



Asia CCUS Network Annual Report

2022 - 2023

The Asia CCUS Network provides a platform for policymakers, financial institutions, industry players, and academia to work together to ensure the successful development and deployment of carbon capture, utilisation, and storage.

On the initiative to promote carbon capture, utilisation, and storage (CCUS) and carbon recycling, the 14th East Asia Summit Energy Ministers Meeting in 2020 noted the importance of CCUS and carbon recycling in supporting the goals of decarbonisation, recovery, and economic growth.







VISION

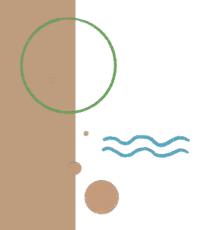
Through collaboration and cooperation on the development and deployment of CCUS in the Asia region, the Asia CCUS Network will contribute to the decarbonisation of the region.

The Asia CCUS Network also provides a platform for policymakers, financial institutions, industry players, and academia to work together to ensure the successful development and deployment of CCUS in the Asia region.

MISSION

The network's mission is to facilitate deployment of CCUS in the East Asia Summit (EAS) region through the following activities:

- Promote knowledge sharing by holding an annual forum, conferences, workshops, and meetings.
- Conduct research on technical, economic, and legal standards of CCUS in the EAS region.
- Hold capacity-building training workshops to bridge the knowledge gap on CCUS.





Second Asia CCUS Network Forum: CCUS Towards Carbon Neutrality Efforts Beyond 2050

30 September 2022



The Second Asia CCUS Network Forum was held in a hybrid format at the Tokyo Prince Hotel, Japan, on 30 September 2022. It was co-hosted by the Ministry of Economy, Trade and Industry (METI) of Japan and the Economic Research Institute for ASEAN and East Asia (ERIA). The meeting featured messages from Prof. Hidetoshi Nishimura, President of ERIA, jointly with Mr Nishimura Yasutoshi, Minister of Economy, Trade and Industry, and VIPs from member countries of the Asia CCUS Network, and was attended by about 70 people in person and about 600 online. The participants deepened the discussions towards constructing an Asia-wide network for CCUS, which will be key

to simultaneously achieving decarbonisation and economic growth. The forum featured keynote speeches emphasising the importance of technological development to reduce the cost of CCUS and the effectiveness of carbon markets in promoting its development. ERIA, the ACN Secretariat, reported on its activities, which included a knowledge-sharing conference, capacity-building training, and public calls for investigative research necessary to commence a CCS project. The ACN Advisory Group discussed launching a CCS pilot project in ASEAN, sharing the view that CCUS technology is essential for the Asian region, which is heavily dependent on thermal power generation. The group stated that it would closely watch the activities of ERIA and METI, which support the realisation of CCUS in Asia.







Sixth Asia CCUS Network Knowledge Sharing Conference: Leading Canadian Company Talks Climate Technology and Direct Air Capture Opportunities in Asia

31 January 2023

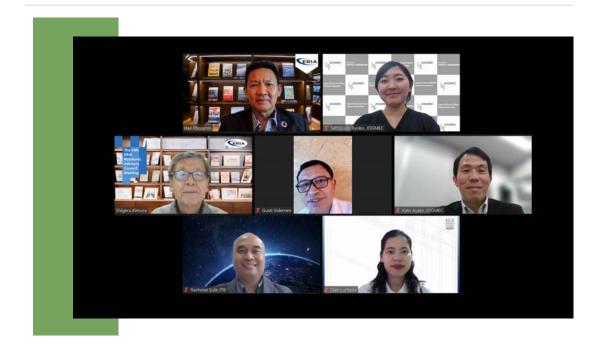


Canadian company Carbon Engineering is at the forefront of the commercialisation of direct air capture (DAC) technology, which has the potential to be a game-changer in the effort to combat climate change. At the Sixth Asia CCUS Network Knowledge Sharing Conference, Paul Kennedy, Vice President of International Business Development at Carbon Engineering, highlighted four key points that are essential in achieving carbon neutrality: regional cooperation, a range of decarbonisation solutions, availability of resources, and leveraging those resources to drive investment in

