

3-1 APEC Symposium on Pursuing Decarbonization of Fossil Fuels

EGCFE 2024 Meeting
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Yoshiaki IMAIZUMI, Deputy General Manager, APERC



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Objectives and Outcomes

Objectives

- Follow up to APEC Symposium on the [Holistic Approach of Decarbonization towards Carbon Neutrality](#) held online in August 2021.
- First sectoral symposium focusing on the [decarbonization of fossil fuels, including hydrogen, ammonia, CCUS, and DAC](#).

Outcomes

- 11 October 2023 – Symposium (in-person)
- 12 October 2023 – Site visit (Kawasaki Heavy Industries, Kobe Steel, Mitsubishi Heavy Industries)
- Venue: Kobe Portopia Hotel, Hyogo, Japan
- 61 Participants from 16 economies (Female participants 36%)

(Australia, Canada, Chile, China, Indonesia, Japan, Korea, Malaysia, New Zealand, Papua New Guinea, The Philippines, Portugal, Chinese Taipei, Thailand, The United States, Viet Nam)

Day 1 Agenda

- 9:00** Session 1: Opening & Keynote speech
- 9:20** Session 2: Hydrogen (production, transportation, and utilization)
- 11:35** Session 3: Fuel Ammonia (production, generation, and shipping)
- 14:10** Session 4: Carbon Capture, Utilization, and Storage
(current status in Australia, China, Japan, and ASEAN)
- 16:15** Session 5: Direct Air Capture (R&D and commercialization)
- 17:15** Closing remarks

Session 1: Opening Remarks and Keynote Speech

Dr Kazutomo Irie, President of Asia Pacific Energy Research Centre (APERC) –Opening Remarks

- Welcomed participants and explained the [background & objectives of the Symposium](#).
- Emphasized the importance of the [energy transition and decarbonization of fossil fuels and sharing knowledge and experiences](#) among APEC economies.

Ms Reiko Eda, Director for Natural Resources and Energy Research, METI Japan –Keynote speech

- Highlighted the common goals of net zero emissions through [various pathways according to circumstances of each economy](#) and the need to utilize [all kinds of technologies energy sources](#).
- Emphasized Japan's plan to [invest approx. US\\$ 1 trillion in green transformation over the next 10 years](#) in both public and private sectors and [contribute to decarbonization of Asian economies under the Asia Zero Emissions Community \(AZEC\) platform](#).

Session 2: Hydrogen (production, transportation, and utilization)

Mr Alex Santander Guerra (Ministry of Energy, Chile) –Production 1

- Explained the [Green Hydrogen Action Plan 2023~2030](#). With its abundant renewable resources Chile positions itself as [future green hydrogen exporter](#).

Mr Awadh Asyraf Bin Supri (Gentari Hydrogen, Malaysia) –Production 2

- Gentari, [the clean energy solutions arm of PETRONAS](#), focuses on clean energy with a [global target of renewable energy \(30-40GW\) and Hydrogen \(up to 1.2 million ton\) as well as Green Mobility \(10% market share in select markets\)](#) by 2030.

Mr Yuji Chishima (Chiyoda Corporation, Japan) –Transportation 1

- The major advantage of using Methylcyclohexane (MCH) as hydrogen carrier is that [existing infrastructure and logistic facilities](#) can be utilized.

Session 2: Hydrogen (continued)

Mr Shintaro Onishi (Kawasaki Heavy Industries (KHI), Japan) –Transportation 2

- KHI focuses on using [liquefied hydrogen as a hydrogen transportation carrier](#) and has a liquefied hydrogen supply chain demonstration project between Australia and Japan.

Dr Amgad Elgowainy (Argonne National Laboratory, the US) -Utilization

- Argonne's hydrogen [carbon footprint assessment model](#) finds out that hydrogen produced from electrolysis using renewable electricity has the lowest carbon intensity from well-to-gate.
- Results from the economic evaluation model suggest that for the [hydrogen applications to be competitive](#), hydrogen supply cost need to be below \$1~2/kg-H₂.

Q&A and Discussions

- Utilization of [existing infrastructure](#) is important to bring down hydrogen supply costs.
- [Government support at the early stage](#) is necessary to [scale up the market](#).
- Although there is no [price index](#) for hydrogen and synthetic fuels, there are some players working on price index development.

Session 3: Fuel Ammonia (production, generation, and shipping)

Mr Yoshikazu Kobayashi (The Institute of Energy Economics, Japan) -Production

- Low carbon ammonia from natural gas is likely to be **more cost competitive** than ammonia from electrolyzed hydrogen. Lowering carbon intensity on a well-to-gate basis is the major challenge.

Dr Najib Rahman Sabory (JERA Co., Inc., Japan) –Fuel Ammonia for Power Generation

- JERA aims to commence 20% co-firing within the fiscal year 2030, and 50% co-firing after 2030.
- **Plans to apply its expertise of ammonia utilization aboard** and partners with foreign firms in Bangladesh, Malaysia, the Philippines, Thailand, and Indonesia.

