, *Energy Technology Prespectives, Special Report on Carbon Capture Utilisation and Storage* (International Energy Agency, 2020), www.iea.org/t&c/.

bridges the transition to carbon-free alternative fuels while maintaining a circular economy.[8]

Method

The research method in the research carried out is using a normative juridical approach. The normative juridical approach is carried out by examining legal principles, legal provisions, legislation and legal mechanisms.[9] Based on the normative type of legal research, several normative approaches are also used, namely the Conceptual Approach and the Statutory Approach. A conceptual approach is used to analyze the views and doctrines found in legal science based on literature studies and secondary data.[10] Then a legal approach is carried out by analyzing norms and positive legal regulations related to the legal phenomena that occur. After the approaches have been implemented by the author, the author will analyze the results of the approach using a qualitative approach method. In the field of legal science, a qualitative approach should be related to examining all legal events that are currently occurring and studying them in depth, in which the procedures will be reduced or filtered, processed, presented and analyzed data and ultimately conclusions will be drawn from the analysis that has been carried out.

The Policy of Carbon Capture and Storage in Indonesia

The Capture and Storage of Carbon (CCS) rules are a proposed strategy to reduce greenhouse gas emissions and combat climate change. The precautionary principle is a crucial foundation in implementing CCS, considering its significant impact on the environment and society. To ensure

[8] Ismail Ismail and Vassilis Gaganis, "Carbon Capture, Utilization, and Storage in Saline Aquifers: Subsurface Policies, Development Plans, Well Control Strategies and Optimization Approaches—A Review," *Clean Technologies* 5, no. 2 (2023): 609–37.

[9] Stefanie Simanjuntak, "PROBLEMATIKA STATUS KEBERANGKATAN PENGUNGSI DI INDONESIA SECARA YURIDIS-NORMATIF," *Jurnal Dialektika Hukum* 5, no. 1 (2023).

[10] Ajie Prasetya, Yulia Emma Sigalingging, and Aris Prio Agus Santoso, "Peran Hukum Dalam Pembangunan Dengan Pendekatan Economic Analysis Of Law," *JISIP (Jurnal Ilmu Sosial Dan Pendidikan)* 7, no. 1 (2023): 211–18.

the success and safety of CCS implementation, a series of strict and detailed rules are required. The precautionary principle refers to an approach that focuses on protecting against environmental damage and public health before harmful effects occur. In the context of CCS, this means that prevention and mitigation measures must be the top priority throughout the project lifecycle, from carbon capture to long-term storage.

One important aspect of CCS rules is the comprehensive identification and evaluation of risks. Before commencing a project, stakeholders must conduct in-depth analyses of potential risks such as carbon dioxide (CO2) leakage from storage reservoirs, its impact on marine or terrestrial ecosystems, and its effects on human health. Risk assessments should consider all possible scenarios and their consequences. Furthermore, CCS rules should also prioritize transparency and broad public engagement. Communities should be provided with clear and accurate information about CCS projects that have the potential to affect their environment and livelihoods. Public participation in decision-making processes should be encouraged and valued so that their concerns and inputs can be accommodated. Regarding carbon storage, selecting the right location is crucial. CCS rules should establish strict criteria for the selection of safe and stable storage sites. This includes careful geological research, identifying suitable zones for long-term storage, and ensuring that the reservoirs are well-isolated to prevent CO2 leakage. Legal and regulatory aspects should also be considered in CCS rules. A clear and robust legal framework is needed to regulate carbon capture, transportation, and storage. This includes project licensing, financial responsibility, and effective monitoring and enforcement mechanisms to ensure compliance with regulations.

Moreover, CCS rules should take into account the social and economic impacts of these projects. This includes considering their potential influence on local livelihoods, community infrastructure, and energy prices. Governments and companies should strive to ensure that the economic benefits of CCS are distributed fairly and that communities negatively affected are adequately compensated. Finally, the development and implementation of CCS rules should be based on solid scientific and technical principles. Continuous research and development are required to improve the efficiency and safety of CCS technologies and to reduce the costs and associated risks.