climate change solutions. Adam Baylin-Stern, Policy and Engagement Lead at Carbon Engineering, emphasised that DAC can be a valuable economic opportunity as a carbon removal technology, and he sees several opportunities for Asia to accelerate its net-zero transition through DAC technology, including excellent storage potential across the region, the availability of clean energy, the strength of channels to markets and customers, the abundance of highly skilled labour, and supportive policies and incentives. As countries in the region continue to pursue their emissions reduction goals, DAC presents a promising solution.

Seventh ACN Knowledge Sharing Conference: Japan's JOGMEC Shares Experience and Findings of Pioneering CCS Screening Methodology in Southeast Asia

16 February 2023



The Japan Organization for Metals and Energy Security (JOGMEC) shared the results of its ground-breaking study on CCS screening in Southeast Asia. Dr Ayato Kato, Director of JOGMEC's Overseas Exploration Division explained that this study is important to promote CCUS deployment, which requires uniform seismic and engineering data from a regional geological data set applying uniform criteria. The JOGMEC study of Southeast Asia was carried out from October 2021 until March 2022 using Neftex® Predictions by Halliburton as the database. Ms Setoguchi stipulated that 'this study is positioned on site screening' and that JOGMEC mapped the CCS potential by basin and formation to estimate the prospective storage resources of each formation. Using Neftex® Predictions, the evaluation was divided into Phase 1 as a regional scale screening and Phase 2 as a basin-scale assessment. JOGMEC's two-phase methodology indicates that CCS screening using uniform criteria for a wide area is possible. Mr Mohammad Rachmat Sule, Manager of the National Center of Excellence for CCS and CCUS – Bandung Institute of Technology (ITB), Indonesia – raised the need to consider geomechanics when discussing the injection of carbon dioxide (CO₂) into saline aquifers. Additionally, Mr Sule suggested that CO2 transportation be included as a criterion in similar future studies. Ms Setoguchi explained that the 'next step is a detailed study including using well and seismic data' in which her team has already started studying the Sarawak area in addition to updating their CCS screening methodology. On the critique regarding the use of the 'prospective storage resources' terminology in the evaluation, Mr Sule suggested that the term 'pore space' would be more fitted to represent JOGMEC's results.

Eighth ACN Knowledge Sharing Conference: Pertamina and JOGMEC Give In-Depth Look at Huff and Puff EOR Project to Promote Decarbonisation Tech in Asia

13 April 2023



Pertamina and JOGMEC presented the initial findings of their latest project on CO_2 huff and puff enhanced oil recovery (EOR) in the Jatibarang field in Indonesia. The event moderator, Mr I. Gusti Suarnaya Sidemen, Expert on CCS/CCUS, ERIA, stipulated that the CO_2 huff and puff method has existed since the 1960s, but that it has seen slow development due to 'the availability of easier and cheaper ways to produce resources'. Ms Merry Marteighianti, Vice President, Upstream Research and Tech Innovation, Pertamina, gave an overview of the motivation and objectives behind the Jatibarang field project, Indonesia's regulatory framework concerning CO_2 huff and puff, as well as

the results. Ms Marteighianti stipulated that there are two primary objectives behind their CO₂ huff and puff injection: (i) to incorporate CO₂ to boost petroleum recovery in the Jatibarang field while upholding Pertamina's decarbonisation target; and (ii) to validate the performance and response of the wells and reservoirs following a CO, injection, which will serve as an input in the development of field-scale EOR projects. Ms Deby Halinda, Expert Research and Tech Innovation, Pertamina, stated that CO. huff and puff will require further study 'which would be the pilot CO₂ injection' and would involve two wells that are then flooded to assess whether there is interference between the wells. From an operational perspective, Ms Halinda asserted that well integrity and pre-work are mandatory in addition to a pre-inspection check of pumping equipment. Mr Kazuaki Mikami, Reservoir Engineer and Deputy Director of Sub-Surface Division Hydrogen and the CCUS Department, JOGMEC, explained that there are several considerations to make before implementing CO, huff and puff, including lab experiments, good reservoir characterisations, careful design for production, monitoring, and having quality data. The topic of CO₂ leakage was frequently raised during the session, but Ms Halinda stated that the project did not have leakage. Instead, it had a high concentration of CO₂ for 2.5 days during the huffing stage.



