



ASEAN Centre for Energy
One Community for Sustainable Energy

Coal Transition in Southeast Asia:

Challenges, Lessons Learned, and Strategic Insights
from the ASEAN

东南亚国家煤炭转型：挑战与经验

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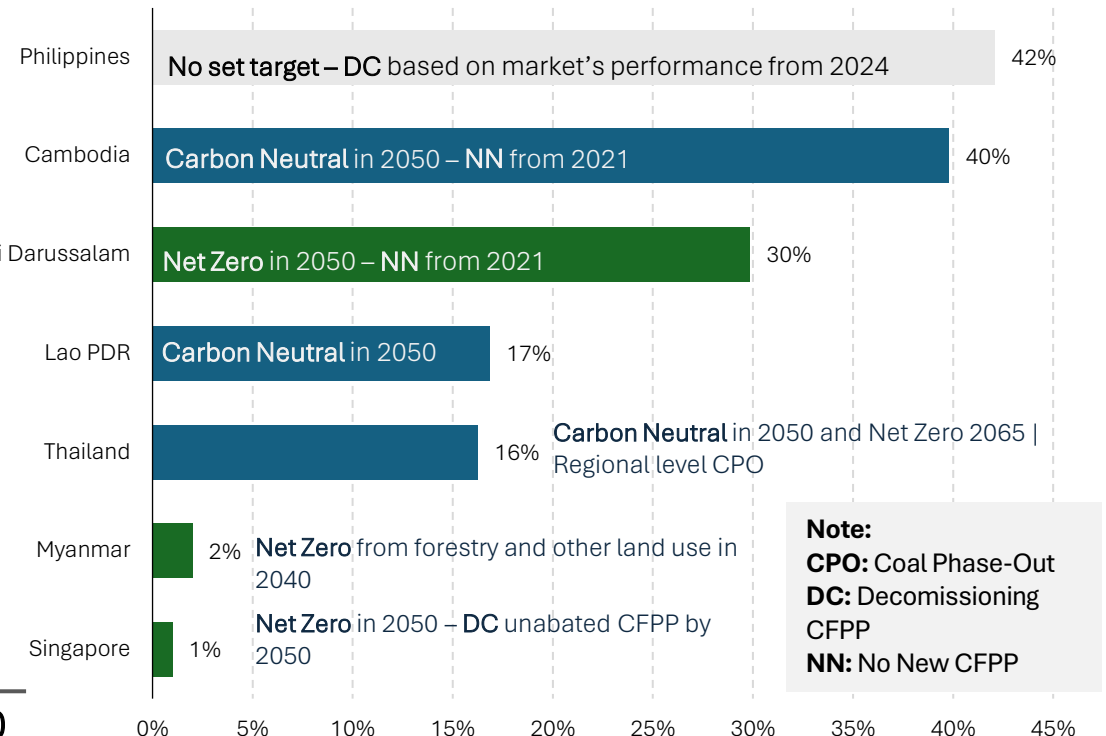
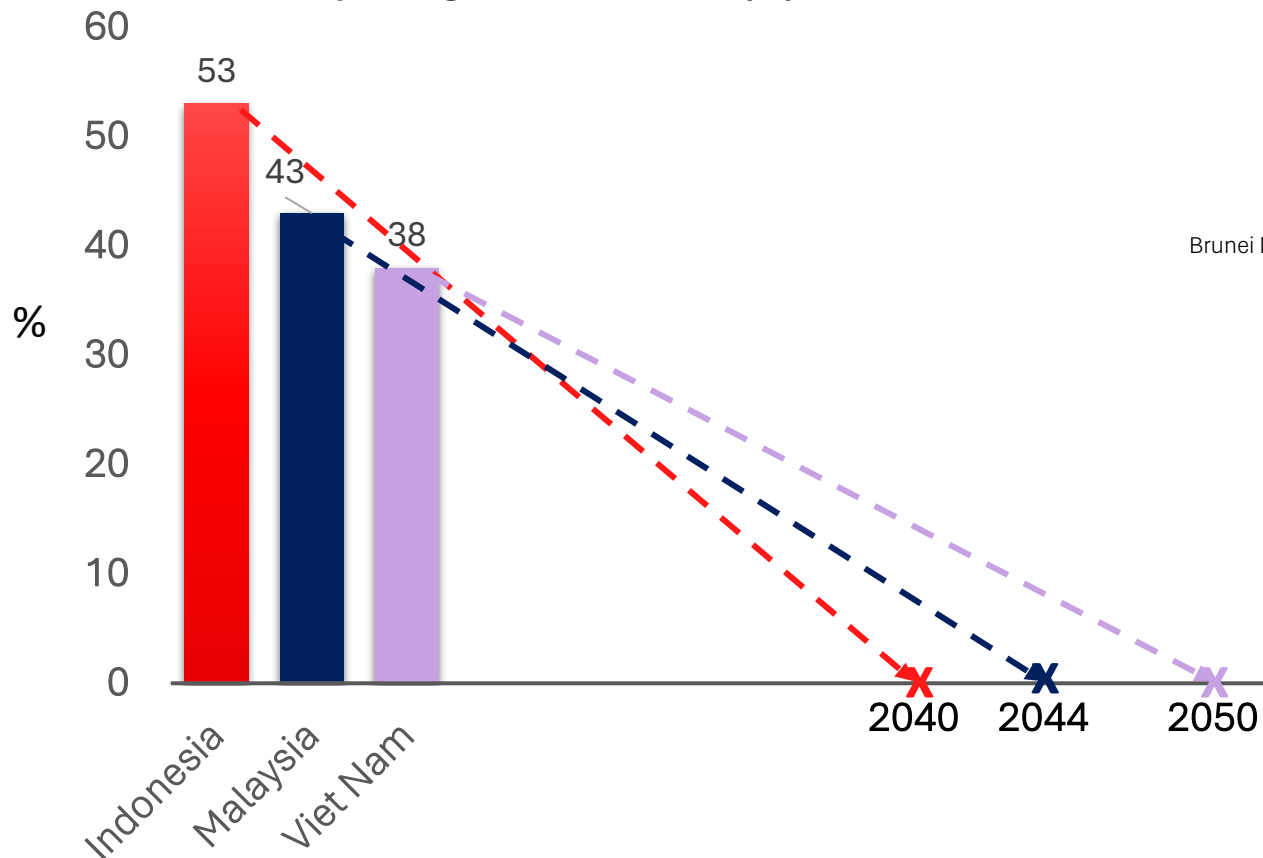
东盟能源中心 可持续和可再生能源部门主任

