



Utilisation of Coal Resources in ASEAN towards Energy Transition

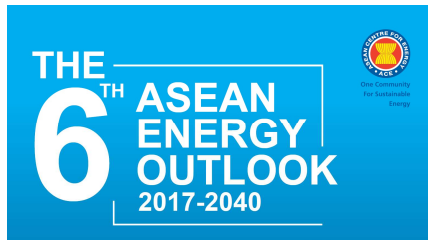
The 31st "Clean Coal Day in Japan" International Symposium (2022)

5 September 2022



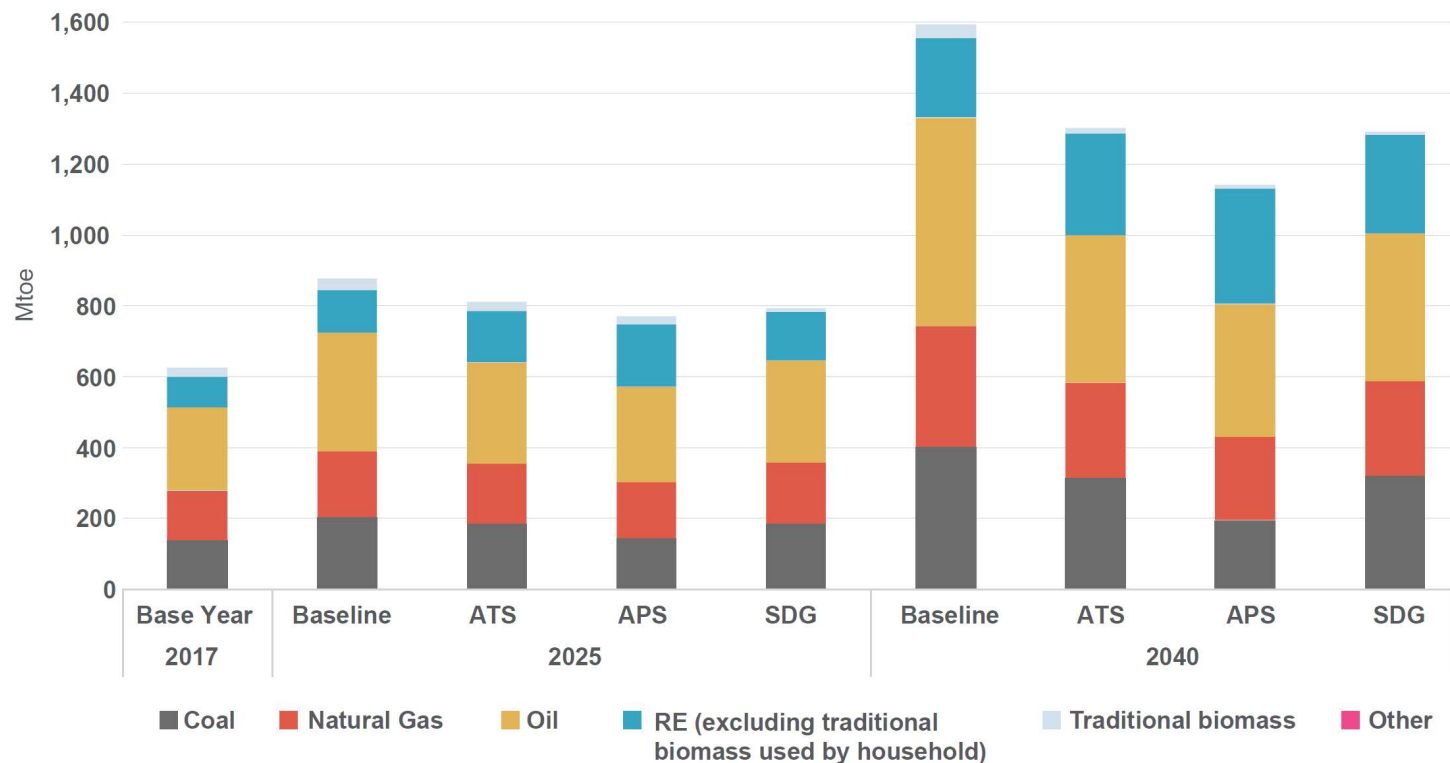
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Key choices determine the future ASEAN energy landscape