Research Study



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The ACN Secretariat and Advisory Group members selected five research studies related to CCUS, particularly in ASEAN region. CCUS development is now considered a crucial technology to achieve clean energy transition targets. A deep understanding of CCUS from the technical, financial, and policy perspectives will be beneficial to accelerate its development. Five titles of the Asia CCUS Network Research Study, 2022–2023 will be developed by the Global CCS Institute (GCCSI) and the Research and Innovation Agency (BRIN), Indonesia. Each topic is outlined here:

1. Estimation of Basin-Scale CO₂ Storage in Indonesia

- Perform a geological storage assessment based on criteria developed specifically for Indonesian sedimentary basins and estimate the storage capacity available based on existing data, using the following methodology:
- · Identify sedimentary basins
- Review the characteristics of sedimentary basins
- Rank sedimentary basins qualitatively or quantitively in order of CO₂ storage suitability
- · Estimate storage capacity

2. Estimation of CO₂ Storage Potential in the ASEAN Region

- Create a targeted strategy for ${\rm CO_2}$ storage development in this region, focusing on potential CCS networks.
- Characterise storage prospects (onshore and offshore) for the development of storage appraisal programmes.

3. Establishment of Asia CCS/CCUS Value Chain as a Collective Framework in the ASEAN region

- Convene an ASEAN Storage Group and hold a series of in-person workshops to gather information on the current state of knowledge of geological CO₂ storage resources.
- Engage with a network of ASEAN regulators and policymakers through a series of workshops to inform a regulatory gap analysis and to assist in describing the potential institutional frameworks necessary to support CCUS hubs and networks.

4. Study on the Legal and Policy Framework for the Deployment of CCUS in the ASEAN region

- Identify the role of existing national legal and policy frameworks for supporting CCUS deployment.
- Identify and consider discrete policy, legal, and regulatory issues for CCS, including those specific to the region.
- Consider an appropriate legal and policy framework for countries in the ASEAN region

5. Study on a Financial Framework for the Deployment of CCUS in the ASEAN region

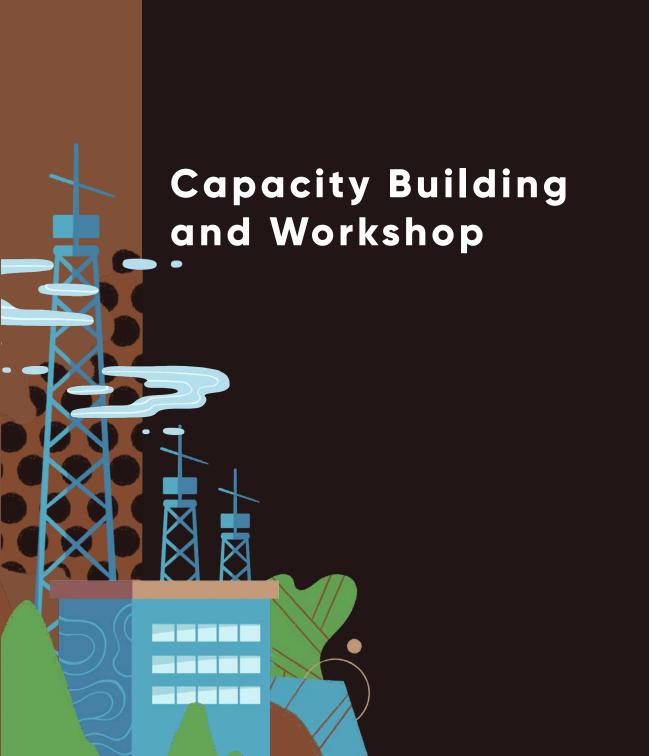
- Forecast the required investment for the deployment of CCS in Asia.
- Identify the roles of public and private finance for CCS projects.
- Identify the financial risks for private sector debt financing and equity investments in CCS projects.
- Understand the role that a CO_2 market price will have in the Asia and how this price will affect CCS projects.