Landscape of Coal in Southeast Asia

东南亚煤炭现状

Almost all ASEAN Member States —except for the Philippines and Myanmar—have declared intentions to either phase out coal by a specified year, commence decommissioning of existing CFPP, or commit to no new construction of CFPPs. 除菲律宾和缅甸外，几乎所有东盟成员国都宣布了以下计划：在特定年份前逐步淘汰煤炭、开始退役现有燃煤电厂，或承诺不再新建燃煤电厂。

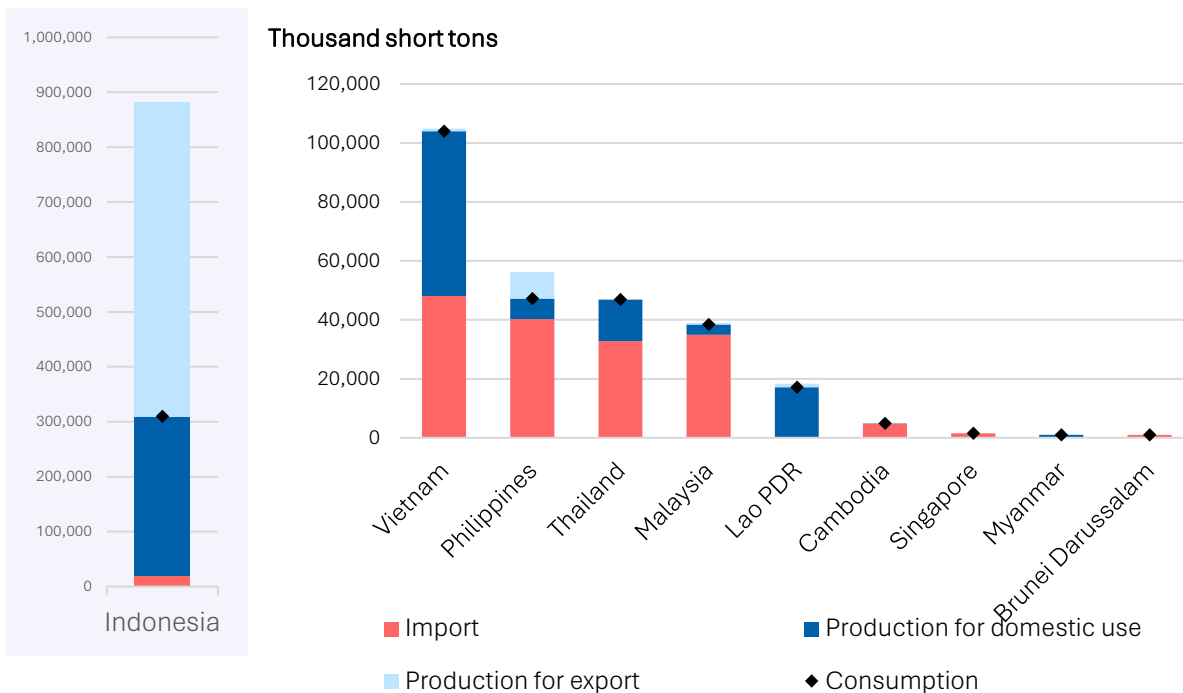
Share of coal in power generation in 2023 (%); AMS climate commitment



