



# Status of CCS and CO<sub>2</sub> Cross-Border Transport in the ASEAN Energy Transition

Workshop on CO<sub>2</sub> Cross-Border Transport and Storage (CCS) in Asia and the Pacific

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# About ASEAN Center for Energy (ACE) & APAEC Phase II



## ASEAN Center for Energy Role



### Catalyst

To unify and strengthen ASEAN Energy Cooperation by providing platform for sharing, policy advisory, best practices, capacity building.



### Knowledge Hub

To provide a knowledge repository for ASEAN Member States (AMS) and services through data Management, publication, dissemination.



### Think Tank

To assist AMS on research and identifying practical & specific solution policies, legal & regulatory framework, technologies, innovative Solutions

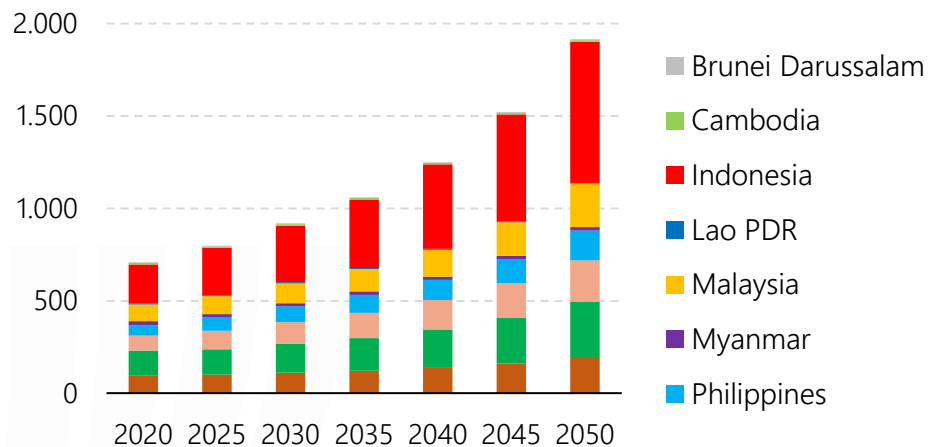
## ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II (2016-2025)

Focus	Program Area & Key Strategy
	<b>ASEAN Power Grid:</b> Expand MPT, Grid resiliency and clean & renewable energy integration
	<b>Trans ASEAN Gas Pipeline :</b> Develop Common Gas Market by LNG connectivity and accessibility
	<b>Clean Coal Utilization:</b> Optimize the role of Clean Coal in energy transition
	<b>Energy Efficiency:</b> Reduce energy intensity by 32% in 2025 based on 2005 level
	<b>Renewable Energy:</b> Achieve 23% share of RE in ASEAN energy mix and 35% share of RE in ASEAN installed Capacity
	<b>Regional Energy Policy and Planning:</b> Advance energy policy and accelerate region's energy transition & resilience
	<b>Nuclear Energy:</b> Build human resources capabilities on nuclear technology for power generation

# Background



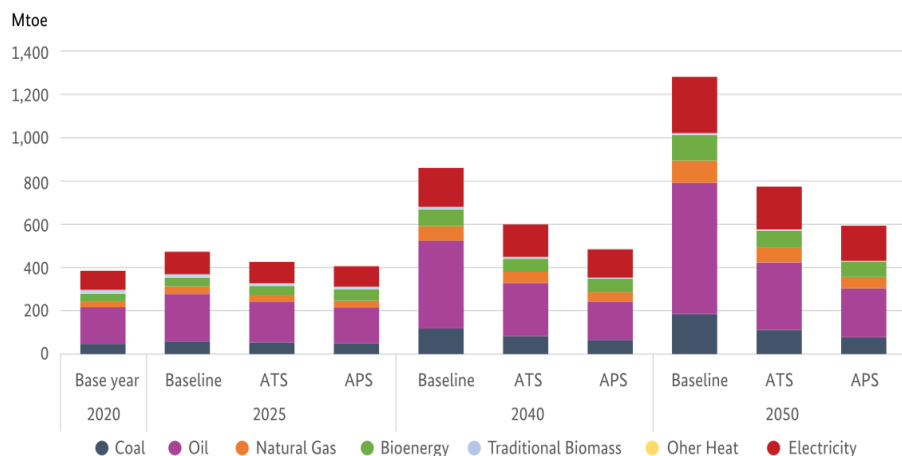
The total energy demand in Southeast Asia by country in Mtoe



Projected as a significant contributor to global economic growth, the economies of Southeast Asia are expected to expand by an average of 4.6% in 2023 and 4.8% in 2024

The [7th ASEAN Energy Outlook](#) suggests that the region's energy demand will surge by approximately 30% by 2030 and will escalate by 170% by 2050 when compared to the levels of 2020. This trend implies an average annual energy demand growth rate of about 3.4% throughout the region, continuing until the mid-21st century.