Publications

Kimura, S., K. Shinchi, U. Coulmas, and A. Saimura A. (2022), Study on the Potential for the Promotion of Carbon Dioxide Capture, Utilisation, and Storage in ASEAN Countries Vol. II, ERIA Research Project Report 2021, No. 25.

Kimura, S., K. Shinchi, S. Kawagishi, and U. Coulmas (2020), Study on the Potential for the Promotion of Carbon Dioxide Capture, Utilisation, and Storage in ASEAN Countries: Current Situation and Future Perspectives, ERIA Research Project Report 2020, No. 21.





USGS-ACN Capacity Building and Training: Carbon dioxide Storage Resource Assessments in the ASEAN Region

23 June 2022

The United States Geological Survey (USGS) introduced its long-standing work on geological CO₂ sequestration (or storage) capacity assessments and is keen to establish partnerships with Asian countries for future geologic storage capacity assessment projects. Through the event, the USGS sought to connect with members of the ACN's extensive network interested in CO, storage and assessment to realise global climate targets. Dr Sean Brennan, Research Geologist, USGS Geology, Energy & Minerals Science Centre, identified three objectives behind the pursuit of collaborative projects in Asia: (i) identify countries, especially emerging economies, seeking to estimate their CO, storage resources to meet climate goals; (ii) work with multilateral organisations and participate in international initiatives to help facilitate CO₂ assessments through funding or networks; and (iii) generate or facilitate CO₂ storage assessments on a global scale, with a focus on emerging economies. Dr Peter Warwick, Science Coordinator for Carbon Sequestration and Energy Storage, Energy Resources Program, USGS, set the scene concerning the required data types for geologic CO₂ storage evaluation. Different types of data are necessary when starting a storage project, but a general geological map acts as the basic underlying base data. Dr Madalyn Blondes, Research Geologist, USGS Geology, Energy & Minerals Science Centre, provided an overview of CO₂ mineralisation of subsurface rocks and surface mine waste based on numerous studies from the United States (US). Pilot projects have thus far shown promising results of rapid mineralisation of CO, in basalts and ultramafic rocks, where trapped CO, undergoes a reaction to become carbonate mineral. Dr Kevin Kroeger, Supervisory Research Chemist Lead, Environmental Geoscience Group, USGS, shared his insights on CO, mineralisation and carbon sequestration in coastal wetlands. This natural climate solution is of special

relevance to Indonesia due to the crucial role of mangrove forests in this technology. Dr Warwick expressed the readiness of the USGS to collaborate on projects for ${\rm CO_2}$ underground storage, mineralisation, and wetland restoration, and encouraged interested parties to reach out to his team.

ACN Supported METI-JOGMEC-IETA Joint Workshop: Global Carbon Market and CCS – Towards ASEAN Decarbonisation

25-26 January 2023

In collaboration with METI and the International Emissions Trading Association (IETA), JOGMEC held a workshop on carbon credits and the creation of environmental value through CCS, with the aim of facilitating CCS deployment through the appropriate use of carbon markets. ACN supported the success of this workshop.

To facilitate CCS project development and contribute to decarbonisation, it is necessary to foster a common understanding of the potential of CCS in climate change mitigation as well as issues such as emission reductions, accounting methodologies, and risk management. To that end, it is important to learn from precedents and participate in international discussions.

Additionally, knowledge sharing on good practices in using the carbon market will be key to creating high-quality carbon credits, including the evaluation of co-benefits other than mitigation impacts.