Note:
CPO: Coal Phase-Out
DC: Decommissioning CFPP
NN: No New CFPP

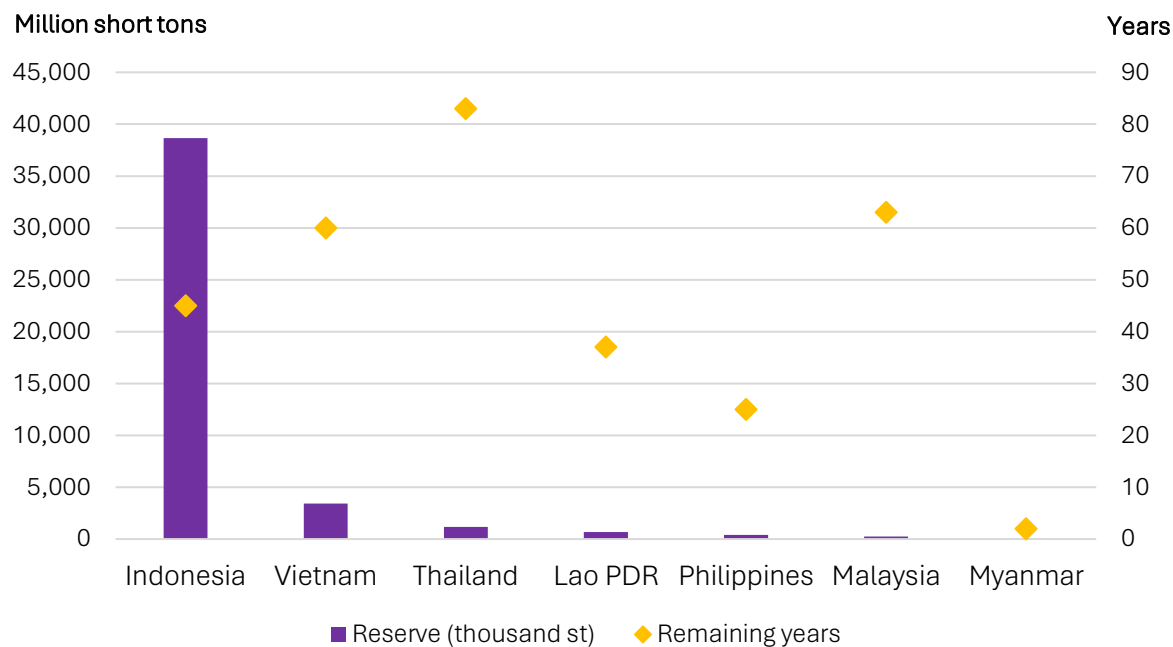
Coal remains deeply embedded in ASEAN's energy value chain, with Indonesia as a key regional supplier contributing to 89% of the region coal production. 煤炭在东盟能源价值链中仍占据根深蒂固的地位，印度尼西亚作为该地区关键供应商，贡献了区域煤炭总产量的89%。

Coal Production, Import, and Export in ASEAN by 2023



Other Member States depend on **imports for power generation**, mainly from Indonesia: Cambodia (85%), Philippines (80%), Thailand (65%), Malaysia (58%), and Viet Nam (40%).

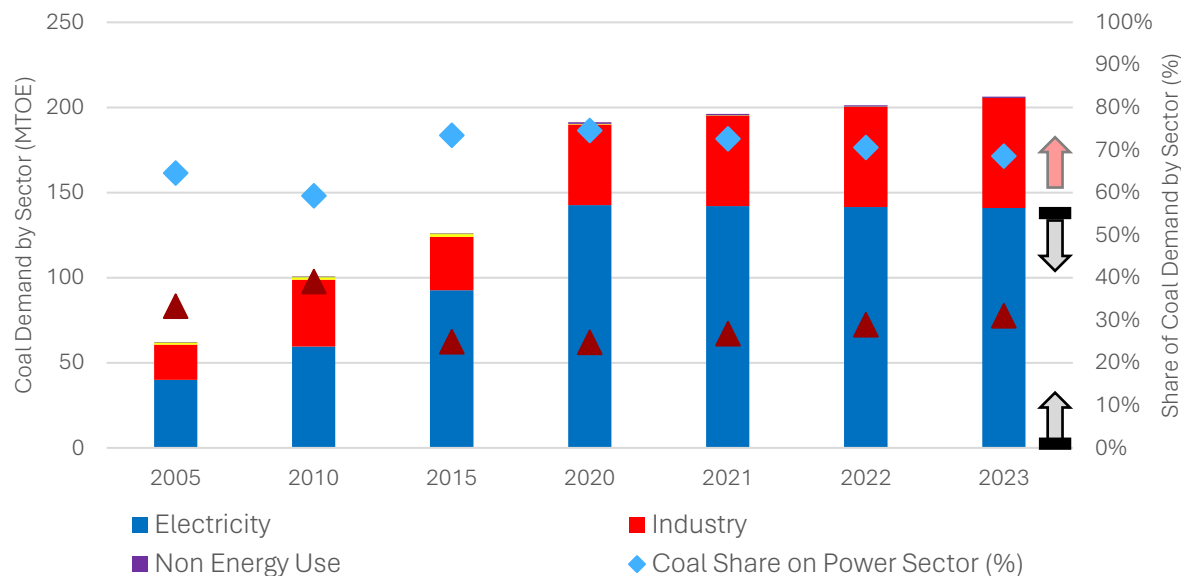
Coal Reserves and Years Left of Reserve Utilisation by 2023



At current production levels, ASEAN's coal reserves could sustain more than four decades (**46 years, up until 2069**) of continued utilisation, slightly lags the net-zero/carbon neutral target years (2050 or 2060).

Coal use in power generation has shown a slight decline recently, conversely, the increase seen in industry and captive coal plants. 近期煤炭在发电领域的使用量出现小幅下降，而工业与自备燃煤电厂的用煤量却有所增长。

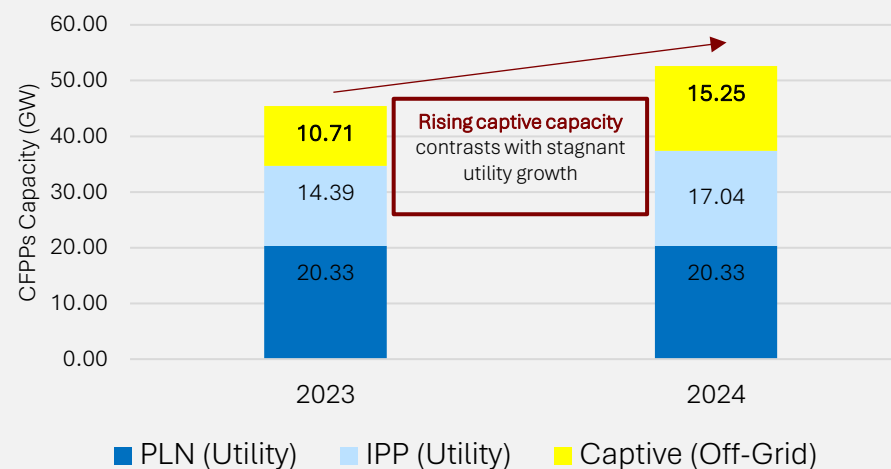
Coal Demand by Sector in ASEAN (2005-2023)



- Coal in power sector declines as solar PV expands in Vietnam (9.5 → 30.5 GWh), and gas starts to replace coal in several countries like Malaysia and Thailand.
- Industrial coal use shows an upward trend, highlighting the need for responsible consumption and decarbonisation in industrial operations.