By implementing strict CCS rules and adhering to the precautionary principle, it is hoped that this technology can become an effective instrument in addressing climate change while minimizing its negative impacts on the environment and society. Determination of ESDM Ministerial Regulation No. 2/2023 has urgency in supporting Indonesia's commitment to reducing greenhouse gas emissions, which by 2060 Indonesia is committed to achieving zero emissions, increasing national energy security, and developing CCS technology. However, it needs to be studied further regarding implementation costs, regulatory uncertainty, and potential obstacles to achieving national development targets.[11]

ESDM Ministerial Regulation No.2 of 2023 does not directly provide benefits to society. This regulation focuses on regulations and incentives for business actors in the upstream oil and gas sector to implement Carbon Capture and Storage (CCS) technology. This regulation opens up great opportunities for investors to enter CCS activities in upstream oil and gas working areas; However, investors must fulfill several requirements and conditions set by the Minister of Energy and Mineral Resources.

But there are several benefits that the public can experience if this Carbon Capture and Storage (CCS) technology is operated:[12]

1. Reducing Greenhouse Gas Emissions

This technology can help reduce greenhouse gas emissions from the upstream oil and gas sector which contribute to climate change. Reducing these emissions can help maintain air quality and public health.

2. Increasing National Energy Security

Carbon Capture technology can help increase national oil and gas production in order to prevent a national energy crisis and reduce dependence on energy imports.

3. Increasing Job Opportunities

The development and application of CCS technology can create new jobs in the energy sector. Through job creation, employment opportunities, community income and economic growth can be increased.

Impact of Minister of Energy and Mineral Resources Regulation No.2 of 2023 regarding convenience for the community is still unclear. On the one

[11] Dadan D S M Saputra, Sugihardjo Sugihardjo, and Edward M L Tobing, "STUDI KELAYAKAN UNTUK IMPLEMENTASI INJEKSI CO2 SKALA PILOT DI LAPANGAN MINYAK A, SUMATERA SELATAN," *Lembaran Publikasi Minyak Dan Gas Bumi* 52, no. 1 (2018): 15–24.

[12] Saputra, Sugihardjo, and Tobing.

hand, implementing CCS can increase energy security and create new jobs. On the other hand, high CCS costs could be passed on to consumers, which could increase energy prices. The government needs to conduct an in-depth study of the impact of Minister of Energy and Mineral Resources Regulation No.2 of 2023 to the community before implementing it widely.

The Minister of Energy and Mineral Resources has emphasized that the implementation of CCS will be one of the main instruments that will be used to achieve Indonesia's NZE target in 2060 or as soon as possible. In this case, the implementation of CCS can increase oil and gas production levels through the CO2 Enhanced Oil Recovery (EOR) or Enhanced Gas Recovery (EGR) methods which work simultaneously to reduce greenhouse gas emissions ("GHG Emissions") in line with production.

Seeing that these potentials can attract further investment and generate economic value through the implementation of CCS activities, as well as help Indonesia achieve its Nationally Determined Contribution (NDC) targets, the government decided to issue Presidential Regulation No.14 of 2024 concerning the Implementation of Carbon Capture and Storage Activities ("Perpres 14/2024"), which has been in effect since 30 January 2024. In general, Presidential Regulation 14/2024 stipulates the applicable provisions regarding the implementation of CCS.

Reflecting on the main objective of Carbon Capture and Storage in Indonesia, considering the national commitment to achieve the ideals of the Paris Agreement in the United Nations Working Convention on Climate Change, Indonesia as a form of Concern and participation towards development with low greenhouse gas emissions and climate resilience until 2050. Comply with the provisions promulgated in the Minister of Energy and Mineral Resources Regulation No.2 of 2023, also discusses more or less the benefits in terms of finance and financing. First of all, it is necessary to identify the elements that cover these costs, if it is based on a regulation that will develop according to the hierarchy of Legislative Regulations, with the participation of the entire community in making it happen, there is a price which is also known as Opportunity Cost.