Site Visit



JCCS Tomakomai CCS Project

28 September 2022



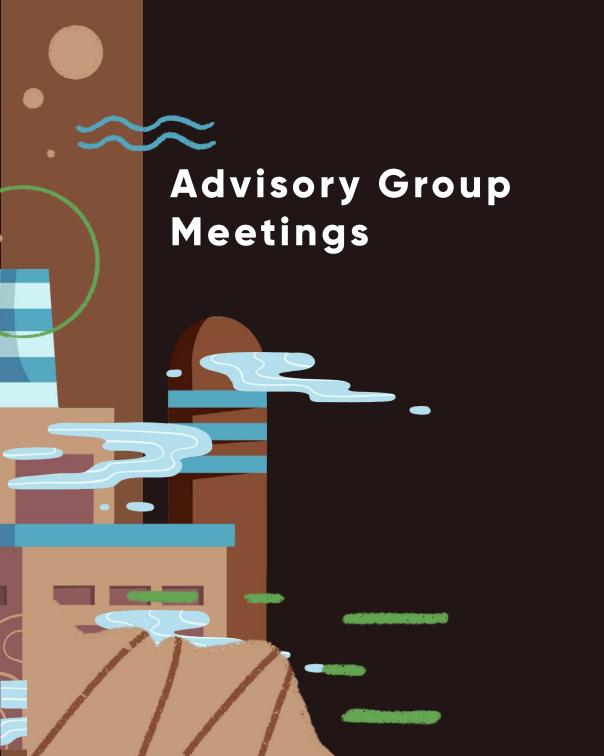
The series of ACN events during 28–30 September 2022 in Japan included a site visit to the Japan CCS Co., Ltd. (JCCS) Tomakomai CCS Project in Hokkaido, the Advisory Group Meeting, and the Second ACN Forum in Tokyo. Members of ACN, ERIA, and The Institute of Energy Economics, Japan (IEEJ) visited the first large-scale CCS demonstration project in Japan, undertaken by METI, the New Energy and Industrial Technology Development Organization (NEDO), and JCCS. From fiscal year (FY) 2012 to FY2015, demonstration facilities were built, injections at a scale of 100,000 tonnes per year commenced in April 2016, and the initial target of 300,000 tonnes of cumulative injections was reached on 22 November 2019











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The Advisory Group counsels the ACN Secretariat on a voluntary basis on capacity building, suggestions for CCUS studies, exchange visits to pilot projects, and the formulation of the CCUS deployment strategy. The secretariat assigns members of the group as follows:

Group Composition

- ASEAN 10 countries and Australia, India, Japan, and the US to represent the members
- Experts at the request of the secretariat, from India, JOGMEC, and the GCCSI

Roles

- Provide substantial support to the secretariat
- Attend regular secretariat meetings (three or four times per year)
- Assessment and approval of the annual activity plan submitted by the ACN
 Secretariat
 - Support to preparation of the contents of the network's annual forum
 - Share opinions and experiences amongst the Advisory Group members for the development of CCUS in their countries

Advisory group meetings were held on 10 June 2022 and 27 March 2023. They discussed the network's progress and upcoming knowledge sharing, capacity building, and workshops; website development; and work plans.