... but rising captive CFPP capacity reveals hidden growth in coal use

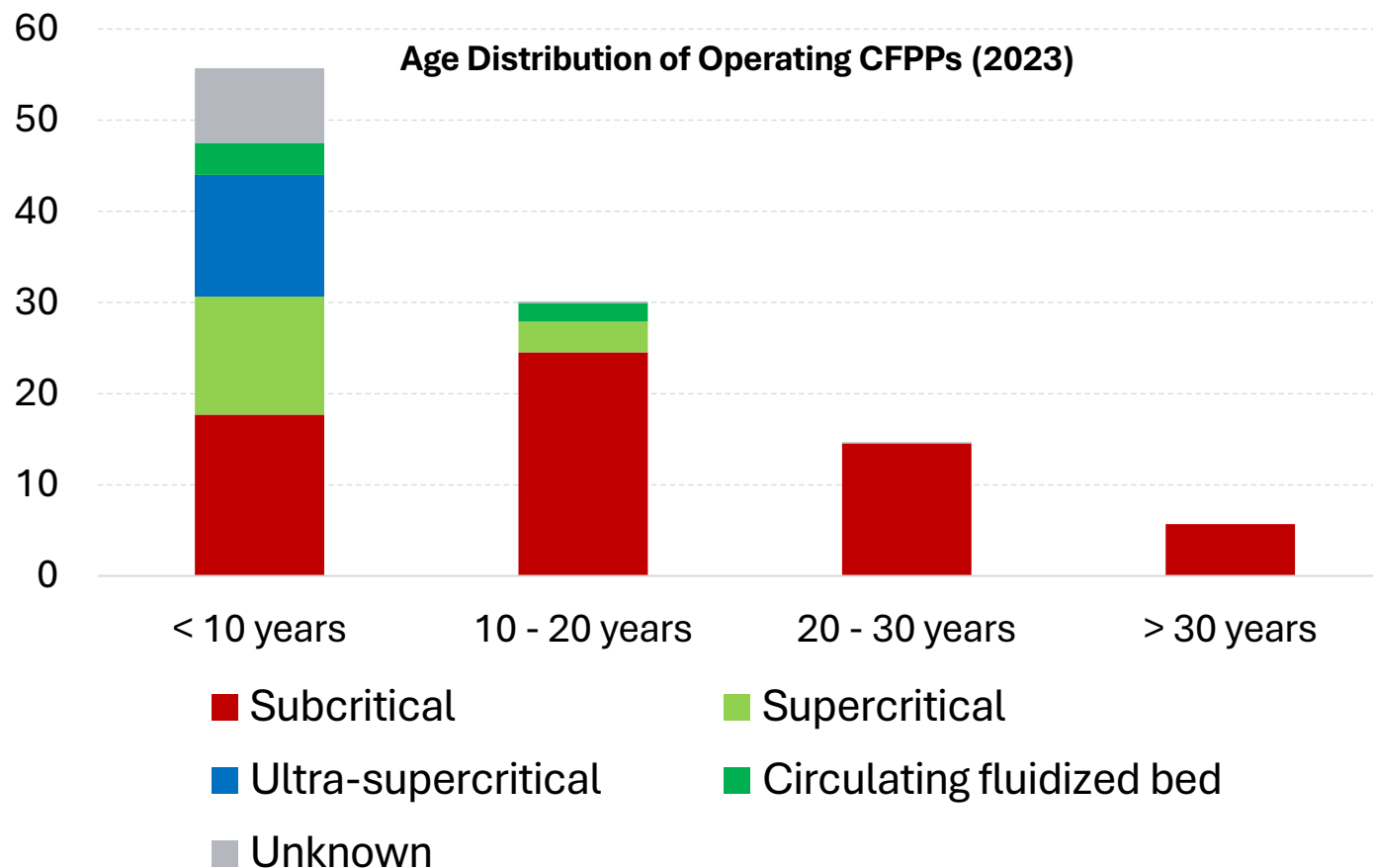
Installed CFPPs Capacity in Indonesia based on Ownership (2023-2024)



Source: CREA & GEM (2024)

Using Indonesia as an example, captive coal plants — often excluded from national transition plan — **continue to expand**, driving up overall coal consumption despite the slowdown in grid-based demand. This trend underscores **the urgency to advance decarbonisation and transition pathways for captive generation** as part of ASEAN's broader coal transition strategy.

