



One Community
for Sustainable
Energy

How will ASEAN countries move forward towards carbon neutrality?

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Introduction to the ASEAN Centre for Energy (ACE)

Established in January 1999, ASEAN Centre for Energy (ACE) is an **intergovernmental organization within ASEAN** structure that represents the 10 ASEAN Member States' interests in the energy sector.

What We Do



Catalyst

Unify and strengthen ASEAN energy cooperation by providing a platform for sharing, policy advisory, best practices, and capacity building.



Knowledge Hub

Provide a knowledge repository for ASEAN Member States (AMS) and services through data management, publication, and dissemination.

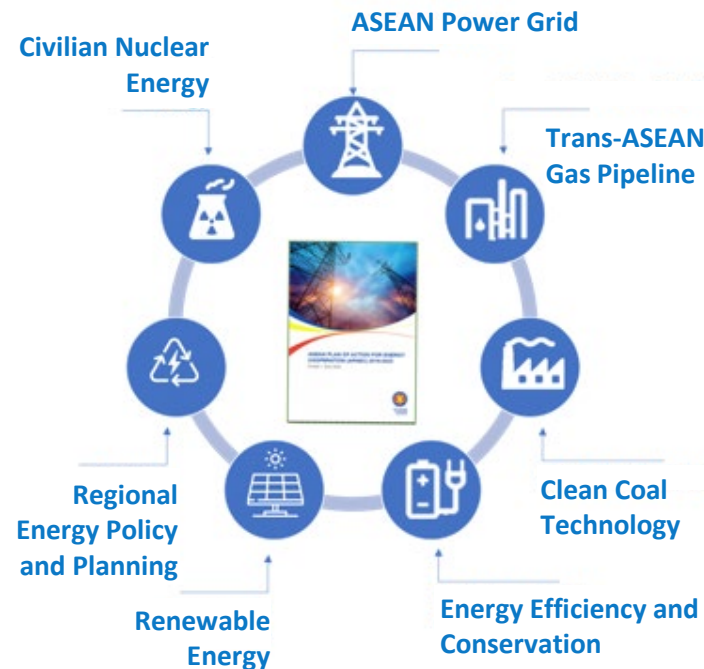


Think Tank

Assist AMS on **research and identifying practical and specific solution** on policies, legal, and regulatory frameworks, technologies, and innovative solutions.

ASEAN Plan of Action for Energy Cooperation (APAEC)

Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All



What is APAEC?

A series of guiding policy documents serving as the platform for deeper cooperation both within ASEAN as well as with DPs and IOs.

What does APAEC do?

Promoting **multilateral cooperation and integration** in the energy sector.

What is APAEC trying to achieve?

To attain the goals of **ASEAN Economic Community (AEC)** by enhancing security, accessibility, affordability, and sustainability in the energy sector.

Energy consumption in ASEAN will continue to grow; fossil fuel still dominates the TFE



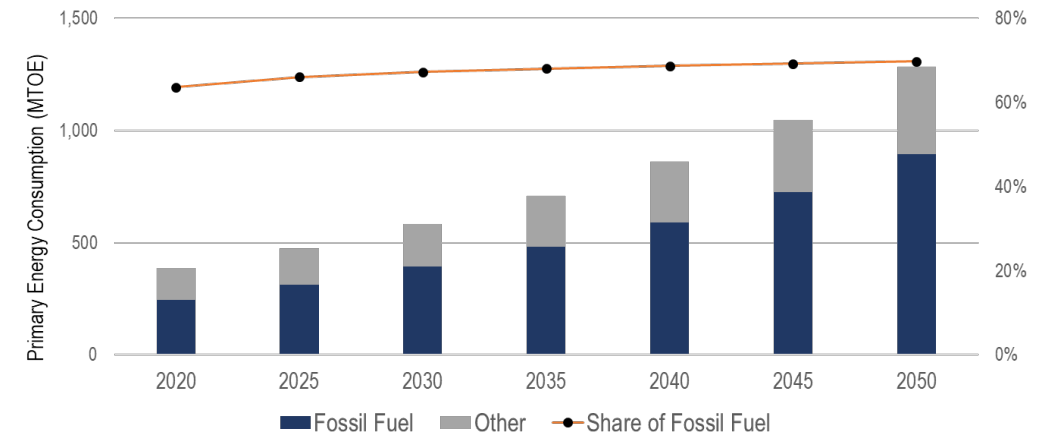
ASEAN energy consumption is **expected to triple from 2020 to 2050** under baseline scenario, with **fossil fuels remain the highest consumption.**

- ❑ Under the baseline scenario, coal, oil and gas consumption will grow 3.6 times in 2050 from 2020.
- ❑ This equals about 70% of the total final energy consumption in 2050, increasing from 63% in 2020.