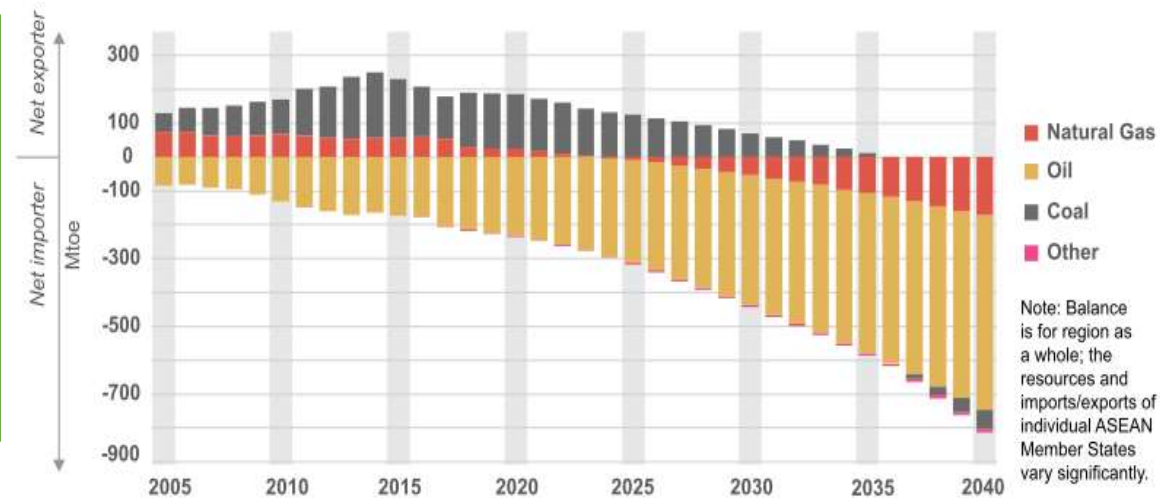
- Baseline Scenario**
Energy growth kept at constant level as of last historical year
- AMS Targets Scenario (ATS)**
Achievement of ASEAN official national energy targets
- APAEC Targets Scenario (APS)**
Achievement of APAEC's aspirational regional targets on RE and EI
- Sustainable Development Goals (SDG) Scenario**
Sustainable Development Goals (SDG) Scenario

ASEAN Total Primary Energy Supply across Scenarios



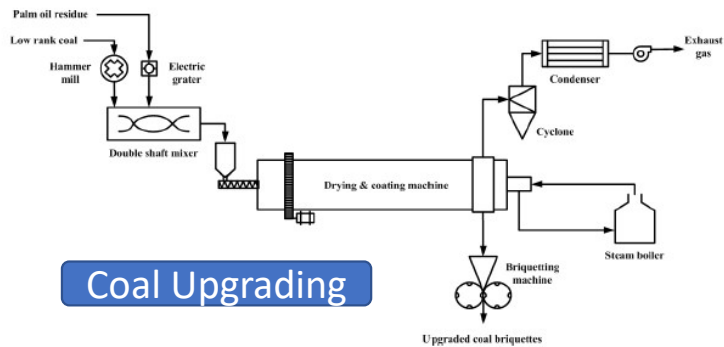
Coal and Energy Security in the Region amid Global Trend

- ❑ Energy Security: The uninterrupted availability of energy sources at an affordable price (IEA)
- ❑ Regional demand in primary energy in 2040 is expected to be **2.5 times higher** than the 2017 level
- ❑ Coal comprises **22.1%** of TPES in **2017** and projected to reach **25.5%** in **2040** (Baseline Scenario of AEO6).
- ❑ Demand-supply imbalance affecting global coal price, affecting affordability and harming energy security.



- ❑ **Globally, coal demand is set to return to its all-time high in 2022** (IEA).
- ❑ ASEAN is already a net importer of Oil. Without significant discoveries and exploitation of domestic resources, ASEAN is projected to become net-importer of gas starting 2025 (Baseline Scenario of AEO6).
- ❑ In term of resources, **regional coal production can secure its energy demand up to 2035**.