“The economist’s notion of cost or, more precisely, opportunity cost, is linked with – but distinct from – everyday usage of the word.”[13]

[13] R N Stavins and K R Richards, *The Cost of US Forest-Based Carbon Sequestration. Prepared for the Pew Center on Global Climate Change*, 2005.

Examined as something that should be sacrificed in order to achieve something else, in discussing the environment, measuring the size of the value scale also needs to be fought for in order to prevent or reduce all opportunities for negative impacts on environmental health.[14] By weighing costs and benefits which are both sides of a coin: benefits to the environment are created by taking various actions by policy, while others are incalculable. Meanwhile, calculating the costs of environmental protection can then be interpreted as the gross reduction in social benefits (consumer and producer surplus) originating from all policy actions accompanied by changes in prices and/or income that may occur.[15]

Considering the link between costs and benefits, in Ministerial Regulation No.2/2023 states that at least in Article 41 paragraph (1), the economics of organizing CCS or CCUS can be centered on other parties by the Contractor, apart from that it can also come from capital and non-capital costs for operating costs, to various cost reserves (e.g. Monitoring activities), so that it does not only depend on the APBN and APBD. Apart from that, discussing the benefits and opportunities for a positive impact on Indonesia[16], together with LEMIGAS on the previous regulation, Ministerial Regulation No. 13 of 2007, shows that all regulations and legal aspects covering the operation and management of CCS or CCUS projects have focused on increasing production in old oil and gas wells embedded in various points in Indonesia. So, the potential that is reviewed regarding the spread of the implementation of this regulation, in terms of CO2 storage, is also related to enhanced oil recovery, therefore large funds are needed as a form of realization of this regulation .[17]

With the large benefits in the form of opportunities for success from previous regulations, which are also strengthened by a variety of funding sources, it can be seen that the latest Ministerial Regulation on CCS or CCUS contains various benefits for the nation's commitment to sustainable environmental protection until 2050.

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14 Stavins and Richards.

15 Maureen L Cropper and Wallace E Oates, "Environmental Economics: A Survey," *Journal of Economic Literature* 30, no. 2 (1992): 675–740.

16 Dennis Best et al., "Status of CCS Development in Indonesia," *Energy Procedia* 4 (2011): 6152–56.

17 Fiqya Fairuz Zaemi and Rian Cahya Rohmana, "Carbon Capture, Utilization, and Storage (CCUS) Untuk Pembangunan Berkelanjutan: Potensi Dan Tantangan Di Industri Migas Indonesia," *Prosiding Seminar Nasional Teknik Lingkungan Kebumian SATU BUMI* 3, no. 1 (2021).

Carbon Capture and Storage Implementation Scheme in Indonesia based on Presidential Regulation Number 14 of 2024

In Presidential Regulation no. 14/2024 states that holding CCS can be based on three things, including: (1) holding CCS based on a cooperation contract; (2) holding CCS based on an exploration permit and (3) holding CCS based on a storage permit. Furthermore, based on article 4 paragraph 2 of Presidential Regulation 14/2024, it is stated that what is meant by the cooperation contract above can be a production sharing contract with return of operating costs, a gross-split profit sharing contract or other cooperation contracts. To carry out KKS-based CCS activities in the Work Area, eligible Contractors must submit a CCS implementation plan with relevant carbon storage capacity certification ("Implementation Plan") to the Special Task Force for the Implementation of Oil and Gas Business Activities ("SKK Migas") or Aceh Oil and Gas Management Agency ("BPMA") in accordance with the relevant jurisdiction. In this case, the Implementation Plan must be submitted as part of the application for Plan of Development approval ("POD"). The Minister, based on recommendations from SKK Migas or BPMA or SKK Migas itself, can reject the above implementation plan. Furthermore, based on Article 8 of Presidential Regulation 14/2024, it also regulates that in the event of an expansion of the work area due to the expansion of the Land Injection Zone (ZTI) outside the planned work area, the contractor through SKK Migas can propose an expansion of the work area to the minister which can then be approved or rejected, if approved, the contractor and SKK Migas will amend the cooperation contract. In addition, emission producers can utilize CCS operating facilities operated by the Contractor, as long as these facilities meet the applicable feasibility requirements (i.e. technical feasibility, economics and operational safety).