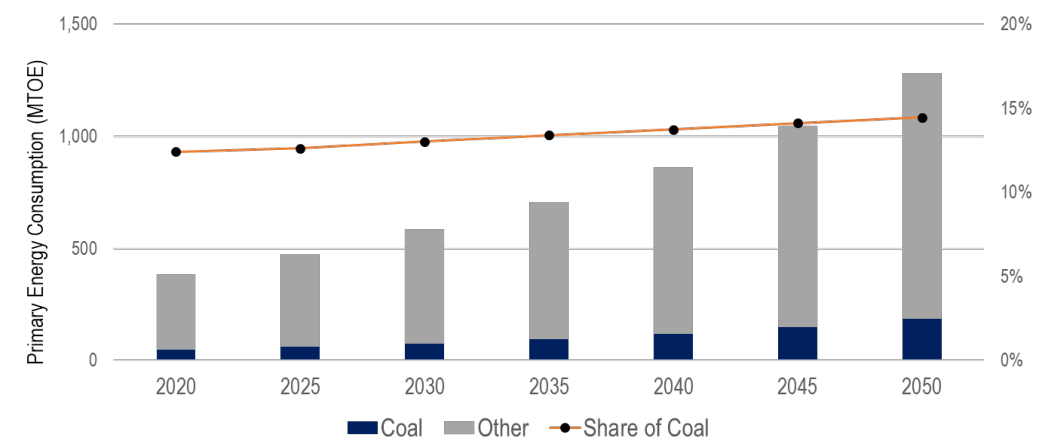
Despite the requirement to boost renewable energy consumption, **coal will still play an important role in meeting the energy consumption in ASEAN.**

- ❑ Transportation sector is still dominated by **oil for about 91% of the total energy demand required by transportation sector in 2050.**
- ❑ Oil and gas will also supply **nearly half** the required energy for commercial and residential sectors.
- ❑ Coal will provide around 31.5% energy demand for industrial sector.

Mtoe **Final Energy Consumption (Mtoe) and Share of Fossil Fuel (%)**



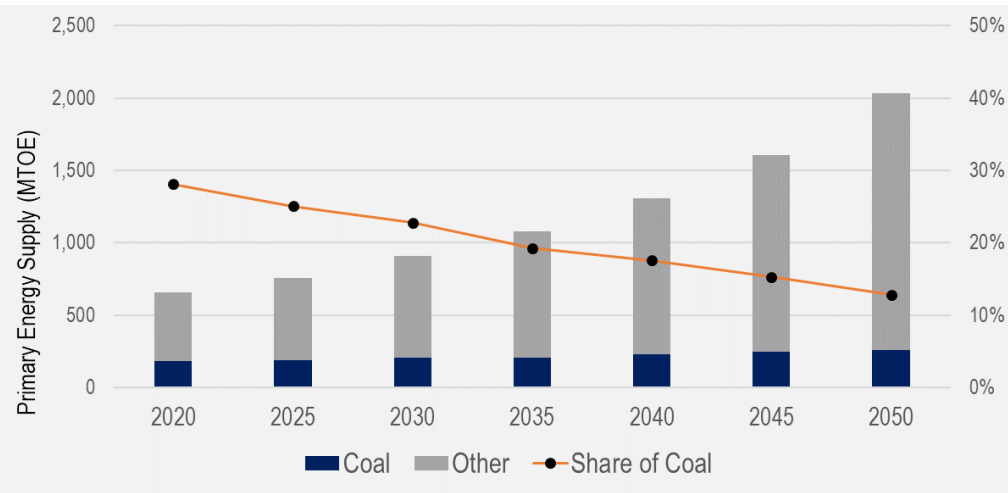
Mtoe **Final Energy Consumption (Mtoe) and Share of Coal (%)**



Despite the global pressure on coal phase-out/phase-down, coal will still be contributing to the total ASEAN's energy mix



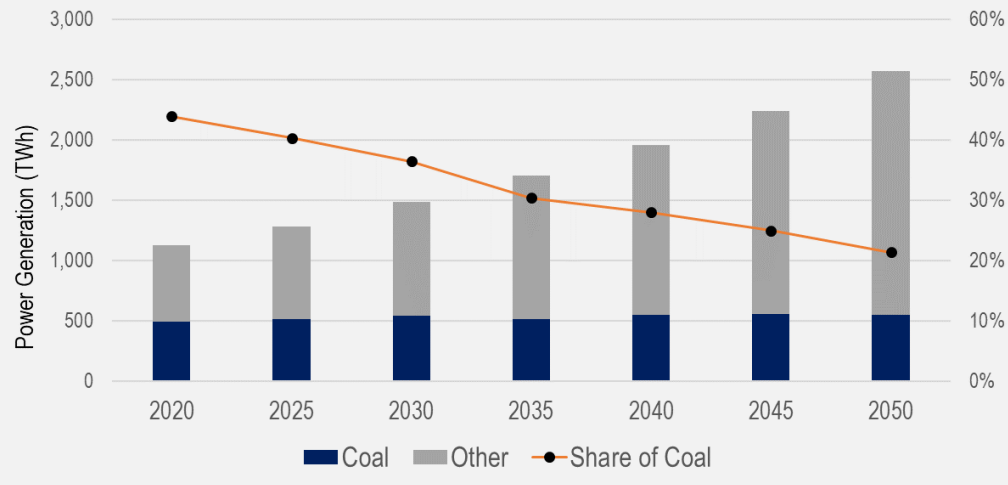
Mtoe **Primary Energy Supply (Mtoe) and Share of Coal (%)**