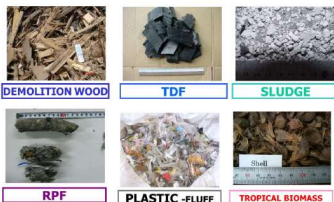
Variety of Current and Planned CCT technology in AMS



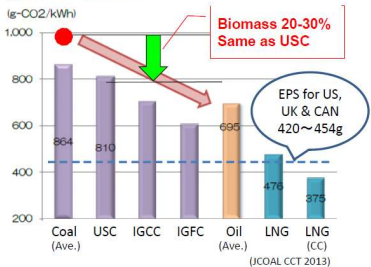
Coal Upgrading

Co-combustion with Biomass

Many kinds of biomass & waste fuels are used in CFB

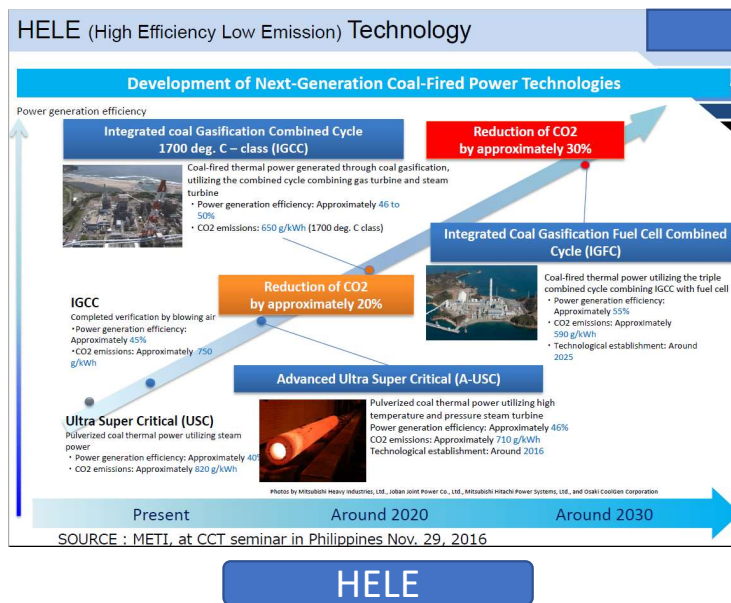


Biomass is no CO₂ generation fuel. 20-30% Biomass co-firing is the same CO₂ generation of USC.

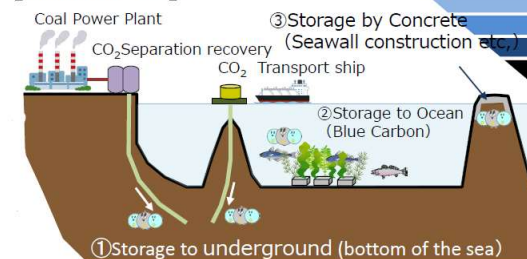


A large amount of agriculture waste etc. are available for Biomass Energy.