Examining the total energy demand by fuel, fossil fuel still dominates the energy demand in ASEAN. With the rising energy demand and the reliance on fossil fuel, it is predicted that GHG emissions are projected to reach 2,471 MtCO<sub>2</sub>-eq by 2025, with electricity and transportation contributing the highest share through 2050.



Source: the 7th ASEAN Energy Outlook

# Why ASEAN Need CO<sub>2</sub> Cross Border Transport

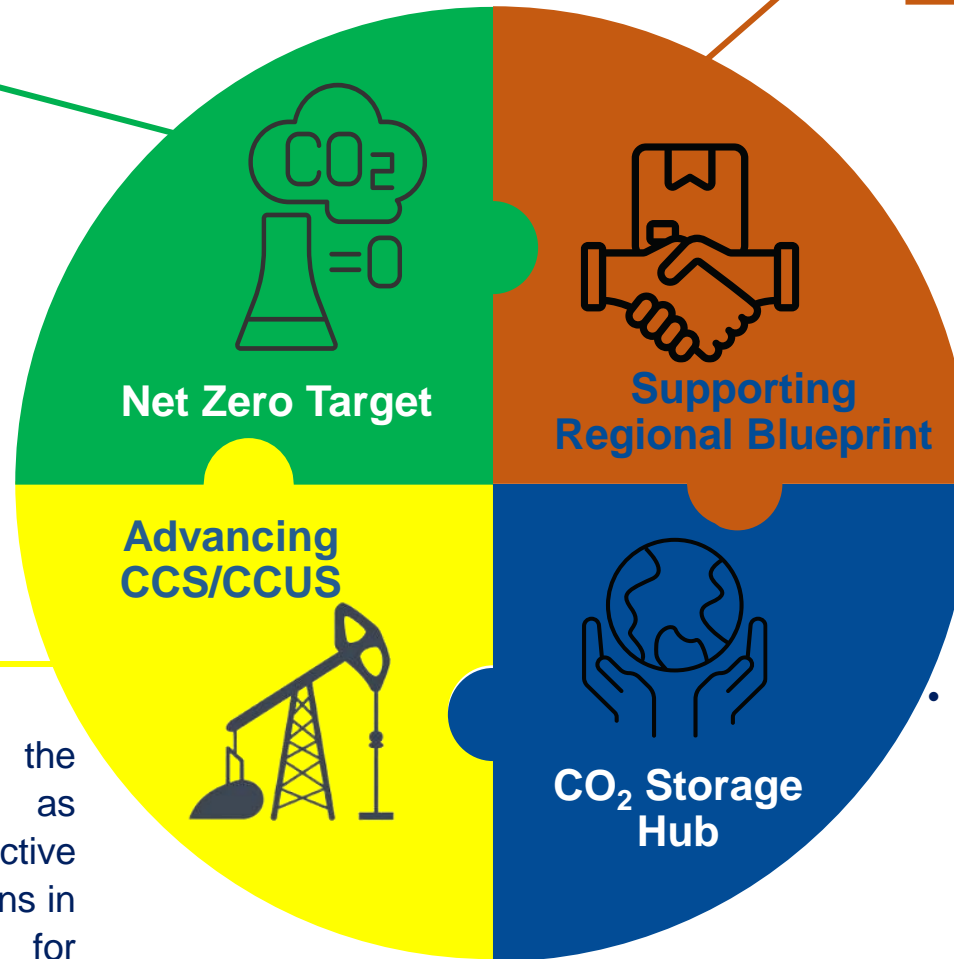


## Realize Net Zero target

- Most of the ASEAN countries have committed to carbon neutral or net zero emissions
- As member countries align with the Paris Agreement's ambitious climate goals, CCS and CCUS emerge as critical solutions, especially in industries where emission reductions are notoriously challenging.