Fossil fuels remain the largest component in the energy supply mix of the region, with **oil and gas contributing more than 65%** of the mix in 2050.

- ❑ Baseline scenario projects a 4-fold increase in energy required to fuel the economic growth from 2020 to 2050.
- ❑ Even with the most aggressive energy transition scenario, coal, oil and gas will contribute to a notable portion of the total energy supply.

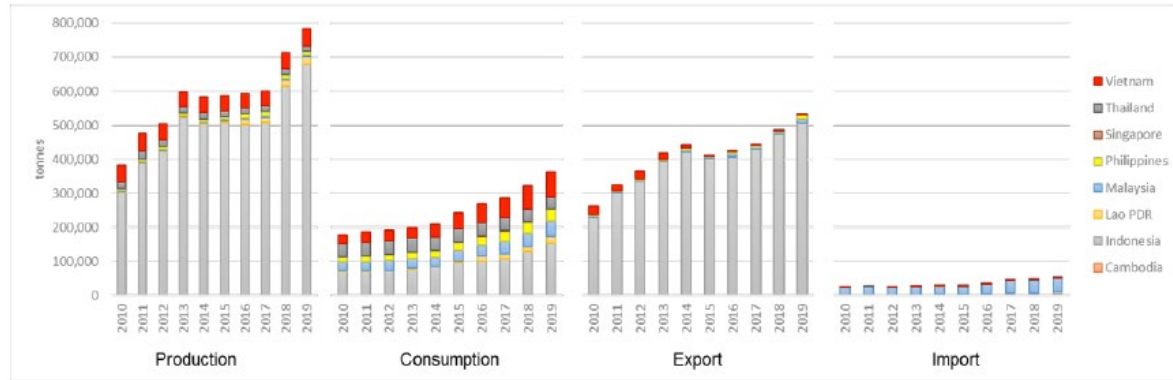
TWh **Total Power Generation (TWh) and Share of Coal (%)**



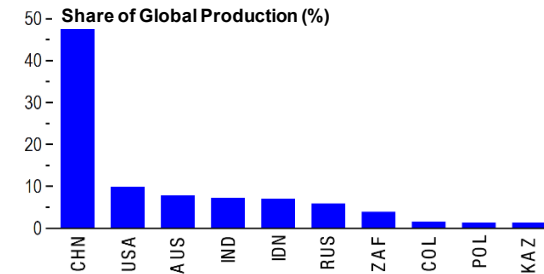
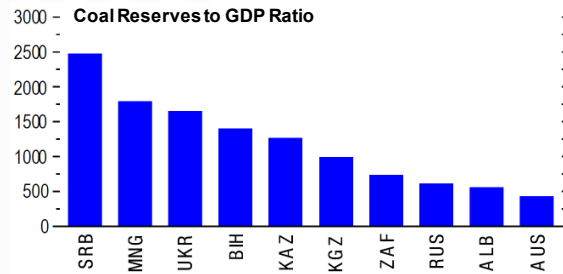
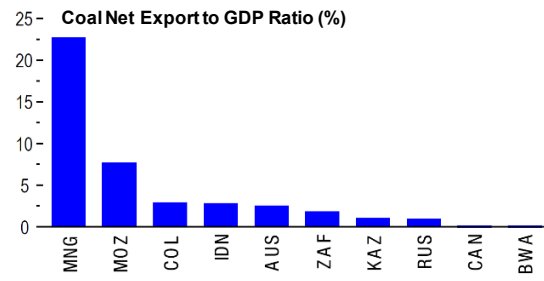
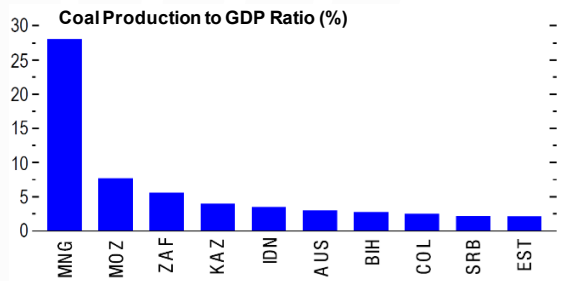
In the power sector, generation from **coal is relatively stable with a slight increase** from 2020 to 2050.