Coal – Biomass Cofiring



【Method of CCS】



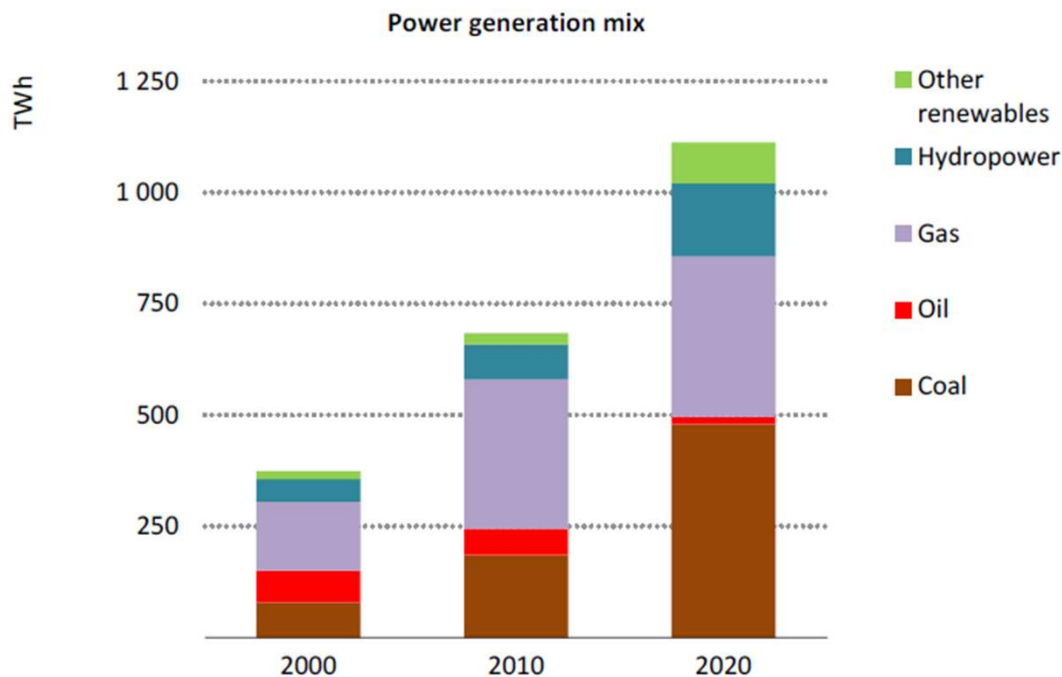
【Example of using CO₂】



- EOR Expanding
- Methanation
- Artificial photosynthesis

CCU/S

Power Generation in ASEAN countries

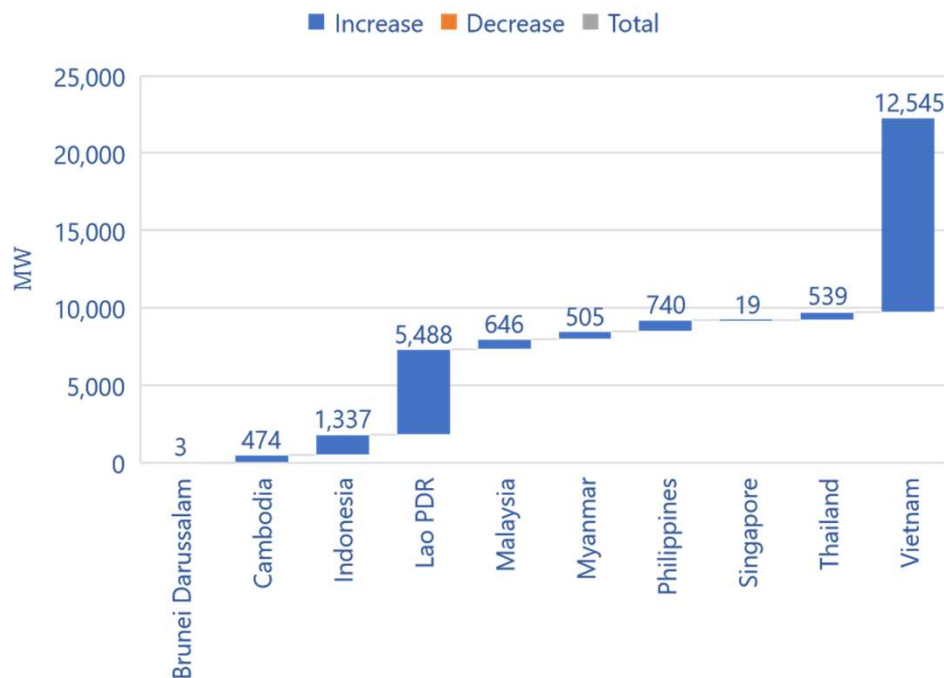


- In the power sector, **coal alone has contributed around 42%** of the total electricity production in 2019.
- **Minimum additional generation** can be seen in 2020, as the region faces a pandemic.
- **Surpassing natural gas**, coal plays a vital role in the ASEAN power sector.
- Without any intervention in achieving renewable energy and energy efficiency targets, **reliance on coal will be inevitable**.
- As the demand for electricity increases, **supply diversification is needed** to ease the burden of coal to fulfil the domestic market.