## Advancing CCS/CCUS

- Although countries have planned the implementation of CCS/CCUS as specified in the countries' respective energy plans, there are some limitations in fully implementing CCS/CCUS, for instance, the regulation to allow transboundary of CO<sub>2</sub> in ASEAN.



## Supporting Regional Blueprint

- This initiative is supporting the region's collective effort for energy cooperation, under the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II: 2021-2025, Programme Area No.3 – Coal and Clean Coal Technology, specifically focusing on OBS 1, Action Plan 1.3. This plan involves the development of a Strategic Coal Report and studies to explore the potential of CCT and CCU/S for promoting a low-carbon energy system.

## CO<sub>2</sub> Storage Hub

- Indonesia and Malaysia are emerging as pivotal CO<sub>2</sub> storage hubs within the ASEAN regions (BIMP-EAGA). Their potential to leverage the vast quantities of CO<sub>2</sub> storage capacity presents a unique opportunity.
- Such efforts are also important for future decarbonisation from a global perspective

# Opportunities and Challenges on Cross-Border CO<sub>2</sub> Transportation in ASEAN for Advancing CCS Towards a Net Zero Future



## **Output I: Readiness of regulatory framework for climate change and CCS project in Indonesia, Malaysia, Thailand and Vietnam.**

- Positioning of CCS in climate change policy
- CCS Related Policies: Trends in consideration of carbon pricing such as emission regulations, carbon taxes, emissions trading, and carbon credits that may lead to the realization of CCS projects
- CCS Specific Incentives: Trends in the formulation of regulatory framework (including licenses and liabilities, etc.) for the realization of CCS projects
- CCS Specific Legal and Regulatory Framework: Mapping local related organizations such as CCS competent authorities

## **Output II: Challenges and Opportunities of CO<sub>2</sub> cross-border transportation in the ASEAN region**

- Examples of cross-border transport of CO<sub>2</sub> planned in the ASEAN region
- Expected issues and benefits for each of the assumed exporting and importing countries
- Potential recommendations to address the issues/challenges.

<Interviewee> Government officials, companies/ NOCs(National Oil Company) and think thank

# Current CCS specific policy, legal, regulatory and projects in selected ASEAN countries



	Indonesia	Malaysia	Thailand	Vietnam
International Climate Change Commitment	✗	✓	✓	✓
Net Zero Target	✓	✓	✓	✓
Party to the London Protocol	✗	✗	✗	✗
CCS-specific domestic policies or incentives	✓	✓	✓	✗
CCS project(s) proposed/in development	✓	✓	✓	✗
CCS specific legal and regulatory framework	✓	✓ (one state)	✗	✗
Existing legislation applicable to CCS operations	✓	✓	✓	✓

## CCS-related policy and regulatory framework

<p>CCS in Climate Change Policy (NDC)</p>	<p><b>[Target]</b> Reducing GHG emissions by 31.89% relative to the BAU scenario by 2030 and a conditional reduction is 43.2% with international support.</p> <ul style="list-style-type: none"> <li>NDC only mentioned CO<sub>2</sub> capture in the petrochemical (especially ammonia production) and steel &amp; Iron sectors</li> </ul>
<p>CCS-related Policy</p>	<p><b>Indonesia Long-Term Strategy for Low Carbon and Climate Resilience 2050</b></p> <ul style="list-style-type: none"> <li>Decarbonize power sector by 2050 includes equipment most coal power plants with CCS/CCUS and biomass co-firing in coal power plants connected to CCS (BECCS)</li> </ul> <p><b>Indonesian Ministry of Energy and Mineral Resources' (MEMR) Roadmap to Net Zero Emissions by 2060 in Energy Sector</b></p> <ul style="list-style-type: none"> <li>Roadmap aims for the capture 6Mt-CO<sub>2</sub> onwards from 2030, with the ultimate goal of 190Mt-CO<sub>2</sub> in 2060</li> </ul> <p><b>Presidential Regulation 98/2021 on Economic Value of Carbon</b></p> <ul style="list-style-type: none"> <li>Regulation reference CCS/CCUS as a mitigation and emission reduction activities</li> </ul>
<p>CCS-specific incentives</p>	<ul style="list-style-type: none"> <li>The new presidential regulation no 14 of 2024 mentioned about the plan to provide tax and non-tax incentives for CCS/CCUS.</li> </ul>
<p>CCS-specific legal and regulatory framework</p>	<ul style="list-style-type: none"> <li>MEMR Regulation No. 2 of 2023 on the implementation of CCS and CCUS for offshore oil and gas business activities</li> <li>Presidential Regulation No. 14 of 2024 on the organisation of CCS. It includes regulation on the cross-border CO<sub>2</sub> activities.</li> </ul>