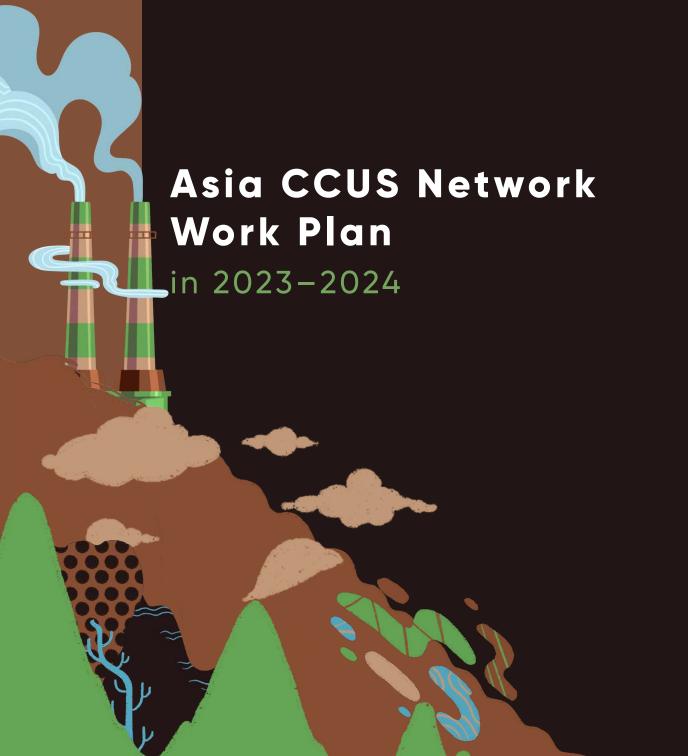
Asia CCUS Network Newsletter



Published Newsletter list

- Asia CCUS Network Newsletter Volume I/2022 January 2022
- Asia CCUS Network Newsletter Volume II/2022 April 2022
- Asia CCUS Network Newsletter Volume III/2022 July 2022
- Asia CCUS Network Newsletter Volume IV/2022 November 2022
- Asia CCUS Network Newsletter Volume V/2023 January 2023
- Asia CCUS Network Newsletter Volume VI/2023 May 2023
- Asia CCUS Network Newsletter Volume VII/2023 July 2023





The annual work plan highlights knowledge sharing, research studies, and capacity building. The activities will help formulate policy to support CCUS development and deployment.

Activities 2023-2024

Component 1: Annual Work Plan Forum and Knowledge Sharing			
1.1	Third Asia CCUS Network Forum	27 September 2023 in	
1.2	ACN Knowledge-sharing conference (KSC):	Hiroshima city	
1,2	9 th ACN KSC: Australia's Northern Territory's CCS Hub Project to Facilitate Carbon Reduction Initiatives in Asia	30 June 2023	
	10 th ACN KSC: The Quest for Less CO ₂ : Lessons from Shell's Quest CCS Project	12 September 2023	
	11 th – 15 th ACN Knowledge-sharing conference will be held	5–6 times per year	
Component 2: Research Studies			
2.1	Feasibility study on initiation of a CCS pilot project in ASEAN region including financing framework	Open tender	
2.2	Publishing five research reports (one BRIN and four GCCSI)	End of 2023	
Component 3: Capacity Building and Workshop			
3.1	Capacity building and training on carbon dioxide storage resource assessments in the ASEAN region Introduction to geologic carbon dioxide storage by U.S. Geological Survey (USGS)	11–15 September 2023	
3.2	Workshop on the $\rm CO_2$ -EOR guideline prepared by JOGMEC and a financial framework.	18 June 2023	
	Upcoming one – two workshops will be held	To be determined	

Activities 2023-2024

Component 4: Site Visit			
4.1	Osaki Coolgen CCS Project Hiroshima, Japan operated by JGC Holdings Corporation	28 September 2023	
Component 5: Advisory Group			
5.1	Advisory group meetings	3-4 times/year	
Component 6: Website			
6.1	New ACN website will be released	October 2023	
6.2	Maintenance and update of the Website	Monthly	
6.3	Release of quarterly newsletters: Volume VIII-X	4 times per year	

Note: ASEAN = Association of Southeast Asian Nations; CO2 = carbon dioxide; CCS = carbon capture and storage; CCUS = carbon capture, utilisation, and storage; JCCS = Japan CCS Co., Ltd.

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Members and supporting members of the Asia CCUS Network share its vision and support its mission. Any activities amongst network members and supporting members are to be conducted on a voluntary basis and not obligatory.

Members and supporting members are encouraged to share their experience in and knowledge on CCUS development — either policy formulation or practical pilot projects. The ACN secretariat will conduct research on CCUS, with technical assistance from the supporting members.