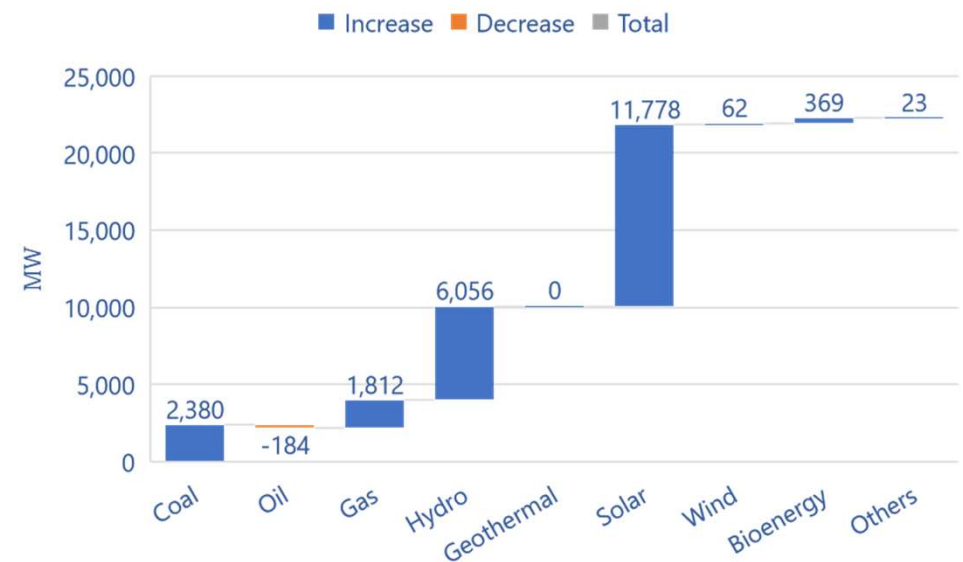
Power Sector in 2020, pandemic hits

- Approximately 22 GW of capacity was added in 2020: about **82% of the ASEAN new capacity in 2020 was renewable**.

Additional ASEAN Installed Power Capacity in 2020, compared to 2019, by country

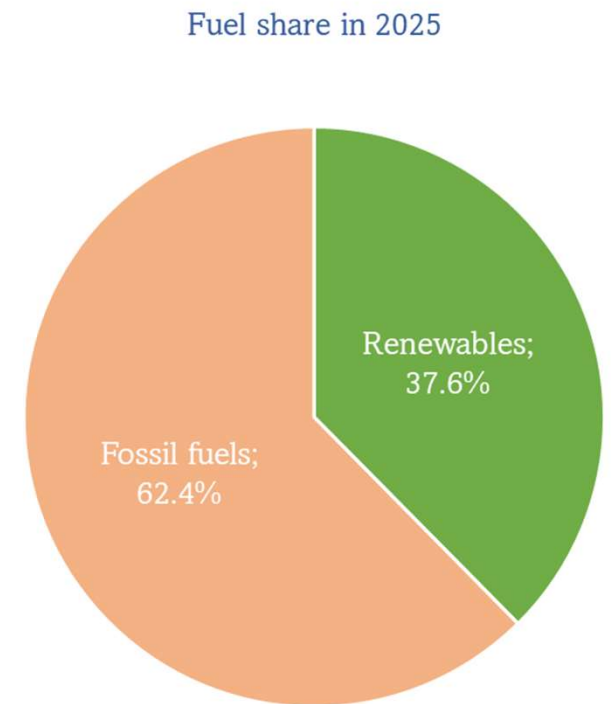
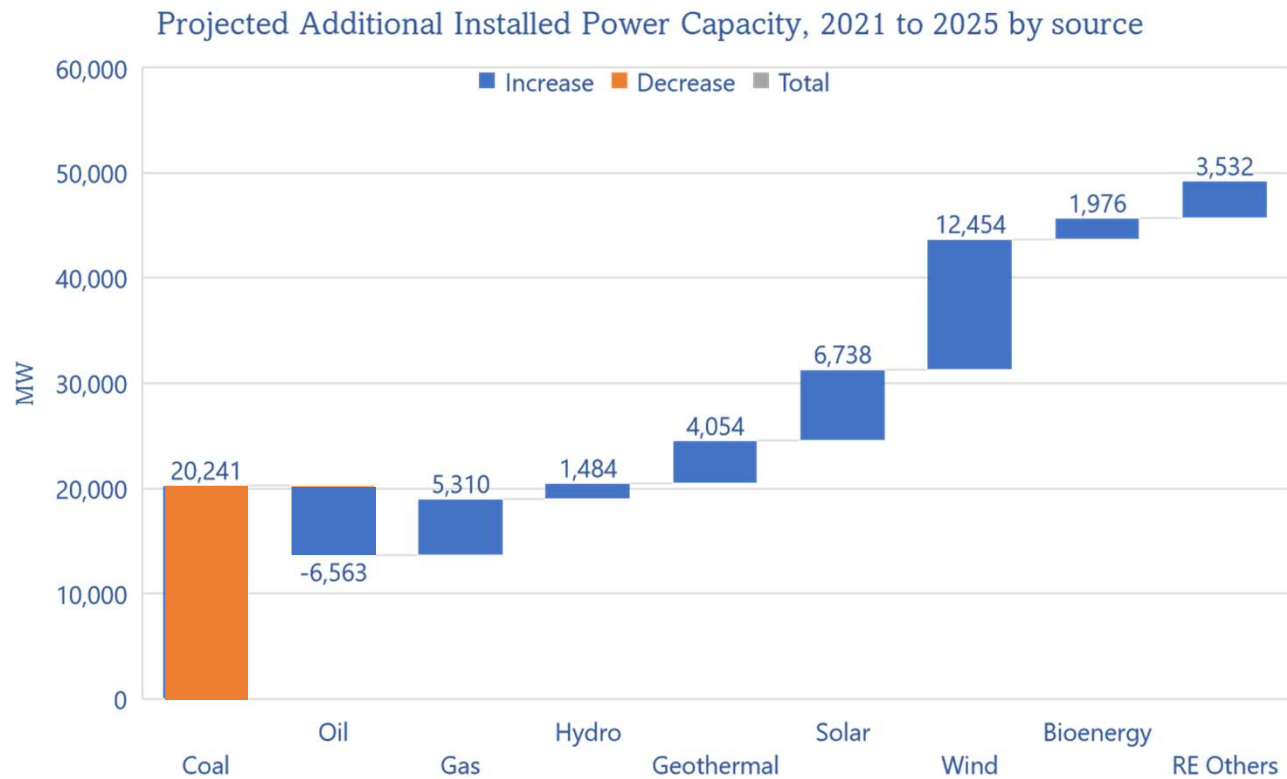