## CO<sub>2</sub> cross-border transportation

- The Indonesian government recently enacted the President Regulation No. 14 of 2024 that allow cross-border CO<sub>2</sub> transportation and storage in Indonesia. It allows 30% of CO<sub>2</sub> storage capacity to be utilized for captured CO<sub>2</sub> from international sites, while 70% of the storage capacity is dedicated for captured CO<sub>2</sub> from domestic sites. The administration will be centrally governed by the Ministry of Environment with National Registry System to promote fair trading and avoid double counting.

### Comparison of MEMR Regulation No.2/2023 and New Presidential Regulation

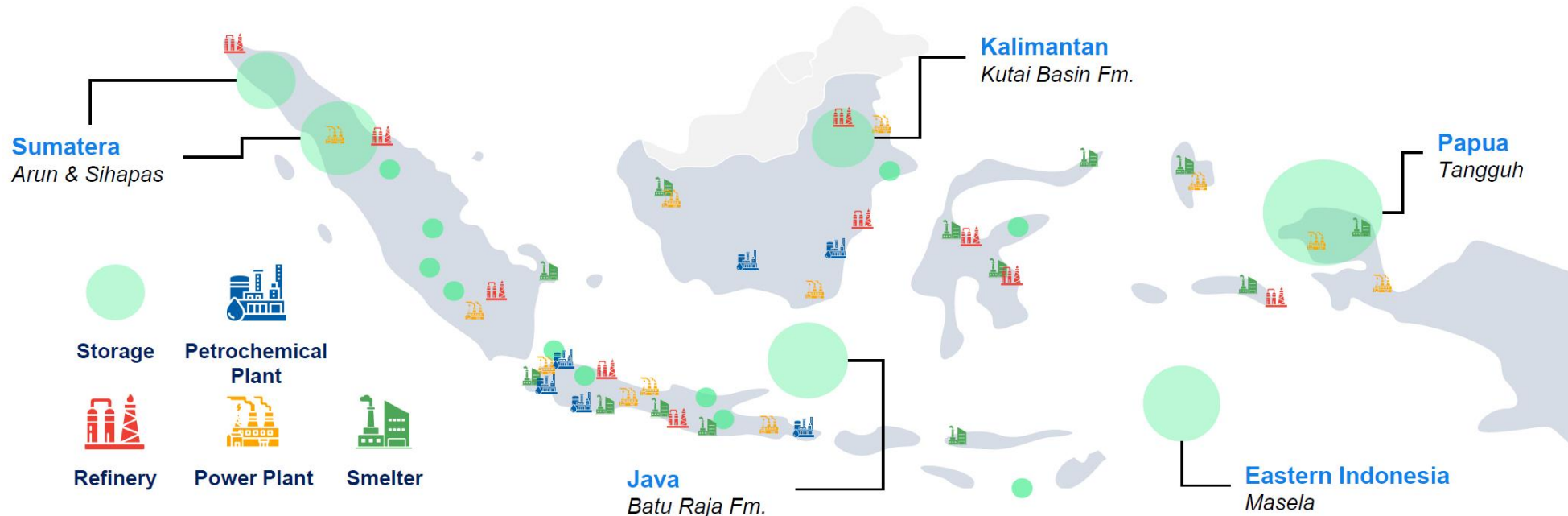
	MEMR Ministerial Regulation No.2/2023	New Presidential Regulation
Area	<ul style="list-style-type: none"> <li>Limited on CCS/CCUS in O&amp;G Working Area only</li> </ul>	<ul style="list-style-type: none"> <li>Enabling CCS outside of the O&amp;G Working Area.</li> </ul>
Business Entity	<ul style="list-style-type: none"> <li>Only conducted by O&amp;G Contractor, based on Upstream O&amp;G Business Mechanism (Production Sharing Contract &amp; Gross Split)</li> </ul>	<ul style="list-style-type: none"> <li>Opens up investment opportunities through 2 schemes: (1) Cooperation Contract for CCS in O&amp;G Working Areas, (2) Exploration Permit and Storage Operation Permit for CCS in the Carbon Storage Permit Areas</li> </ul>
CO <sub>2</sub> Sources	<ul style="list-style-type: none"> <li>Open for CO<sub>2</sub> sources from outside upstream O&amp;G (for CCUS)</li> </ul>	<ul style="list-style-type: none"> <li>Enabling CCS with CO<sub>2</sub> sources from other industries.</li> <li>Enabling Cross-border CCS.</li> </ul>
Implementation Scheme	<p><b>CCS Implementation is carried out by O&amp;G Contractors (K3S) in their Working Areas through Cooperation Contract</b></p> <ul style="list-style-type: none"> <li>K3S can utilize their petroleum operations facilities and injection target zones (depleted reservoir or saline aquifer) to receive carbon from other K3S or other industries after the POD has been approved by the MEMR</li> <li>CCS Implementation can be monetized through storage services (storage fees), storage fees are applied based on applicable regulations regarding taxation in upstream oil and gas business activities</li> </ul>	<p><b>The implementation of CCS is carried out by Business Entities (BU/BUT) through the Exploration Permit and Storage Operation Permit schemes in Carbon Storage Permit Areas</b></p> <ul style="list-style-type: none"> <li>The government prepares Carbon Storage Permit Areas (based on BU/BUT proposals or based on data processing), then offers the area to the companies through auctions and limited selection</li> <li>CCS implementation can be monetized through storage services, the government gets royalties on storage fees</li> </ul>