Mr Sergio Alda (European Maritime Safety Agency, Portugal) -Ammonia as Fuel in Shipping

- The International shipping industry would need substantially reducing its GHG emissions to achieve net zero by or around 2050 and **green ammonia has potential as a zero-carbon fuel for maritime.**

Session 3: Fuel Ammonia (continued)

Q&A and Discussions

- Ammonia-co-firing has **low technological risks** compared to CCS at coal-fired power plants. Japan will not be able to find sufficient domestic storage capacity and **utilizing storage abroad** may be an option
- **Ammonia will be used soon** because it is more technologically matured with existing infrastructure. **In the long run, other hydrogen carriers** could enjoy the benefits of economies of scale and learning curve effect as their production will grow.

Session 4: CCUS (current status in Australia, China, Japan, and ASEAN)

Dr Kenta Asahina (METI, Japan) -CCUS in Japan

- Japan published its [annual storage capacity target of 120 to 240 million tons by 2050](#) and need to start its first commercial CCS operation by 2030 to find enough storage capacity and scale up the operation. Japan has already selected [seven CCS projects](#) as potential commercialized projects.

Dr Matthias Raab (CO2CRC, Australia) -CCUS in Australia

- Australian upstream operations have reached a crossover point where [the cost of emitting CO2 exceeds the cost of CCS](#), stimulated by several factors, including 2050 net-zero targets set by most companies. There are [no real technical barriers to CCS operation](#) in Australia.

Prof Jiutian Zhang (Beijing Normal University, China) -CCUS in China

- CCUS is a very [important decarbonization solution for China's energy transition and achievement of its carbon neutrality goal before 2060](#) and will play an important role in keeping the power system at zero emission as well as for the industry sector to realize carbon dioxide removal.

Session 4: CCUS (continued)

Dr Usman Pasarai (BRIN, Indonesia) -CCUS in ASEAN

- CCUS will play a **critical role** in achieving carbon neutrality in Southeast Asia (SEA). CO2 capture in SEA will have to reach 35 million tons in 2030 and exceed 200 million tons in 2050 to achieve Paris Agreement.
- Indonesia is an active promoter of CCS in SEA. **Most of 15 CCUS initiatives in Indonesia at varied development stages will be on stream before 2030.**

Q&A and Discussions

- **Technological development** is needed to reduce costs further, particularly in the carbon-capturing process. Financing will be a major challenge because few CCS projects have been conducted in Asia. **Close dialogue and transparent information sharing** with the local community and the **government's support** are necessary.
- It was agreed that CCUS **collaboration in APEC** is essential. Sharing best practices in safety practices in operation, legal and regulatory framework to incentivize business, and intergovernmental dialogue and agreement for international CCS operations will facilitate CCS projects in the APEC region.

Session 5: Direct Air Capture (R&D and commercialization)

Prof Kenji Yamaji (RITE, Japan) -R&D for DAC in Japan

- Realizing [low-cost and high-efficiency DAC system](#) should be given a high priority in their initiative. [Various new technologies](#) are also developed such as synthetic fuel to bring additional values to DAC.

Mr Adam Baylin-Stern (Carbon Engineering, Canada) -R&D/commercialization for DAC in North America

- When [a large-scale project](#) under construction in West Texas by Carbon Engineering is expected to be the largest DAC project in the world.

Q&A and Discussions

- Importance of [policy framework](#), e.g. incentive and credits trading, [life cycle CO2 emissions](#) including capital goods, and [downstream pathways of utilization and storage](#) were discussed.

Evaluation Survey

Survey Statements	Strongly Agree	Agree	Disagree	No answer	Total
➤ The symposium improved your understanding of decarbonization of fossil fuels.	18	7	0	1	26
➤ The symposium was a good opportunity to provide you with new insights and awareness about decarbonization of fossil fuels-related activities.	16	9	0	1	26
➤ The symposium was a good foundation for future international cooperation and discussion among APEC economies regarding decarbonization of fossil fuels.	17	8	0	1	26
➤ The symposium was effective in sharing successful expertise, best practices, and knowledge.	16	9	0	1	26
➤ The symposium included diverse viewpoints across economies and professions (government, private sector, academia).	14	11	0	1	26
➤ The time allotted for the symposium was sufficient.	15	7	3	1	26
➤ Will you apply the project's content and knowledge gained at your workplace?	9	15	0	2	26
➤ The content was well organized and easy to follow.	15	10	0	1	26
➤ The agenda items and topics covered were relevant.	16	9	0	1	26
➤ The symposium achieved its intended objectives.	15	10	0	1	26
➤ The objectives of the symposium were clearly defined.	19	7	0	0	26

Next Step

➤ 3rd Carbon Neutrality Sectoral Symposium

APEC symposium on “Bioenergy”

Dates: December 2024

Venue: Thailand

Co-Organizer: Ministry of Energy, Thailand

Date	Topic
August 2021	Symposium on “Holistic Approach of Decarbonization towards Carbon Neutrality”
October 2023	1st Sectoral Symposium on "Pursuing Decarbonization of Fossil Fuels"
January 2024	2nd Sectoral Symposium on "Promoting Energy Efficiency and Energy Management Systems"



Thank you.

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