The CFPPs in the region are relatively young, averaging just 14.3 years. The majority of CFPPs in Southeast Asia are low-efficiency models. 本地区燃煤电厂的平均运行年限较短，仅为14.3年。东南亚大多数燃煤电厂属于低效机型。



- About 55.7 GW of generating capacity from plants operating for 10 years or less, primarily in Indonesia and Viet Nam.
- The majority of these operating CFPPs (at least 61% of total generating capacity in 2023) **still utilise less efficient, subcritical technology.**

The controversies surrounding the coal phase-down under climate commitment, specifically debates on energy security and affordability, frequently lead to policy paradoxes. 在气候承诺背景下，围绕煤炭逐步淘汰的争议——特别是能源安全性与经济性之争——常常引发政策悖论。

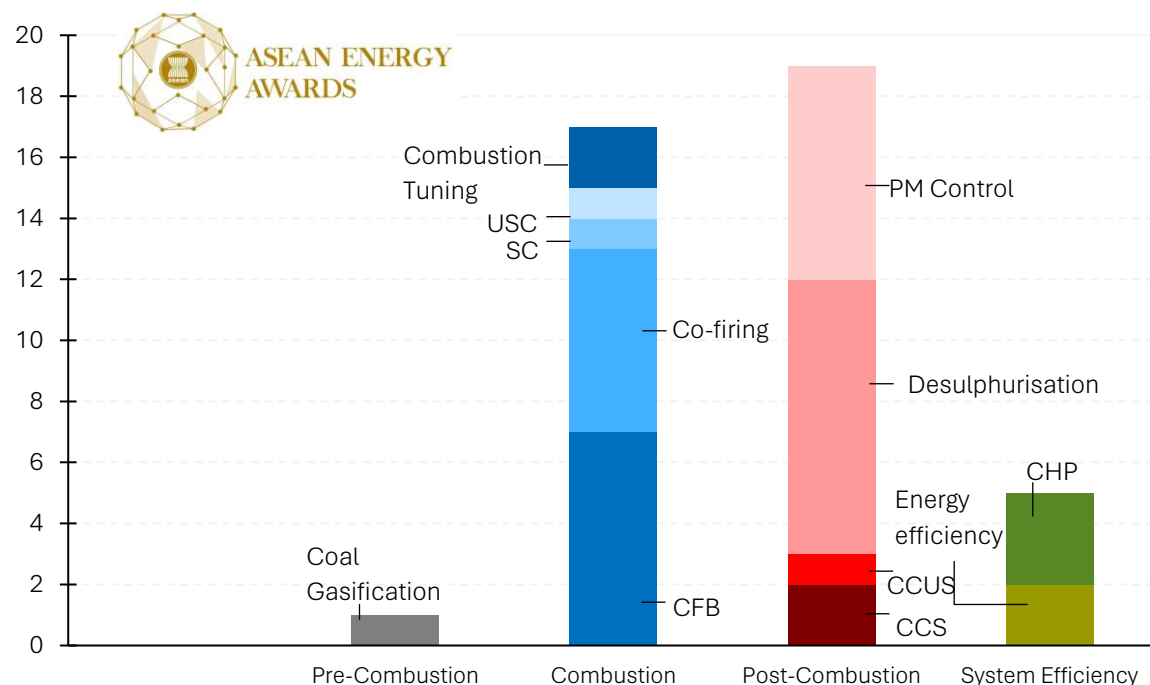
	Coal production/Coal mining	Tariff/Price Cap	PPAs	Ease of Import
 Indonesia	Domestic Market Obligation (DMO) requires producers to allocate 25% of their coal production for domestic use, primarily for CFPP.	Domestic Price Obligation (DPO) caps coal price at USD 70/tonne for electricity generation and USD 90/tonne for selected industries.	Long-term Power Purchase Agreements (PPAs) creates financial and operational lock-in, often span 20-30 years.	Competitive import pricing and proximity to Indonesia's coal.
 Malaysia	Coal was incorporated to the national energy mix through the 1981 Fuel Diversification Policy to reduce dependency on oil.	Imbalance Cost Pass-Through (ICPT) mechanism adjust tariffs every six-month based on fuel price. Cheap coal = cheap tariff.	Long-term PPAs in the energy planning phase.	Competitive import pricing and proximity to Indonesia's coal.
 Philippines	Coal Roadmap 2017-2040: Increase coal production from 23 to 282 million tons by 2040 to support power and industry. Maximize domestic coal use to reduce imports. Promote local mine development and attract private investment in exploration, mining, transport, and infrastructure.	Competitive Selection Process (CSP) requires utility to procure power at the least cost → coal often wins	- Long-term PPAs in the energy planning phase. - Include fixed-price contracts, fuel cost-pass through and guaranteed dispatch.	Competitive import pricing and proximity to Indonesia's coal.
 Viet Nam	Decision 55/QĐ-TTg (2024) Coal Industry Development Strategy through 2030, with a vision to 2045: Targets 45–50 million tons of annual coal production by 2030, Plans for a competitive coal market and infrastructure expansion.	Decision No. 1009/QĐ-BCT (2025) cap electricity price from coal at US\$6.6 cents/kWh	- Long-term PPAs, many benefit from sovereign guarantees. - National power company commits to purchasing a minimum quantity of power even if not dispatched.	- Decision 55/QĐ-TTg (2024): Promotes domestic and imported coal blending. - Benefit from the competitive coal import price from Indonesia. - Decision No. 1009/QĐ-BCT (2025) cap imported coal power from Lao PDR at US\$ 7.02 cents/kWh

ASEAN Country Spotlights: Existing CFPP Solutions

东盟国别聚焦：现有燃煤电厂的解决方案

Coal utilisation operations are gradually adopting cleaner practices—pollution control and higher efficiency—rather than deep decarbonisation. Such measures reduce environmental harms; they do not fundamentally lower carbon emissions. 煤炭利用业务正逐步转向更清洁的运行方式——包括污染控制与能效提升——但尚未实现深度脱碳。此类措施虽能减轻环境危害，却无法从根本上降低碳排放。