# Indonesia: Potential CCS hub



- Indonesia is aiming to become the region's CCS hub, with sufficient storage capacity and strategic geographical position



Source: ICCSC

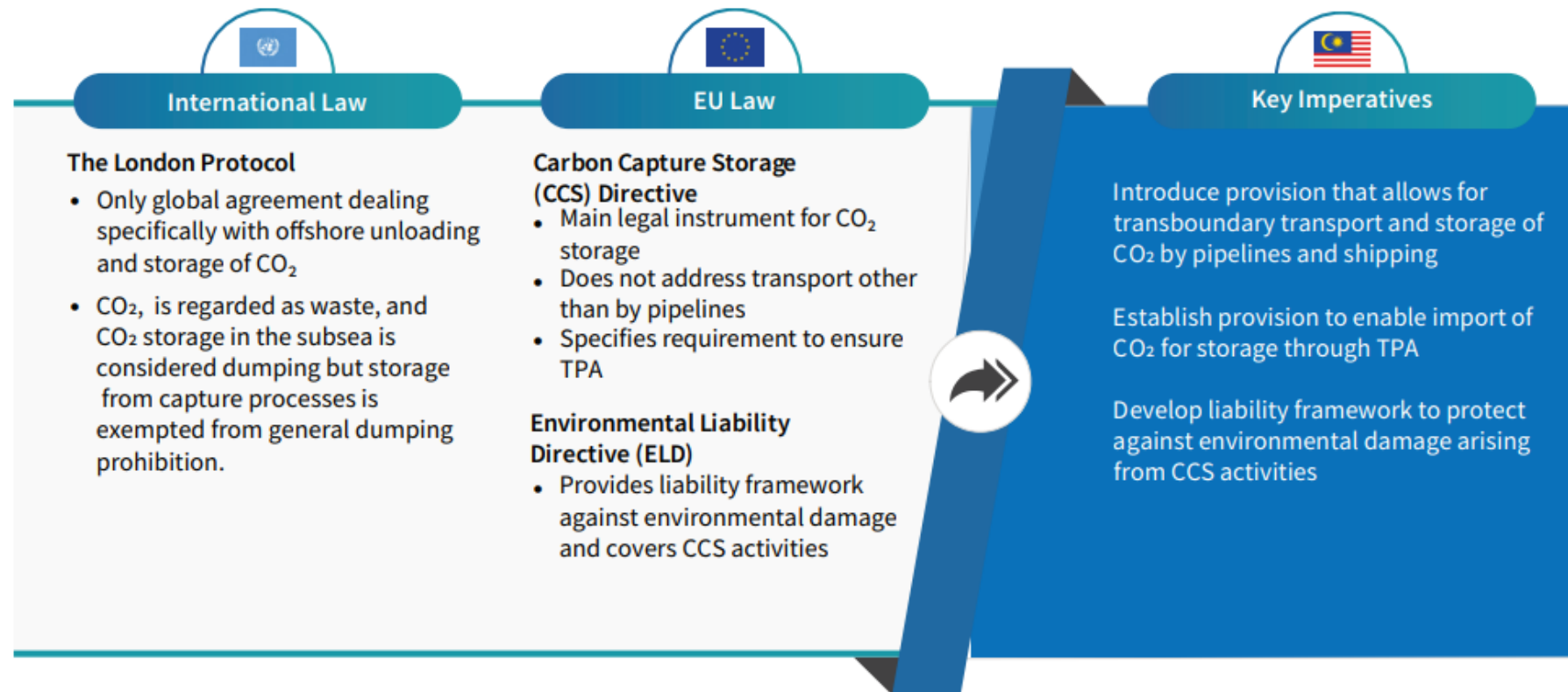
## CCS-related policy and regulatory framework