Furthermore, for the implementation of CCS based on an exploration permit, in this case the implementer who meets the requirements is a business entity and permanent business form with a working area coverage in the form of open areas, mining permit areas and/or working areas. To obtain their own permit, a business entity or permanent business entity can propose it to the minister in the Carbon Storage Permit Area ("WIPK"). After the proposal was proposed based on article 10 of Presidential Regulation 14/2024, the

minister prepared the WIPK which will be determined based on an initial risk assessment and technical evaluation of the results of data processing, exploration and exploitation activities or general surveys. In the event that the proposed WIPK overlaps or is in the same area as the working area and/or mining business permit area, then the preparation of the WIPK is carried out in collaboration with data utilization and/or joint use of surface facilities. After the proposal is received, the minister will make a WIPK offer to the business entity or permanent business form which will be carried out through a limited selection or auction as regulated in Article 12 of Presidential Regulation 14/2024. For a business entity or permanent business form to participate in the limited selection or auction as stated in article 12, it must fulfill the requirements written in article 12 paragraph 6, namely: (a) have technical capabilities related to upstream, mining or geothermal business activities; (b) have technical capabilities related to the management of hazardous and toxic materials; and (c) financial capacity to carry out ZTI exploration activities and/or carbon storage operations at WIPK. Furthermore, after going through this process the minister will determine the winner of the limited selection or WIPK auction where the winner will receive an exploration permit after submitting an application to the minister through the electronically integrated business licensing system (online single submission) as regulated in Article 15 of Presidential Regulation 14/2024.

Before the minister grants an exploration permit as regulated in article 15, the business entity or permanent establishment designated as the winner must also fulfill administrative requirements, technical requirements, environmental requirements and financial requirements. These requirements include:

Table 1
Requirements that Must Be Met to Obtain an Exploration Permit

Administrative Requirements	Technical Requirements	Enviromental Requirements	Financial Requirements
Business Registration Number (NIB)	ZTI's definite commitment to exploration	Fulfillment of environmental requirements in accordance with applicable environmental	Proof of placing collateral for the implementation of ZTI Exploration's

		laws and regulations.	definite commitments
Name and deed of establishment of the entity applying for the permit, which must be owned or controlled directly by the Winner or its parent company	Work plan for implementing ZTI Exploration commitments		Fiscal certificate in accordance with statutory regulations in the field of taxation
Application letter	Guaranteed implementation of ZTI Exploration's definite commitment		
Composition of management, list of shareholders and beneficial owners of the business entity or permanent business form in the event of data updates	Leak path mitigation studies, well drilling and formation injectivity tests		
	Conceptual study of Carbon Storage development and selection of development concepts		

	Other technical requirements in accordance with other provisions

Source: Article 15 of Presidential Regulation No. 14/2024.

Once obtained, the Exploration Permit will be valid for six years and can be extended once for a maximum period of four years as stated in Article 17 Paragraph 1 of Presidential Regulation No.14/2024. However, it should be noted that Exploration Permits are prohibited from being transferred to other parties. Furthermore, Exploration Permit holders are mandated to carry out the following things:

1. Submit a work plan to the Minister regarding the implementation of definite commitments for ZTI Exploration to obtain approval;
2. Obtain approval from the Minister for the work plan above before carrying out ZTI Exploration activities.