Technological Innovation Listed in ASEAN Coal Awards 2021-2025



The largest SC in ASEAN
Paiton CFPP Complex
Indonesia – 4,825 MW

First, largest USC in ASEAN
Manjung CFPP Unit 4 & 5
Malaysia – 2 x 1,000 MW

Largest USC in ASEAN
Batang CFPP Unit 1 & 2
Indonesia – 2 x 1,000 MW

	Supercritical (SC)	Ultra-Supercritical (USC)	Total HELE
Indonesia	0.82 GW	4.74 GW	5.56 GW
Malaysia	-	3.00 GW	3.00 GW
Philippines	0.50 GW	-	0.5 GW
Thailand	0.66 GW	0.66 GW	1.32 GW
Viet Nam	4.20 GW	1.24 GW	5.44 GW
ASEAN	6.18 GW 5% of total capacity	9.64 GW 7.9% of total capacity	15.82 GW 13% of total capacity

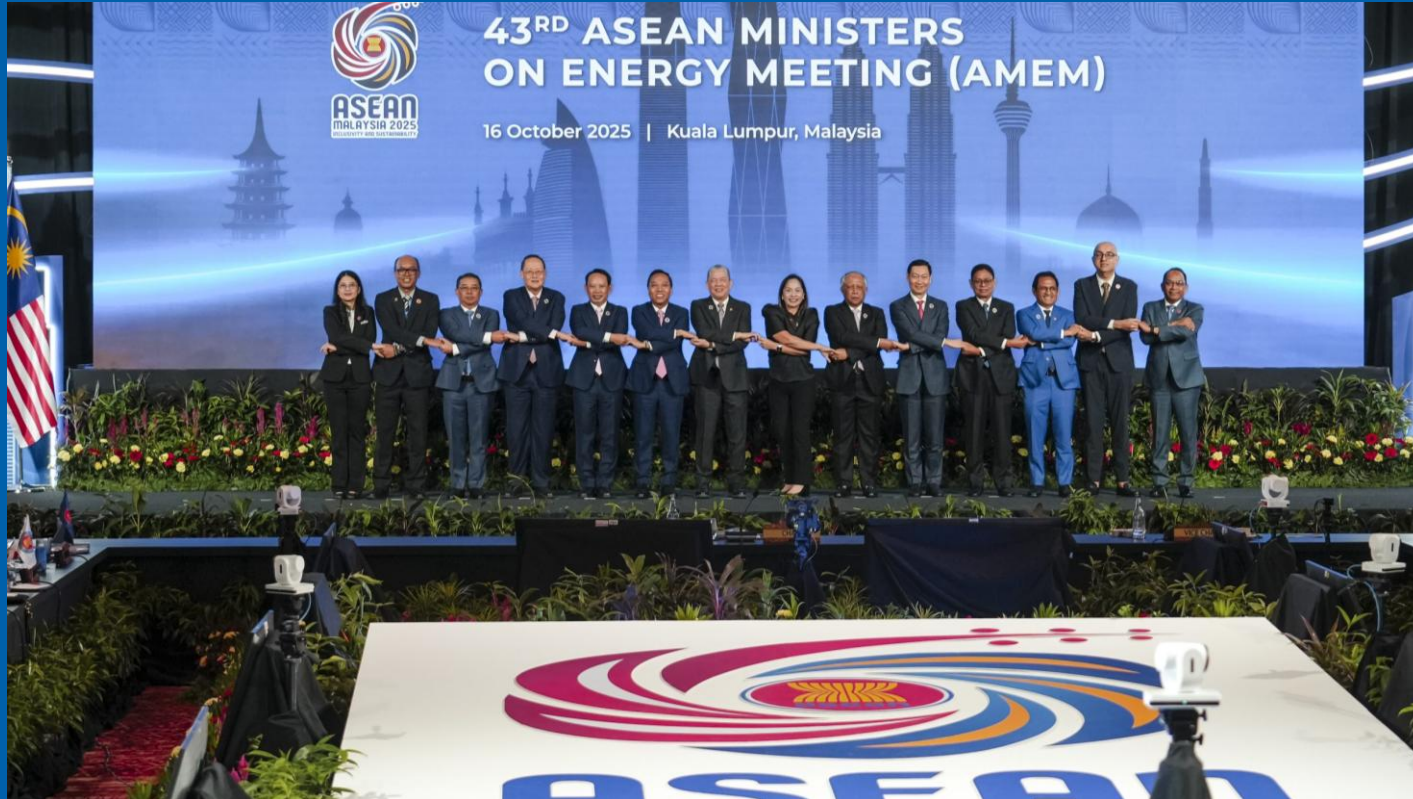
Key Takeaways 核心结论

- Coal remains attractive in ASEAN largely due to regulatory and policy factors that prioritise energy security and cost stability.
- **Coal production and consumption continue to rise despite regional carbon neutrality and CPO commitments.**
- Lack of transition planning for captive and industrial coal use remains a key gap.
- **Progress has been made mainly in HELE and co-firing, while broader decarbonisation options remain nascent or under discussion.**
- Policy inconsistencies and financial barriers (e.g. long-term PPAs, stranded assets) hinder early retirement efforts.