- ❑ Despite increasingly being replaced by renewable energy, oil and gas still comprises around one-third of the total electricity generation in 2050.
- ❑ Natural gas will remain the second most important energy sources after coal in power sector, contributing to 29% of the total generation in 2050.

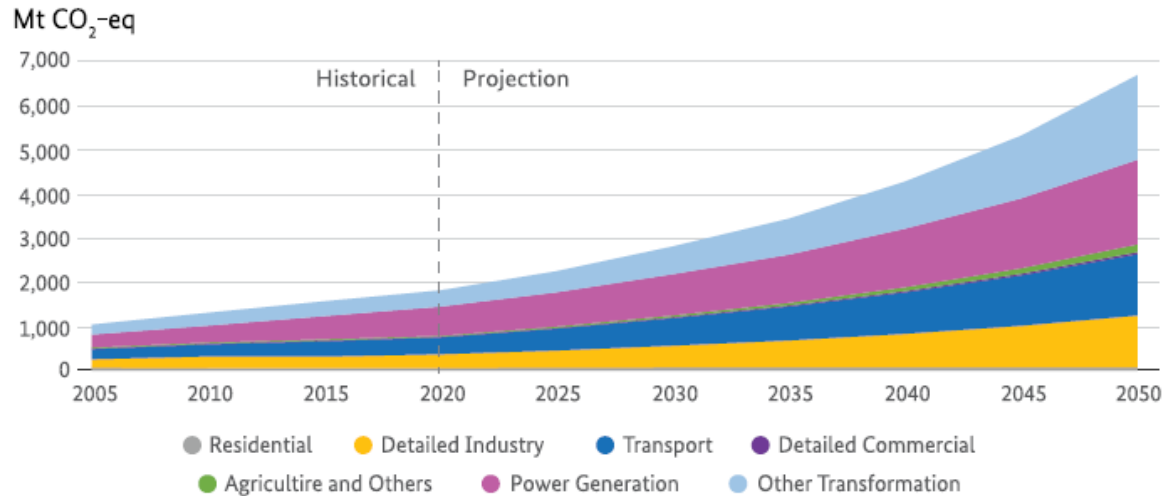
Coal in ASEAN's economic development – driver of economic development in the some of AMS



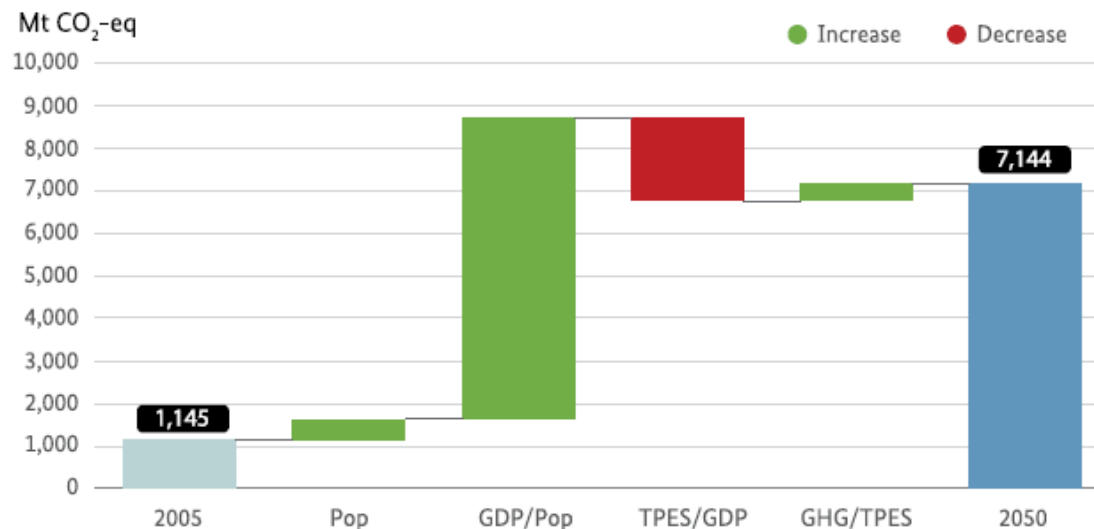
- Coal is the **most cost-effective** in Indonesia, Malaysia, the Philippines, Thailand, and Vietnam.
- Coal is a **substantial export commodity** in Indonesia, generating over USD14.5 billion in 2020.
- Vietnam's domestic coal production to support the domestic market.
- An 8% of Indonesia's coal domestic production of the global production, have **notable proportions of their economy** coming from coal production of 8% and net export of 3%.
- Coal value chains **absorb a significant portion of labour**. In 2020, there were around 167,000 workers in coal companies and 250,000 indirect coal mining activities in Indonesia.



It is projected that the GHG emissions in the ASEAN region is steadily increased which raise environmental concerns



- Under baseline scenario, ASEAN **GHG emissions** is expected to **increase 3.6 times** in 2050 than in 2020 levels.
- GHG emissions comes from **electricity** (power generation and transformation processes) of about **56%** and **transportation of 22%**.
- **GDP and population growth** are the main driver of energy emissions growth in 2050.