Once the ZTI Exploration process has been implemented and the relevant commercial capacity for carbon storage has been determined, the Exploration License holder must submit a ZTI Development and Operation Plan ("PDO ZTI") to the Minister for approval. In this case, the ZTI PDO must at least include the results of studies that discuss various aspects, including geophysics, engineering, economic factors, closure, monitoring and Measurement, Reporting and Verification (MRV).

Next, the final implementation is through a storage permit. The implementation of CCS with storage permits can only be granted to business entities but does not rule out the possibility for permanent business forms to obtain storage permits. Permanent establishments that receive DOP ZTI approval must form a business entity to obtain a storage permit as regulated in Article 23 Paragraph 4 and 5 of Presidential Regulation 14/2024. Similar to the CCS scheme with an exploration permit, the implementation of CCS with a storage permit must also fulfill four types of requirements, namely:

Table 2
Requirements that Must Be Met to Obtain an Storage Permit

Administrative Requirements	Technical Requirements	Enviromental Requirements	Financial Requirements

Business Registration Number (NIB)	Map of the proposed Storage Operation permit equipped with latitude and longitude in accordance with the national geographic information system	Environmental approval	Proof of placement of collateral for the implementation of carbon storage operations
Name and deed of establishment of the entity applying for the permit, which must be owned or controlled directly by the Winner or its parent company	Full report of ZTI's Exploration phase	Operation plan document	Financial reports covering the last three years, audited by a public accountant
Application letter	Approval of the Plan for Development and Operation (PDO) of ZTI by the Minister		Fiscal certificate in accordance with statutory regulations in the field of taxation
Composition of management, list of shareholders and beneficial owners of the business entity or permanent			

business form in the event of data updates	
Other basic requirements, as regulated in applicable laws and regulations	

Source: Article 24 of Presidential Regulation No. 14/2024.

Once issued, the Storage Permit will be valid for a maximum period of 30 years and can be extended for a period of 20 years taking into account the relevant storage capacity as stated in Article 25 Paragraph (1) of Presidential Regulation No.14/2024. As with Exploration Permits, Storage Permit holders are prohibited from transferring their permits to other parties and are mandated to carry out the following things:

1. Submit an annual plan that addresses the operation's carbon storage activities;
2. Obtain approval from the Minister for the annual plan described above before implementing operational carbon storage activities.

Enforcement of the Carbon Capture and Storage Implementation Scheme in Indonesia

Carrying out CCS or CCUS implementation in Indonesia begins after obtaining a storage permit for CCS implementation schemes based on permits, whereas for CCS implementation schemes based on cooperation contracts begins when the contractor obtains approval for the proposed field development plan or changes thereto as regulated in Article 28 Paragraph (1) and (2) of Presidential Regulation 14/2024. The implementation of CCS in this case is regulated in Article 28 to Article 35 of Presidential Regulation 14/2024. Furthermore, this implementation is carried out through at least 11 phases, including: (1) risk mitigation for long-term storage; (2) handling environmental, social impacts and public involvement in accordance with environmental agreements; (3) engineering, procurement and construction processes; (4) commissioning and operation of CCS activities; (5)

commissioning and operation of CCS activities; (6) management of environmental aspects; (7) implementation of emergency response activities; (8) implementation of repair and maintenance activities; (9) implementation of Monitoring and MRV at initial data collection and during operation; (10) closure of CCS activities; and (11) implementation of post-closing monitoring. Then from these 11 phases, there are also processes regulated therein, the first is carbon capture, in Article 29 of Presidential Regulation 14/2024 it is regulated that carbon capture can be carried out in several ways, including: a. Carbon separation in oil and gas production facilities; b. Capture of carbon from combustion; c. Pre-ignition catch; d. Oxyfuel combustion capture; e. Direct air capture; and/orf. Other capturing methods that are in line with developments in science and technology.