<p>CCS in Climate Change Policy (NDC)</p>	<ul style="list-style-type: none"> <li>Enhanced NDC: Reduction in GHG emissions intensity of GDP by 45% relative to the emissions intensity of GDP in 2005</li> <li>The commitment comprises a 35% reduction, on an unconditional basis, and a further 10% is conditional upon receipt of climate finance, technology transfer and capacity building from developed countries</li> </ul>
<p>CCS-related Policy</p>	<p><b>The 12th Malaysia Plan 2021-2025</b></p> <ul style="list-style-type: none"> <li>Highlights a necessary role for CCUS for the world's fourth-largest LNG producers</li> </ul> <p><b>Malaysia's National Energy Policy (NEP) 2022-2040</b></p> <ul style="list-style-type: none"> <li>Identify CCUS as a key emerging technology for Malaysia's oil and gas sector</li> </ul> <p><b>National Energy Transition Roadmap: Energising the Nation, Powering Our Future</b></p> <ul style="list-style-type: none"> <li>CCS will deliver an additional 5% reduction in GHG emissions, which translates to 4.1 MtCO<sub>2</sub>eq per capita.</li> </ul>
<p>CCS-specific incentives</p>	<ul style="list-style-type: none"> <li>Tax incentives for CCUS activities</li> </ul>
<p>CCS-specific legal and regulatory framework</p>	<ul style="list-style-type: none"> <li>There is not currently a CCS-specific legal framework at the national level in Malaysia</li> </ul> <p><b>Land Code (Carbon Storage) Rules 2022</b></p> <ul style="list-style-type: none"> <li>Sarawak Rules, only applicable in The State of Sarawak)</li> </ul>

# Malaysia: Potential CCS Hub



- Despite not having developed any regulations on CCUS to allow cross-boundary CO<sub>2</sub> transport, Malaysia has outlined its target to develop 3 CCUS hubs in its National Energy Transition Roadmap (NETR)