*Importance of pursuing **emission reduction measures** in both the **end-user and power sectors**, preventing the **missions** from one sector from offsetting the **emission reductions** from another.*

ASEAN states have announced their emission reduction target based on their submission of the NDCs, primarily in the form of a percentage reduction relative to the BAU scenario



Country	Official Emission Reduction Target	Submission Date
Brunei Darussalam	Reduce GHG emissions by 20% from BAU scenario by 2030	31 Dec 2020
Cambodia	Reduce GHG emissions by 42% from BAU scenario by 2030	31 Dec 2020
Indonesia	Reduce GHG emissions by 31.89% from BAU scenario by 2030 (unconditionally) and 43.2% from BAU scenario by 2030 (conditionally)	23 Sep 2022
Lao PDR	Reduce GHG emissions by 60% from BAU scenario by 2030 (unconditionally)	11 May 2021
Malaysia	Reduce carbon intensity (against GDP) by 45% from 2005 level by 2030	30 Jul 2021
Myanmar	Reduce GHG emissions by 244.5 Mt CO ₂ e by 2030 (unconditionally) and by 414.75 Mt CO ₂ e by 2030 (conditionally)	3 Aug 2021
Philippines	Reduce GHG emissions by 75% from BAU scenario by 2030 of which 2.71% is unconditional and 72.29% is conditional	15 Apr 2021
Singapore	Reduce GHG emissions to around 60 MtCO ₂ e in 2030 after peaking emissions earlier	4 Nov 2022
Thailand	Reduce GHG emissions by 30% from BAU scenario by 2030	2 Nov 2022
Vietnam	Reduce GHG emissions by 15.8% from BAU scenario by 2030 (unconditionally) and by 43.5% from BAU scenario by 2030 (conditionally)	8 Nov 2022

Source: Nationally Determined Contributions Registry, UNFCCC

ASEAN Countries towards Net Zero Targets or Carbon Neutrality



THAILAND'S LONG-TERM



Long-Term Strategy for Carbon Neutrality

CHARTING SINGAPORE'S LOW-CARBON AND CLIMATE RESILIENT FUTURE



National Energy Transition Roadmap Energising the Nation, Powering Our Future

No. 050/QĐ-TP

DECISION

APPROVING THE NATIONAL STRATEGY FOR CLIMATE CHANGE UNTIL 2050
PRIME MINISTER

Pursuant to Law on Governmental Organization dated June 19, 2015; Law on amendments to Law on Government Organization and Law on Local Governmental Organization dated November 22, 2019;

Pursuant to Resolution No. 06/NQ-CP dated January 21, 2021 of the Government promulgating the Action program for continuing implementation of Resolution No. 24-NQ/TW of the 9th Central Executive Committee on active response to climate change, extensive resource management, and environmental protection according to Conclusion No. 56-KL/TW dated August 23, 2019 of the Politburo;



Several AMS have formalised their planning towards carbon neutrality into the long-term targets documents, while the others are stated their commitment to achieve carbon neutrality.

ASEAN needs “AND” Equation, rather than “OR” Equation

Our energy policies should balance the trade-offs between **securing energy supply** and **accelerating energy transition** to enable a sustainable economic growth while also halting the climate crisis.

- Diversification of energy sources.
- Reducing imported fossil fuel consumption and increasing domestic energy use.
- Advancement of existing energy facilities to reduce the emissions.



- Replacing traditional technology with low-carbon one in power sector.
- Developing the indigenous renewable energy sources.
- Expanding transitioning fuel to enable wider renewable energy penetration.

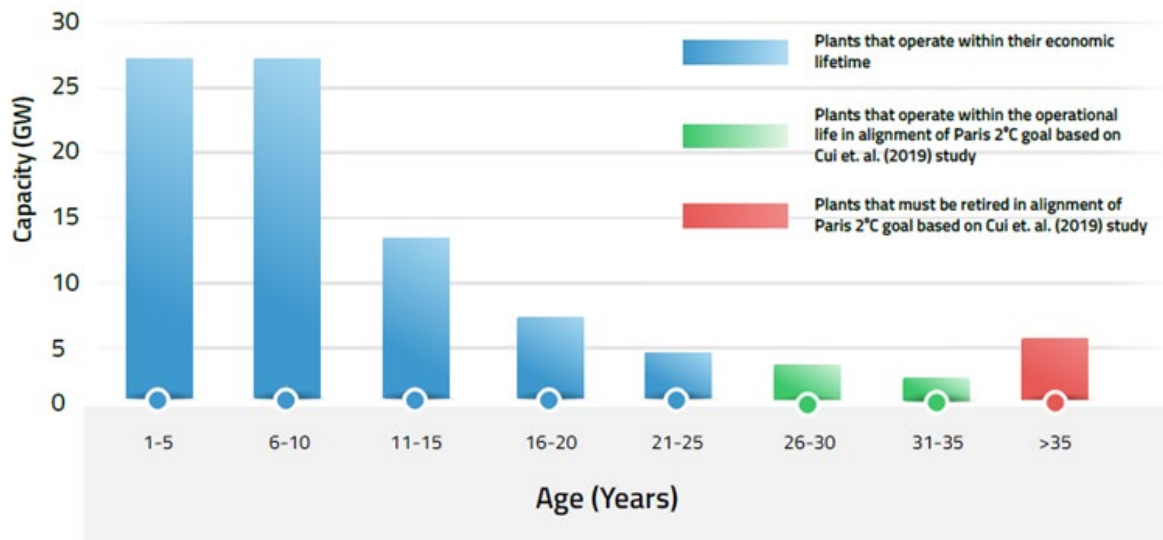
We need to continue the **utilization of fossil fuels**
AND
we need to also advance the **energy transition**