The Future of Coal in ASEAN

东盟煤炭未来展望

ASEAN Member States adopted the new Energy Cooperation Blueprint* last month to advance regional cooperation on energy transition. One of the top priorities for 2030 is to advance renewable energy in the power system and share credible energy attributes through the ASEAN Power Grid. 东盟成员国于上月通过了新版《能源合作蓝图》*，以推进能源转型领域的区域合作。2030年的首要目标之一是在电力系统中推广可再生能源，并通过东盟电网共享可信的能源属性。



The APAEC 2026-2030 has officially been endorsed at the **43rd ASEAN Ministers on Energy Meeting (AMEM)** on 16 October 2025 in Kuala Lumpur, Malaysia 《2026-2030年东盟能源合作行动计划》已于2025年10月16日在马来西亚吉隆坡举行的第43届东盟能源部长会议上获得正式批准。

*Energy Cooperation Blueprint = ASEAN Plan of Action for Energy Cooperation

2021 - 2025

Clean Coal Technology
(CCT)

2026 - 2030


Clean Coal
Transformation
(CCTR)



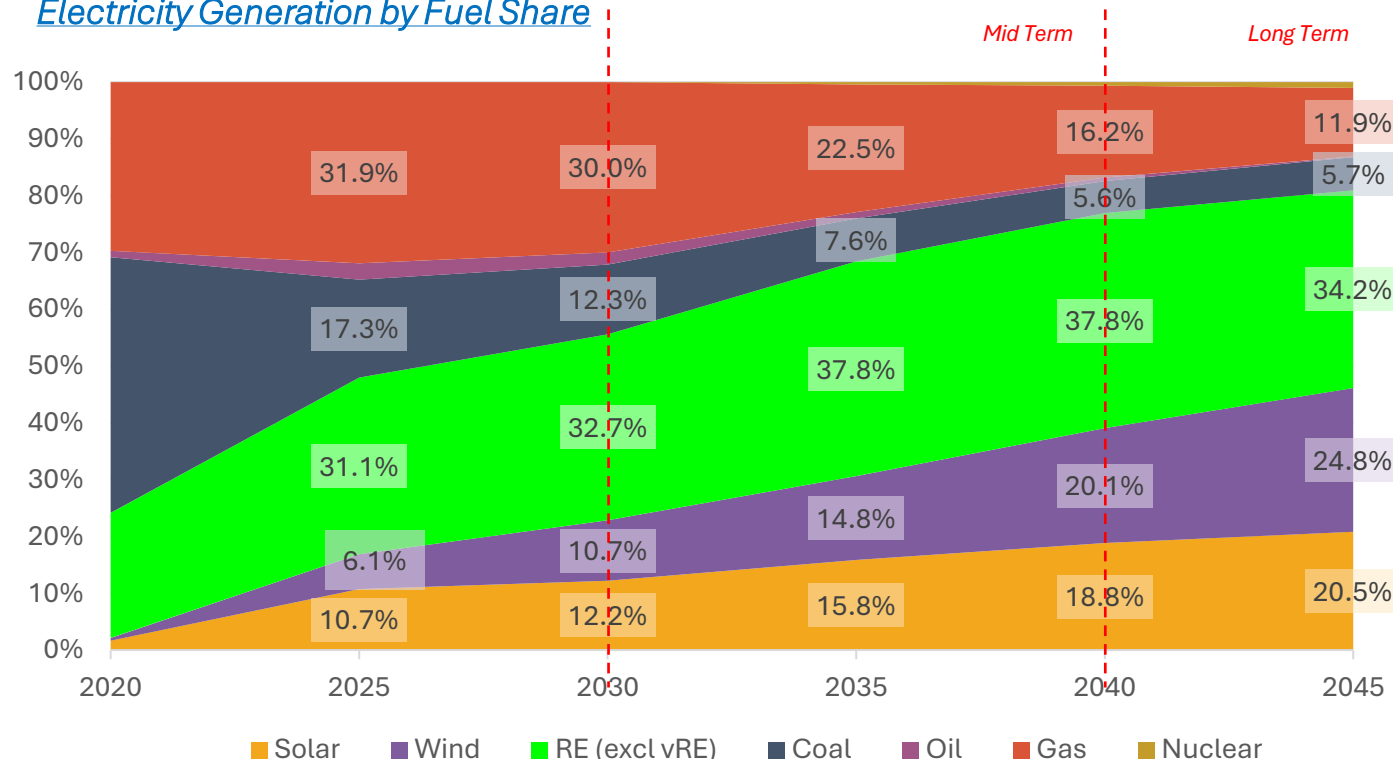
To better reflect the shift from solely advancing high-efficiency, low-emission coal technologies to a broader approach that supports a more responsible and managed coal transition, the **Programme Area 3** is transformed from *Clean Coal Technology (CCT)* to *Clean Coal Transformation (CCTR)*.

As ASEAN progresses in its energy transition and gradually moves away from coal, the CCTR programme aims to **explore more innovative pathways that aligns with carbon neutrality goals and development objectives.**

The member states have adopted the results of the ASEAN RE Roadmap as ASEAN 2030 targets, with the roadmap providing guidance across programme areas, including coal transformation, to align efforts toward the rapid scale-up of VREs. 成员国已采纳《东盟可再生能源路线图》的成果作为2030年目标，该路线图为包括煤炭转型在内的各规划领域提供指引，旨在协同推进可变可再生能源的快速规模化部署。

As ASEAN's vRE generation share grows to over 45% by 2045, coal must transition to flexible operation to balance the grid and mitigate curtailment risks.

Electricity Generation by Fuel Share



vRE Growth & Grid Variability

- APAEC (2026-2030): vRE grows rapidly, creating **greater variability** and **steeper ramps**.
- Mid-Term (2031-2040): vRE continues to expand, leading to **larger fluctuations** and **deeper dips**.
- Long-Term (2041-2045): vRE dominance creating **extreme variability** that requires a balanced approach.