Source: Malaysia NETR, 2023

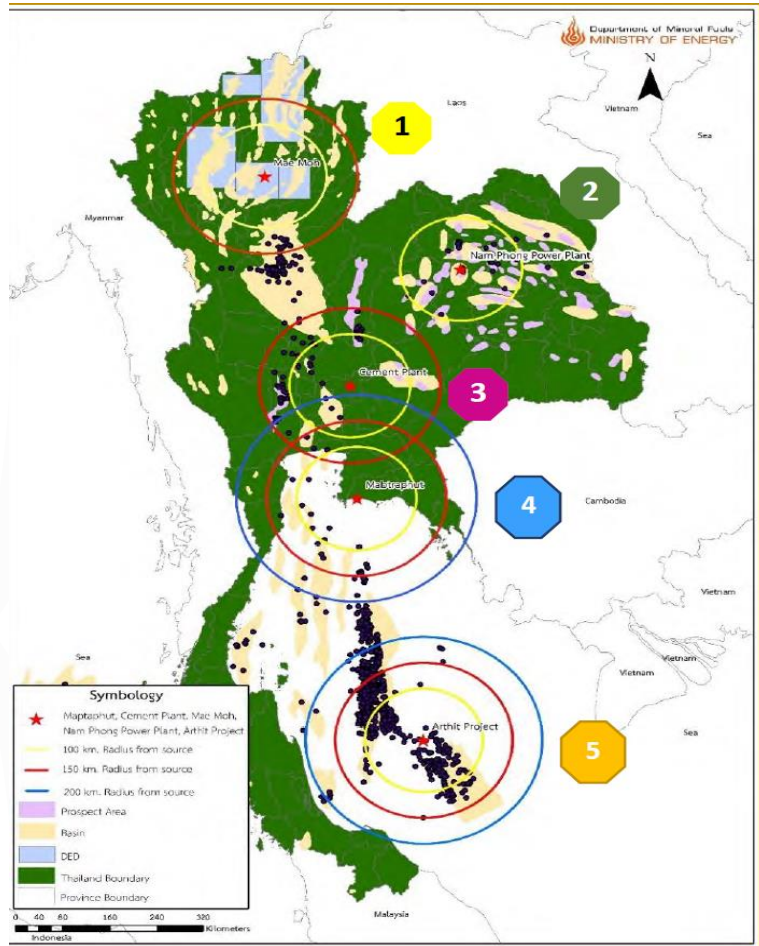


<p>CCS in Climate Change Policy (NDC)</p>	<p>Reducing GHG emissions by 30% relative to the BAU level by 2030 and a conditional reduction is 40% with adequate and enhanced access to technology development and transfer, finance and capacity building</p> <ul style="list-style-type: none"> <li>NDC refers needs of RD&amp;D for advanced technologies include CCS, CCUS BECCS, DAC, and hydrogen as technology development and transfer.</li> </ul>
<p>CCS-related Policy</p>	<p><b>Thailand’s Long-Term Low Greenhouse Gas Emission Development Strategy (LT-LEDS)</b></p> <ul style="list-style-type: none"> <li>Formal mention of CCUS from 2040 and BECCS from 2050 as potential roles to support decarbonisation of the national energy sector.</li> </ul> <p><b>Carbon Neutrality in 2050 and Thailand Net Zero in 2065</b></p> <ul style="list-style-type: none"> <li>Depend mainly on emission reductions in energy sector including using CCUS technologies</li> </ul> <p><b>The 13th National Economic and Social Development Plan (NESDP) 2023-3027</b></p> <ul style="list-style-type: none"> <li>CCUS technology is aligned to the NESDP strategic priorities No. 3 Eco-Friendly living and milestone No.10, “Circular economy and low-carbon society”</li> </ul> <p><b>National Energy Policy (NEP2022)</b></p> <ul style="list-style-type: none"> <li>Includes the role of CCUS technology as a critical decarbonisation tool to address Thailand's increasing energy demand and greenhouse gas emissions</li> </ul>
<p>CCS-specific incentives</p>	<ul style="list-style-type: none"> <li>FS study on financial and incentive policies and business model based on CCUS Development Work Plan</li> <li>DMF will establish new activities of CCUS proposing to the Board of Investment (BOI) to get support</li> </ul>
<p>CCS-specific legal and regulatory framework</p>	<p>n.a.</p>

# Thailand: Key CCS Projects



- CCS pilot projects within E&P Business and beyond E&P Business in Thailand:



No	Project	Operation /Collaboration	Status
1	Lampang	DMF, EGAT, PTTEP	• Planning and expected survey in 2024
	Mae Moh		-
2	Namphong	EGAT	• Finding financial support
	Phu Horm	PTTEP	• EOR
3	Saraburi Sandbox	SCG and DMF	• Geological data review
4	Northern Gulf of Thailand /Kra Basin	PTTEP, DMF, JOGMEC	<ul style="list-style-type: none"> <li>• Signing LOI and TOC between JOGMEC and DMF</li> <li>• Start survey and prove the geological storage capacity (2024-2027)</li> </ul>
5	Arthit	PTTEP	<ul style="list-style-type: none"> <li>• FEED, First injection will be on 2026</li> <li>• Expected to store up to 1 Mt-CO<sub>2</sub> during gas production at Arthit</li> </ul>
	A18		MTJA