Additional ASEAN Installed Power Capacity in 2020, compared to 2019, by source



Power Sector towards 2025

- Eager for energy transition, more than 60% of the newly installed capacity up to 2025 will be coming from renewables.



Challenges on Coal Existence

ASEAN Power Generation – by fuels

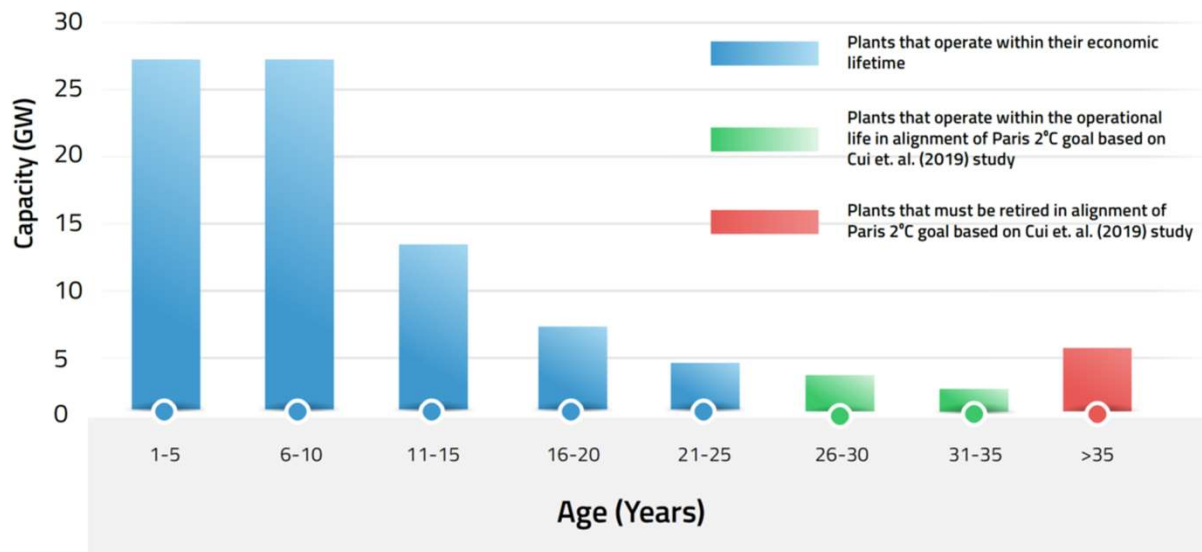


Figure 1. Age of ASEAN Coal Fleet (Source: AEDS)