Decarbonization of the power sector to focus on the existing coal-fired power plants (CFPPs), making carbon capture technology critical



More than 60% of the CFPPs (by installed capacity) in Indonesia currently have been operational for only 10 years or less, far below the global average lifespan (46 years).

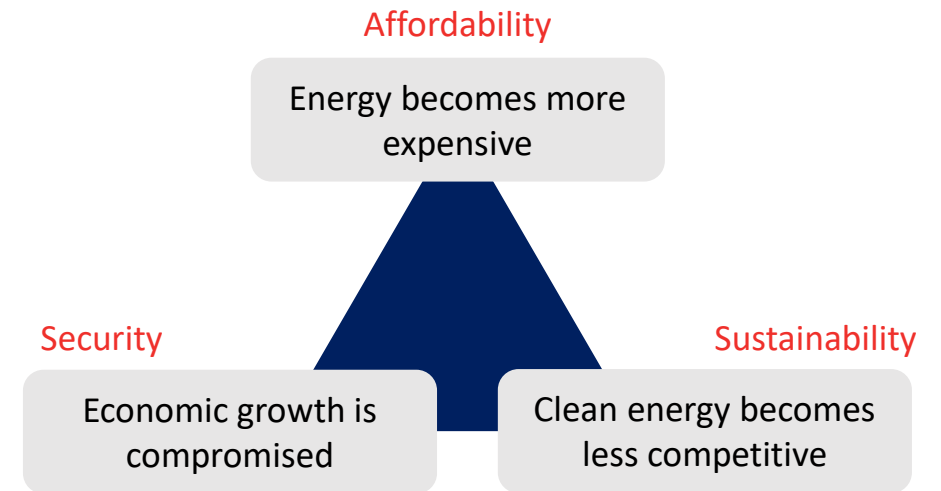
Age distribution of existing coal-fired power plants in Indonesia