Source: Ministry of Energy of Thailand

## CCS-related policy and regulatory framework

<p>CCS in Climate Change Policy (NDC)</p>	<ul style="list-style-type: none"> <li>• Unconditional 15.8% reduction of GHG emissions by 2030</li> <li>• Conditional commitment to a 43.% reduction of GHG emissions. Compared to BAU</li> <li>• NDC references to research and development of CCS technology for power plant and industrial production facilities</li> </ul>
<p>CCS-related Policy</p>	<p><b>Decision No. 896/2022/QD-TTg, “National Strategy on Climate Change (NSCC) for the period to 2050”</b></p> <ul style="list-style-type: none"> <li>• Research and application of CCS technology for factories.</li> </ul> <p><b>Decision No. 140/2020/NQ-CP, “The orientation of Vietnam’s National Energy Development Strategy for 2030, with a Vision to 2045”</b></p> <ul style="list-style-type: none"> <li>• The application of EOR technologies in the production of primary energy sources is recommended.</li> <li>• In reducing emissions in the energy sector, the report mentions the development of mechanisms and policies for the development of CO<sub>2</sub> capture and utilization.</li> </ul> <p><b>Decision No. 38/2020/QD-TTg, “List of high technologies prioritized for development investment and development promotion”</b></p> <ul style="list-style-type: none"> <li>• CCS technology is listed as prioritized high technology in the category of No.15 Environmental Energy</li> </ul>
<p>CCS-specific incentives</p>	<p>n.a</p>
<p>CCS-specific legal and regulatory framework</p>	<p>n.a</p>

# Vietnam: Key CCS Projects



- In 2011, Vietnam became the first country in Southeast Asia to successfully implement a project to increase oil recovery using CO<sub>2</sub> at Rang Dong field, Block 15-2, Cuu Long basin.

## EOR Project at Rang Dong field, Cuu Long basin

### CO<sub>2</sub>-EOR Huff n Puff Pilot Test in 2011

- Rang Dong field, in Block 15-2 of the Cuu Long basin from May 19 to June 6, 2011
- Achieved positive results with an increase in oil production from 950 to 1,500 barrels per day

### Joint study from 2013 to 2015

- On a design of inter well CO<sub>2</sub>-EOR pilot test at an oil field in Vietnam offshore from 2013 to 2015 in order to understand the applicability of CO<sub>2</sub>-EOR associated with CCS.
- The objectives of this study are to understand the CO<sub>2</sub> injectivity, vertical sweep and areal sweep efficiency, incremental oil production, injected CO<sub>2</sub> volume and cost/risks.

## JOGMEC concluded MOU with PetroVietnam to seek further collaboration study on CCS



Rough location of the study area  
(within Vietnamese territorial waters)

Source: AZEC Progress Report 2023  
<https://www.meti.go.jp/press/2023/12/20231218004/20231218004-3.pdf>

Discussions are underway for succeeding studies to actualize CCS project in Viet Nam.

# Way Forward



Most ASEAN countries have not yet established CCS-specific legal and regulatory frameworks. This shortcoming is due to common themes and shared challenges across the region, which include:

- Challenges in enacting national policies for emission reductions as a policy enablers for CCS/CCUS
- Limited development of CCS-specific law and regulation across the region.
- Uncertainty regarding the administration of CCS operations in some jurisdictions

Advancing CCS and CO<sub>2</sub> cross-border transport in ASEAN is a complex but essential task. To effectively approach this, we can consider the following strategic actions among others:

- Integration of CCS/CCUS technology in National Climate Policy and Long-term Energy Roadmap
- Formulation of dedicated regulation on CCS/CCUS including the MRV following the closure of the project
- Formulation of CCS-specific incentive policies
- Establishing a public database of storage-related seismic and well data
- Secure funding and investments, and establish a business model for the project
- International collaboration to facilitate technology transfer, attract investments, and provide models for regulatory frameworks.
- Given the necessity of transboundary transportation of CO<sub>2</sub>, the need for regulations and agreements among nations pertaining to carbon accounting, liabilities, and compliance with the London Protocol (where relevant) are also critical.





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# Thank You