Furthermore, carbon transportation is also regulated as stated in Article 30 to Article 33 of Presidential Regulation 14/2024, which states that this transportation is carried out based on a transportation permit obtained after coordinating with the minister related to the environment. This transportation is carried out using ships, trucks, pipes and/or other methods in accordance with developments in technology. Transportation can only be carried out by business entities or Storage Permit holders based on a carbon transportation permit to the injection location delivery point, which is issued by the Minister in coordination with the Minister of Environment and Forestry. In addition, transportation permits issued for carbon transportation via pipeline will be valid for 20 years and can be extended for 10 years each time. Additionally, Transport Permits for carbon transportation via vehicles will be valid for 10 years with a 10 year extension period available.

Then the next thing regulated in this regulation is regarding carbon injection and storage. This matter is regulated in Article 34 of Presidential Regulation 14/2024, where injection and storage can be carried out in ZTI which takes one of the following forms: 1) Depleted reservoir, 2) Salty aquifer storage, or 3) Coal seam. This activity can only be carried out by the holder of a Storage Permit after first obtaining approval for the annual plan from the Minister as well as environmental approval. And the last thing that is regulated is carbon storage capacity for domestic needs where Article 35 of Presidential Regulation 14/2024 regulates that contractors and permit holders are required to allocate 70% of their total carbon storage capacity for domestic carbon reserves. This means that parties can allocate 30% of their total carbon storage capacity to foreign-source carbon storage.

What Should Indonesia do for the Future of Carbon Capture and Storage

Goals and targets so that there is Ministerial Regulation No.2 of 2023 and Presidential Regulation Number 14 of 2024 are due to Indonesia's goal of becoming zero carbon by 2060. However, there is still a lot to consider before undertaking a work program. As is known, to be able to use carbon capture storage technology requires quite large funds. It would be better if this huge amount of money were allocated to infrastructure or used for education so that the benefits would be felt more.

In the Working Meeting (Raker) of Commission VII DPR RI with the Minister of Energy and Mineral Resources (ESDM) it was agreed that the budget for the Ministry of Energy and Mineral Resources for 2024 would be IDR.6,798,653,040,000. Meanwhile, the cost for this project reaches Rp.316.5 Trillion (assuming an exchange rate of IDR 15,000 per US$). These costs are not in accordance with the agreed budget.[18]

It is not only a matter of funding, but the readiness of human resources in Indonesia itself is not yet able to operate Carbon Capture Storage technology optimally. ESDM Ministerial Regulation No.2 of 2023 needs to be deleted and reviewed. In the Indonesian state's mission to pursue zero carbon by 2060, it starts from simple things first and not directly into very complex things such as the use of CCS technology. Looking at history during Covid-19 in 2020, most work activities were carried out from inside the house so there was no need to leave to use a motorized vehicle. At that time, global emissions were reduced by 7%, which was a truly amazing reduction in emissions. Therefore, before moving to the use of CCS technology which requires very large costs and is far from the existing APBN, it is better to implement more Work From Home (WFH), public transportation that uses cleaner energy, and the government and the police work together inobserve vehicles that do not qualify for emissions tests.[19]

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[18] Agung Pribadi, "Anggaran Kementerian ESDM Tahun 2024 Disetujui Rp6,7 Triliun, Ini Rinciannya," esdm.go.id, 2023, https://www.esdm.go.id/id/media-center/arsip-berita/anggaran-kementerian-esdm-tahun-2024-disetujui-rp67-triliun-ini-rinciannya.

[19] Doni Nugroho Nugroho and Agus Rianto, "Strategi Indonesia Dalam Mengurangi Emisi Karbon Dioksida (CO2) Di Masa New Normal," *Prosiding Ilmu Pemerintahan* 1, no. 1 (2022): 228–42, https://e-journal.umc.ac.id/index.php/IP/article/view/2712.