Source: AEDS, 2022

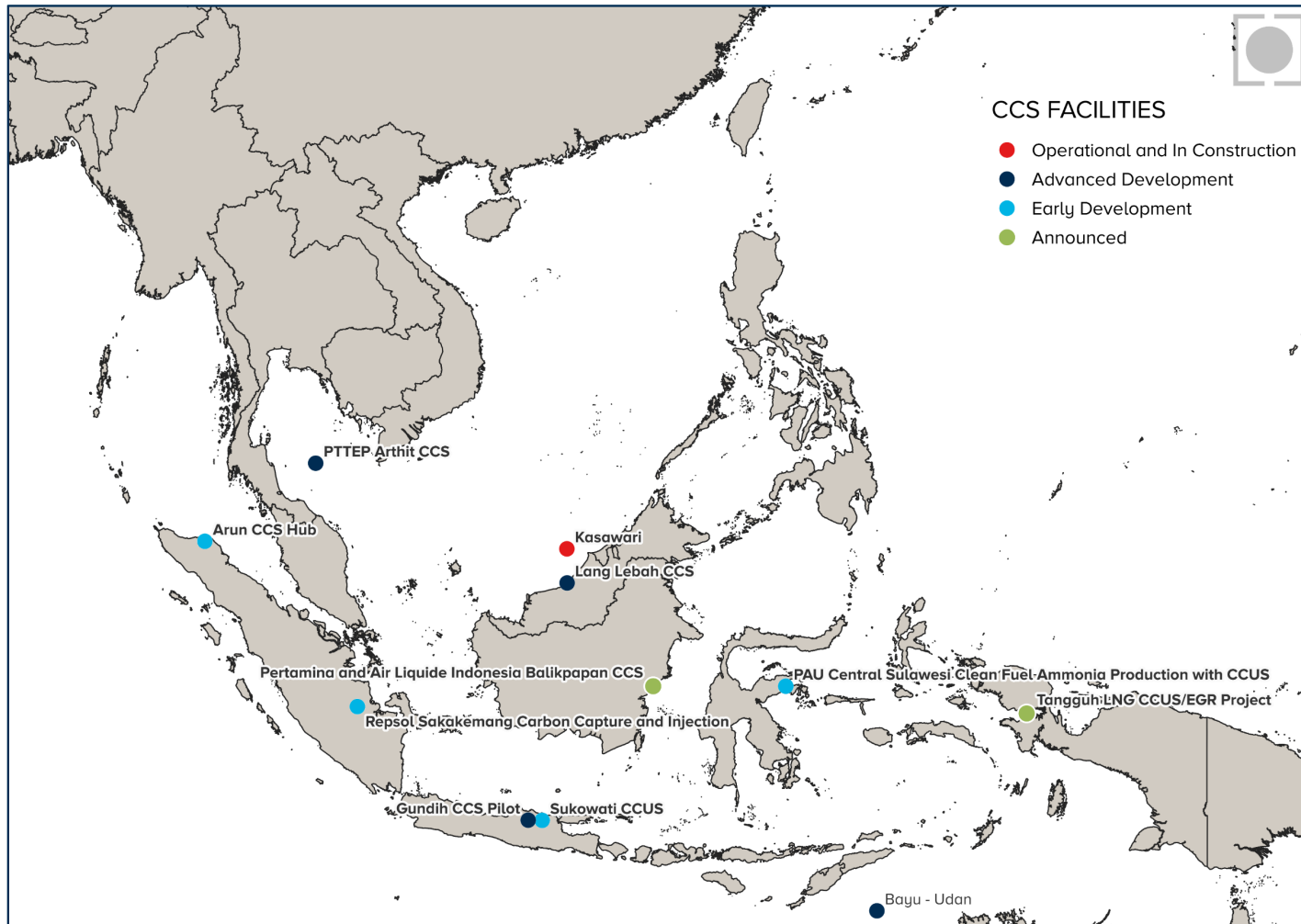
Complete phase-out of the existing coal-fired power plants can jeopardize just and seamless energy transition aspiration.

Consequences of an abrupt energy transition



Ensuring an orderly energy transition necessitates a reduction of the carbon intensity of the existing energy infrastructure → **carbon capture technology can provide a solution to address the above trilemma**

Nascent development of CCS/CCUS in the ASEAN region. The region has enormous storage potential, but policies and regulations need to be established.



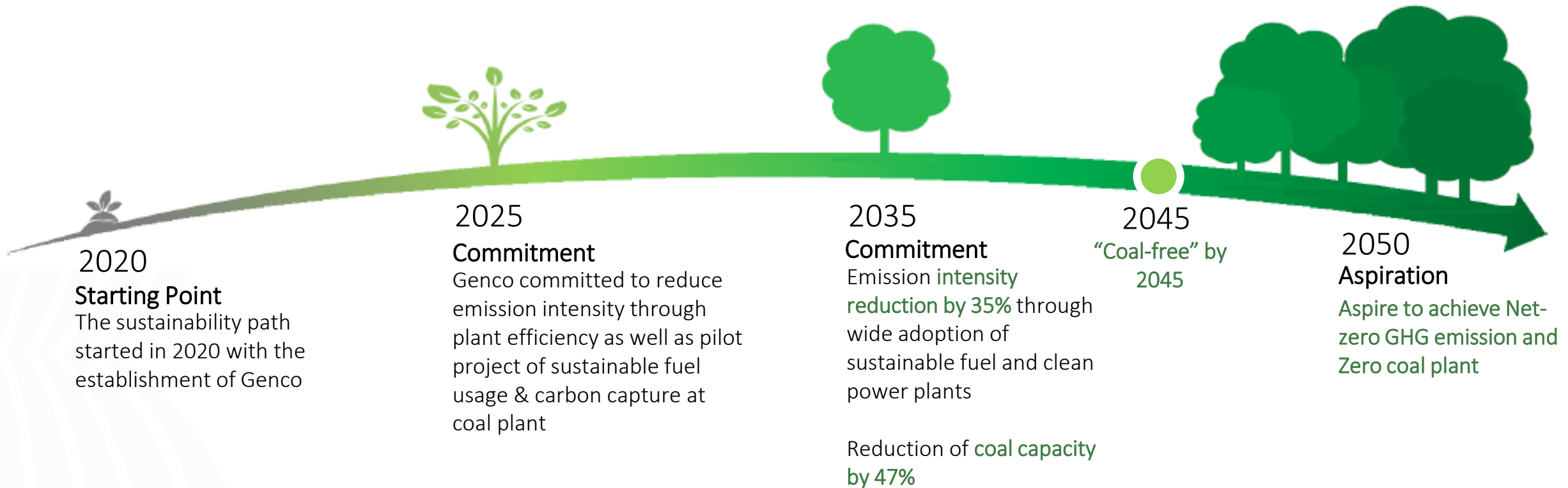
Source: GCCSI

- CCS facilities in ASEAN are **under development** – in construction, advanced development, early development and announced.
- **Primary driver** is reducing CO₂ from **existing oil and gas** fields – to be leveraged in wider sectors.
- Uncertainty in the market, policy is required to **incentivise investment** – mitigating negative effects of market failures on cost, revenues and risk.
- **Limited development** of CCS/CCUS specific **law and regulation** in ASEAN with recent developments in Indonesia and Malaysia.