- ❑ ASEAN region homes the youngest coal power plants in the world. The **average plant age of the ASEAN coal fleet is about 12 years**. A partial or complete shutdown will give financial challenges to plant owners/investors and the utility companies who signed construction and operation contracts.
- ❑ The energy security and reliability of the power system would be a huge challenge for the countries and the region.

Current updates of climate issues and national commitments at COP26

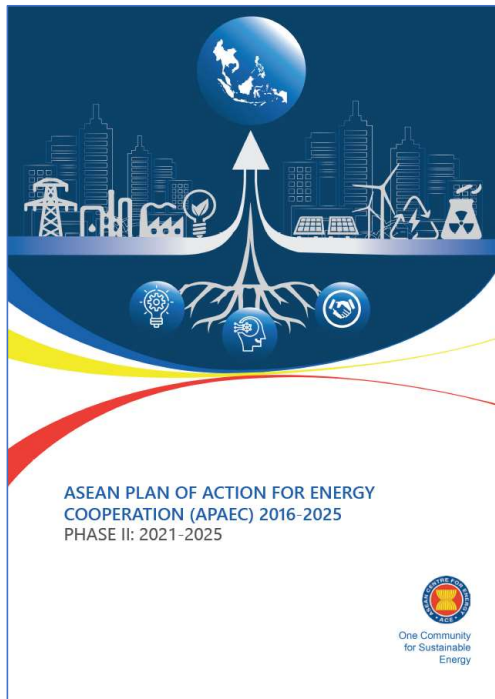
Country Name	Coal phase-out	Methane reduction	Interconnected green grid	Product efficiency	Net Zero target
Brunei	Yes	No	No	No	2050
Cambodia	No	Yes	Yes	No	2050
Indonesia	Yes (partial)	Yes	No	Yes	2060
Lao PDR	No	No	No	No	2050
Malaysia	No	No	No	No	2050
Myanmar	No	No	Yes	No	2050
Philippines	Yes (partial)	Yes	No	No	No target set
Singapore	Yes	Yes	No	No	2 nd half of the century
Thailand	No	No	No	No	2065
Vietnam	Yes	Yes	No	No	2050

Note: (as of November 17, 2021) and updated for Cambodia based on https://unfccc.int/sites/default/files/resource/KHM_LTS_Dec2021.pdf (Accessed on June 13, 2022)
 Source: Extracted from R. Safrina (2021) Available from <https://theaseanpost.com/article/cop26-aseans-commitment-energy-sector> (Accessed on June 6, 2022)

Role of CCUS in Low-Carbon Development in ASEAN

- **Supporting ASEAN to reach the net-zero target.** The majority of the AMS still rely heavily on fossil fuels to meet their energy demand. Though the AMS have made commitments to reduce their use of fossil fuels, the process will take many years. The AMS have no choice but to continue using fossil fuels while slowly replacing them with cleaner technologies. This transitioning process could be eased by deploying CCUS, thus helping the ASEAN to reach its net-zero target.
- **Contributing to ASEAN energy security and economy.** The deployment of CCUS will allow the existing power plants to continue operating with significantly reduced emissions. This will help ensure energy security in the region, as well as job opportunities for people working in the fossil fuel sectors. In addition, CCUS will also help decarbonise heavy industries like cement and steel, and create new economic opportunities for the AMS.
- **Supporting blue hydrogen development.** The region is also examining how hydrogen technology could be used to decarbonise energy systems. A recent study from the ASEAN Centre for Energy (ACE) on hydrogen suggested that the ASEAN region ought to develop a roadmap for hydrogen development. One of key routes would be to shift from the production of grey hydrogen to the production of blue hydrogen by utilising CCS or CCUS facilities to capture the emitted CO₂ from the steam methane reforming (SMR) process or coal gasification technique.