With regard to testing vehicles that are eligible for emissions tests, they must be implemented more firmly so that Indonesia's goal of zero carbon by 2060 can be fostered from an early age.[20]

Considering the above regulatory framework in order to achieve the national commitment target for handling global climate change in order to achieve the goals of the Paris Agreement on the United Nations Working Convention on Climate Change towards low gas emission development Greenhouses and climate resilience by 2050 need to be phased out and replaced with Government Regulations (PP). In this Goverment Regulations, it have to regulate not only about the technical issues of CCS or CCUS but also need to regulate more about the funding of this program. The insentive that will be given to the investor which stated in Article 43 of Presidential Regulation 14/2024 is not clear so it need to be cleared in this new regulation.

Based on Article 41 paragraph (2) of Ministerial Regulation 02/2023, there are three sources of funding that can be used by Contractors, namely: (1) project financing; (2) grants and/or (3) other schemes in accordance with statutory regulations. Sources of funding for budget preparation at this institution are very necessary. This is none other than because the costs that must be incurred in implementing CCS are very large. The estimated costs to carry out CCS are 15 USD to 130 USD per metric ton of carbon dioxide and 100 to 345 USD per metric ton of carbon dioxide for direct-to-air CCS. Meanwhile, Indonesia itself is targeting at least 2.5 million tonnes per year since 2026 which is targeted to continue to increase to 8.6 million tonnes per year in 2031. If the funding source is only obtained from the government then of course this program will not be implemented optimally due to the lack of required funds, so that it requires investment from outside the government or by implementing taxes on CCS actors as is done by America. The program carried out by America itself is called Section 45Q Federal Tax Credit, where for a company or agency that implements CCS with minimum qualifications the company must capture and store at least 500,000 tons of carbon per year, which has now been reduced to 18,750 tons per year. Furthermore, the company will be given 10 USD per metric ton of carbon dioxide captured to increase oil production and will be given 50 USD which has now been

[20] Alvino Aryasena, Arya Pratama Iqbal, and Raditya Rahman Kusuma, "MELACAK KELEMAHAN: MENGAPA PENGIMPLEMENTASIAN KEBIJAKAN UJI EMISI DI DKI JAKARTA TAK EFEKTIF?," *Kultura: Jurnal Ilmu Hukum, Sosial, Dan Humaniora* 1, no. 2 (2023): 124–36, http://jurnal.kolibi.org/index.php/kultura.

increased to 85 USD per metric ton of carbon dioxide sequestered and 60 USD for CCUS.[21]

Reflecting on the steps taken by America, we can see a method that not only earns money but can also attract investors to enter and carry out CCS/CCUS in Indonesia. By implementing the 45Q Tax Credit method, investors will also get certainty regarding the income they will get from investment results in CCS/CCUS projects. Apart from that, by having your own funding source, the implementation of the CCS/CCUS project in Indonesia will be able to be carried out optimally because it is less dependent on the government and can be more adapted to each work area.

Apart from that, public participation also needs to be included in the Carbon Capture and Storage program, currently public participation is only limited to the environmental approval process. Community participation will also help monitor this program. Without supervision from the public, investors and the government will be able to act arbitrarily. This program is a very expensive program, without transparency and supervision from the public, corruption can easily occur during the CCS process. From the explanation above, the regulations that have been formed and passed have not yet achieved perfect efficiency, so that in the implementation of CCS operations, strong trust with investors regarding project development and public trust needs to be taken into consideration.[22] In the case of the wider community, there needs to be policies and activities in the form of socialization of learning costs so that people are fully aware and sensitive to the CCS they aspire to.[23]

Conclusion

Determination of ESDM Ministerial Regulation No. 2/2023 has urgency in supporting Indonesia's commitment to reducing greenhouse gas emissions, which by 2060 Indonesia is committed to achieving zero emissions, increasing national energy security, and developing CCS technology. ESDM Ministerial Regulation No. 2 of 2023 does not directly