Advisory Members (13 country members)

Ms Jocelyn Taylor Manager, International CCUS
Policy, Department of Climate Change, Energy, the
Environment and Water (DCCEEW). Australia

Mr Norihiko Saeki Director for CCUS Policy, Agency for Natural Resources (ANRE), Ministry of Economy, Trade and Industry of Japan (METI)

Mr Jesus Tamang *Director, Energy Policy and Planning Bureau, Department of Energy, Philippines*

Mr Hoan Tam Deputy Head, Climate Change and Green Growth Office, Ministry of Industry and Trade, Viet Nam

Mr Victor Jona Director, Thermal and Combustion Energy Department, Ministry of Mines and Energy, Cambodia

TBC, Ministry of Energy and Mines, Lao People's Democratic Republic (Lao PDR)

Mr Brian Tham Senior Analyst, External Relations, Energy Market Authority, Singapore **Dr Muhammad Wafid** Expert Staff, Environment and Spatial Planning, Ministry of Energy and Mineral Resources, Indonesia

Mr Fahrur Rozi Firmansyah Inspector, Oil and Gas, Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources, Indonesia

Mr Zaharin Zulkifli Senior Assistant Director, Planning and Strategic Communication, Energy Commission, Malaysia

Mr Nopasit Chaiwanakupt Vice President, International Asset Group, PTT Exploration and Production Public Company Limited, Thailand

Dr Ranjith Krishna Pai Director and Scientist 'E', Department of Science and Technology, Ministry of Science and Technology, India

Ms Soe Soe Nyein Deputy Director, Oil and Gas Planning Department, Ministry of Electricity and Energy, Myanmar

Mr Izma Rahem Zukhairri Abdul Zani Head, International Affairs Unit, Department of Energy, Prime Minister's Office, Brunei Darussalam

Mr Adam Wong Director of the Strategic Engagement Division, Office of Fossil Energy and Carbon Management, Department of Energy, United State of America

Supporting Members (203 members)

Academia and Research Institutes (47 members)

Finance - Banking (15 members)

Private - Public (215 members)

Regional and International Organisations (25 members)

Become a Supporting Member

If you represent a public/private company, academic institution, financial institution/ commercial bank, or regional/international organisation and your organisation or institution shares the ACN's vision and supports its mission, please fill out the <u>form</u> if you are interested in becoming a supporting member.







Asia CCUS Network Secretariat



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As the ACN Secretariat, ERIA prepares and implements an annual activity plan including:

- Hold annual the Asia Asia CCUS Network forum and CCUS conferences, workshops, and meetings.
- Selecting research studies and successful models that can be replicated or expanded to EAS member countries.
- · Conduct capacity-building training sessions.

The secretariat prepares a 3-year rolling plan of activities, which embraces the basic principles of:

- Knowledge-sharing technologies, projects, business models, investment incentive options, policies, strategies, amongst others
- Research studies: mapping, feasibility studies, finance, amongst others
- Capacity-building training sessions: technologies, regulations, business models, amongst others
- Establishment of a one-stop knowledge centre in the form of the ACN website to provide up-to-date information on CCUS development in terms of technologies, business models, development, and deployment of CCUS
- Forming of partnerships with regional and international organisations, and initiatives related to CCUS activities



Asia CCUS Network Website

www.asiaccusnetwork-eria.org

Asia CCUS Network Secretariat

Economic Research Institute for ASEAN and East Asia

Sentral Senayan II, 6th Floor, Jl. Asia Afrika No. 8, Jakarta 10270 Phone: (62-21) 57974460 E-mail: energy@eria.org The Association of Southeast Asian Nations (ASEAN) and the East Asia Summit (EAS) region are facing tremendous challenges regarding the future energy landscape and how the energy transition will embrace a new architecture – including sound policies and technologies to ensure energy access with affordability, energy security, and energy sustainability.

The Asia CCUS Network is an initiative based in Jakarta, Indonesia that facilitate the partnership to support knowledge and experience sharing and research activities related to carbon capture, utilisation, and storage (CCUS) and carbon recycling in supporting the goals of decarbonisation and economic growth in the Asia region.