ASEAN Directives for CCT and CCUS



- ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 Phase 2: 2021-2025
- Theme: “Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All.”
- Sub-theme: “Accelerating Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation.”
- Programme Area No. 3 Coal & Clean Coal Technology (CCT)
- Key Strategy: To optimise the role of clean coal technology in facilitating the transition towards sustainable and lower emission development.
 - OBS 1. Promote the Role of Clean Coal Technology (CCT) and Carbon Capture Utilisation and Storage (CCUS) towards Energy Transition and Low Carbon Economy
 - OBS 2. Conduct Strategic Outreach to Advance Regional Actions to enhance Public Awareness and Image of CCT
 - OBS 3. Facilitate Investment, Innovation and Partnership on CCT through the ASEAN Coal Business Roundtable and Conference
 - OBS 4. Advance CCT Research, Development, and Innovation



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Published reports on coal from 2020-2022



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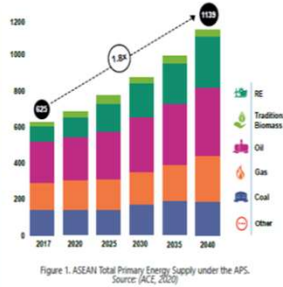
The New Role of Coal Fired Power Plant in the Era of Energy Transition

Iqlima Fuqohar*, Kazuyuki Murakami*, Masahiro Ozawa*, M. Rizki Kresnawati*, M. Oktada Hilmar*, Nadhilah Shani*, Sandy Fajriah*, Silvira Ayu Rosalia*, Tharinya Supasa*, Yamada Fumiko*, Yudiandra Yuwono*



Coal will still play a big part through the effort of the energy transition in ASEAN. However, changes are needed to ensure that coal utilisation will not impair ASEAN's energy security and deter the region's effort in achieving a cleaner and more sustainable energy sector in the future.

- ASEAN is aiming 23% RE share by 2025, it is projected that achieving the target will not reduce fossil fuel significantly.
- ASEAN member states are adopting more policies to improve the situation on coal utilisation.
- Success stories from other countries and regions show that coal can still play an important role in a cleaner and more sustainable energy sector.
- ACE/JCOAL collaboration is initiated to investigate the process of transitioning coal into its possible new role in ASEAN energy development.



mix with 23% of renewable energy (RE) share by 2025, 9.3% more than the region's 2017 level. Following the strategy of



J-COAL



Strategic Report The New Role of Coal-Fired Power Plant in the Era of Energy Transition

August 2021



Policy Brief

No.03 / January 2022



ASEAN Centre for Energy
One Community for Sustainable Energy

Challenges and Implications of Coal Phase-down to the ASEAN Energy Landscape

Alnie Demoral, Muhammad Rizki Kresnawan, Amira Bilqis, Tabita Natasha Wijaya, Andy Tirta



Key Messages

- ASEAN region homes the youngest coal power plants in the world. The average plant age of the ASEAN coal fleet is 11.8 years. Partial or complete shutdown will give financial challenge to the plant owners/investors and the utility companies who signed construction and operation contracts. The energy security and reliability of the power system would be a huge challenge for the countries and the region.
- Shutting a large portion of coal power generation down would require large-scale deployment of renewables to be able to supply the energy that is not served by putting coal plants offline. Establishment of enabling policies and step-by-step phase mechanism that allows stable grid amid high renewable energy penetration is crucial.
- There are several pathways that could be taken aside from retiring coal plants such as deployment of biomass co-firing, carbon capture utilization and storage (CCUS), and high-efficiency low emissions (HELE) technologies, and therefore exploring them in parallel should be an alternate solution to secure the power supply in the transition era.

Phasing-down a substantial portion of coal-sourced power from the energy mix still faces barriers that need to be addressed first to ensure energy security and affordability in ASEAN member states (AMS) whose demand is continually growing as developing countries.

Around 15% of these capacity additions are subcritical plants, 64% are the more efficient supercritical plants, while the remaining shares are ultra-supercritical plants. This increasing share of high-efficiency, low emission (HELE) coal technologies demonstrate the commitment of AMS in making coal power generation cleaner and more sustainable. Achieving the

Source: ACE Website (Accessed on June 6, 2022)