ASEAN is promoting the new roles of CCT towards energy transition and low carbon economy while balancing energy security, sustainability and resilience.

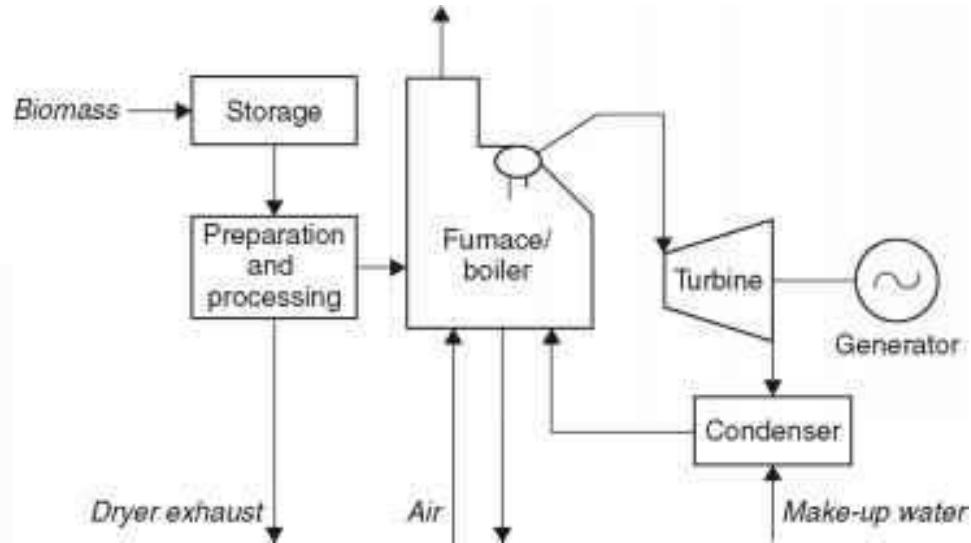


TNB GENCO journey towards 2050 in achieving net zero emission



Source: TNB GENCO

Biomass Co-Firing will potentially reduce the environmental impacts of CFPPs. Some AMS have issued a series of policies, regulations and initiatives to support the development of co-firing biomass in CFPPs.



Source: Brian Williams, 2022

Power Plant	Capacity of Coal-Fired unit (MW)	Biomass Fuel	Co-Firing Ratio
PLTU Pelabuhan Ratu	1,050	Sawdust	1-5%
PLTU Rembang	630	Wood Pellets	1-5%
PLTU Labuan	600	Solid Recovered Fuel (SRF)	1-5%
PLTU Suralaya	1,600	Rice Husks	1-5%
PLTU Ketapang	20	Empty Palm Oil Fruit Bunches	1-5%
PLTU Tembilahan	14	Empty Palm Oil Fruit Bunches	100%

Source: ACE, 2023

- Indonesia, Malaysia, Thailand and Vietnam have **issued policies and regulations** on co-firing biomass.
- **Indonesia** is leading country of co-firing biomass in CFPPs – **13 locations with 7.3 GW** have been commercially operated.
- **Challenges:**
 - **Limitation of biomass feedstocks** due to existing boilers' types.
 - Need **specific handling** of the feedstocks to avoid efficiency reduction.
 - **Stable supply** chain of biomass feedstocks.
 - **Inadequate financial** support for co-firing projects.
 - Need **clear policies** and roadmaps.
- **Way forwards:**
 - **Capacity building** of biomass co-firing across AMS.
 - **Standardisation** of biomass specification.
 - Increase **collaboration** with the industries.
 - Establish **biomass database** and mapping system.
 - Establish **supportive policies**.



ASEAN Interconnection – A catalyst to Expedite Energy Transition



- Realisation of ASEAN’s cross-border interconnection system with higher penetration of variable renewable energy (solar and wind), under the ASEAN Power Grid.
- AIMS III, Phases 1&2 identified **18 interconnectors projects*** and **62 VRE potential sites** – 8,461 GW of RE to advance the APG.
- Pushing ASEAN RE Target in 2025 will require **19,918 MW** interconnection capacity.
- Various forms of **energy storage** can be used to provide stored power during peak hours. Crucial in **enabling higher penetration of RE** and maintaining the power grid's stability.
- In the LCO Scenario, the region is expected to require **26.6 GW of capacity to store** about 1,100 GWh of electricity by 2050.



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