[21] Kiera Zitelman et al., *Carbon Capture, Utilization, and Sequestration: Technology and Policy Status and Opportunities* (National Association of Regulatory Utility Commissioners, Washington, DC …, 2018).
[22] Howard J Herzog, *Carbon Capture* (MIT Press, 2018).
[23] Bruce Hill, Susan Hovorka, and Steve Melzer, "Geologic Carbon Storage through Enhanced Oil Recovery," *Energy Procedia* 37 (2013): 6808–30.

provide benefits to society. This regulation focuses on regulations and incentives for business actors in the upstream oil and gas sector to implement Carbon Capture and Storage (CCS) technology. This regulation opens up great opportunities for investors to enter CCS activities in upstream oil and gas working areas. The Minister of Energy and Mineral Resources has emphasized that the implementation of CCS will be one of the main instruments that will be used to achieve Indonesia's NZE target in 2060 or as soon as possible. Considering the link between costs and benefits, in Ministerial Regulation No. 2/2023 states that at least in Article 41 paragraph (1), the economics of organizing CCS or CCUS can be centered on other parties by the Contractor, apart from that it can also come from capital and non-capital costs for operating costs, to various cost reserves (e.g. Monitoring activities), so that it does not only depend on the APBN and APBD. In Presidential Regulation no. 14/2024 states that holding CCS can be based on three things, including: (1) holding CCS based on a cooperation contract; (2) holding CCS based on an exploration permit and (3) holding CCS based on a storage permit. Furthermore, based on article 4 paragraph 2 of Presidential Regulation 14/2024, it is stated that what is meant by the cooperation contract above can be a production sharing contract with return of operating costs, a gross-split profit sharing contract or other cooperation contracts. Based on Article 8 of Presidential Regulation 14/2024, it also regulates that in the event of an expansion of the work area due to the expansion of the Land Injection Zone (ZTI) outside the planned work area, the contractor through SKK Migas can propose an expansion of the work area to the minister which can then be approved or rejected, if approved, the contractor and SKK Migas will amend the cooperation contract. Furthermore, for the implementation of CCS based on an exploration permit, in this case the implementer who meets the requirements is a business entity and permanent business form with a working area coverage in the form of open areas, mining permit areas and/or working areas. To obtain their own permit, a business entity or permanent business entity can propose it to the minister in the Carbon Storage Permit Area ("WIPK"). Next, the final implementation is through a storage permit. The implementation of CCS with storage permits can only be granted to business entities but does not rule out the possibility for permanent business forms to obtain storage permits. Permanent establishments that receive DOP ZTI approval must form a business entity to obtain a storage permit as regulated in Article 23 Paragraph 4 and 5 of Presidential Regulation 14/2024.

Carrying out CCS or CCUS implementation in Indonesia begins after obtaining a storage permit for CCS implementation schemes based on permits, whereas for CCS implementation schemes based on cooperation contracts begins when the contractor obtains approval for the proposed field development plan or changes thereto as regulated in Article 28 Paragraph (1) and (2) of Presidential Regulation 14/2024. The implementation of CCS in this case is regulated in Article 28 to Article 35 of Presidential Regulation 14/2024. Furthermore, this implementation is carried out through at least 11 phases. Presidential Regulation No. 14 of 2024 also regulates about carbon capture, carbon transportation and carbon injection and storage. Goals and targets so that there is Ministerial Regulation No. 2 of 2023 and Presidential Regulation Number 14 of 2024 are due to Indonesia's goal of becoming zero carbon by 2060. However, there is still a lot to consider before undertaking a work program. As is known, to be able to use carbon capture storage technology requires quite large funds. It would be better if this huge amount of money were allocated to infrastructure or used for education so that the benefits would be felt more. The regulations that have been formed and passed have not yet achieved perfect efficiency, so that in the implementation of CCS operations, strong trust with investors regarding project development and public trust needs to be taken into consideration.

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