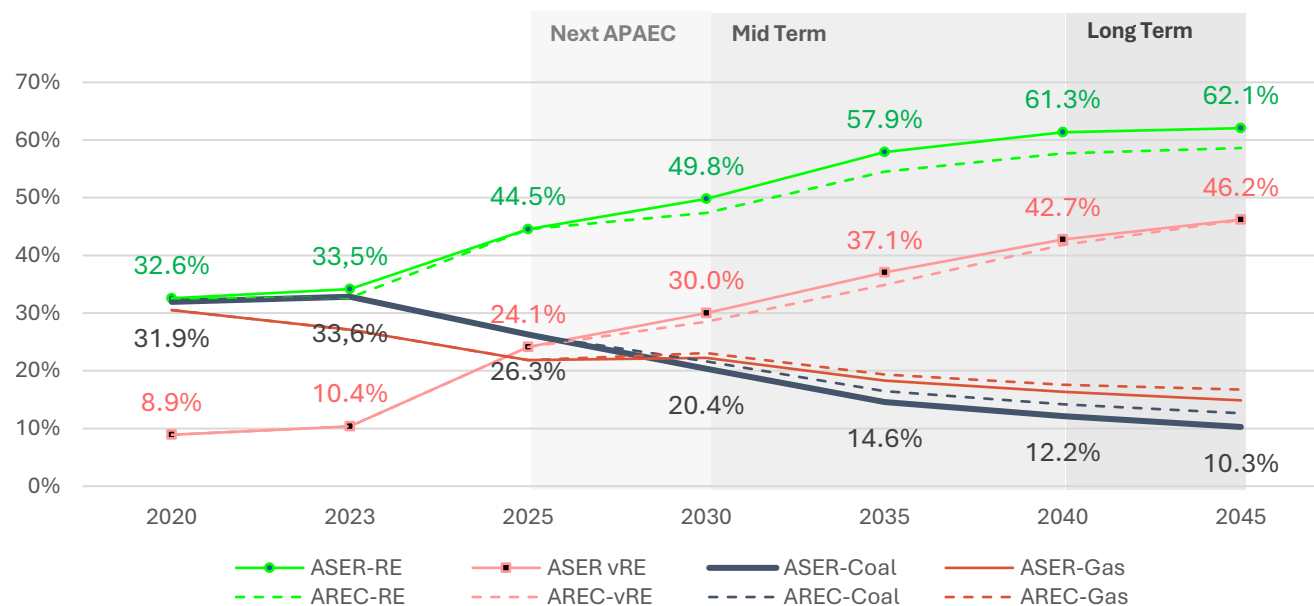
Coal's Evolving Role & Flexibility Requirements

- APAEC (2026-2030): Coal shifts from **baseload** to **flexible support**.
- Mid-Term (2031-2040): Coal moves to **mid-merit** generation, focusing on cycling and handling peak demand.
- Long-Term (2041-2045): Coal focuses on **reserve capacity** and **quick ramping** to support rare events and extreme variability.

Coal Capacity Over Time: Shifting Role and How to Finance It

煤炭产能演进：角色转型与融资路径

Installed Capacity by Fuel Share Across AREC & ASER Scenarios 不同情景下东盟区域燃料结构装机容量占比 2020-2045



- Coal's capacity declines as ageing CFPPs (20–30 years old) retire early, while vRE dominates new additions.
- However, remaining coal assets will continue to play a supportive role in system adequacy and flexibility, requiring retrofitting or repurposing to align with ASEAN's long-term transition pathway.

How do we finance the remaining CFPP capacity for transition purposes?

- Currently the global standards for transition finance remain under intense debate.
- Example of credible global transition finance frameworks such as the [Glasgow Financial Alliance for Net Zero \(GFANZ\)](#) has defined:

What it can finance:

- Early retirement of ageing CFPPs through refinancing or buyout schemes
- Retrofits for emission reduction, co-firing, or CCS readiness
- Flexibility upgrades

Conditions:

- No new unabated coal
- Legally anchored retirement date
- Verifiable emissions decline
- Alignment with a net-zero pathway

ASEAN should adopt a unified stance that defines a limited, stability-focused role for remaining fossil assets to signal and shape global standards.

Tackling emissions from the existing coal-fired power plants 应对现有燃煤电厂排放

	co-firing with biomass/ammonia	High Efficiency Low Emission (HELE) technology	retrofitting with CCS/CCUS technology	repurposing to improve flexibility	early retirement
Mentioned/ Discussed by	Indonesia, Malaysia, Thailand, Viet Nam	Indonesia, Malaysia, Philippines, Thailand, and Viet Nam	Indonesia, Malaysia, Thailand, and Singapore	Indonesia, Thailand, Viet Nam	All AMS except Philippines and Myanmar
Emission reduction potential	Indonesia: 1.05 MtCO ₂ e per year	1% efficiency → 2-3% CO ₂ emission reduction	Indonesia: 2.12 MtCO ₂ e per year	Highly variable*	Indonesia: 2.35 MtCO ₂ e per year
Challenges	- Resource availability, land-use concerns (sustainability) - Infrastructure and logistics issues	- Significant upfront investment - Limited technical capacity	- Economic viability - Regulatory gaps - Infrastructure complexity - Transboundary coordination	- Long-term, inflexible PPAs - Technical limitations - Grid integration complexity - Lack of financing	- Policy inconsistencies - Energy security concerns “No new CFPP” policies - Financial barriers

* Flexible coal plants have unpredictable generation and may still emit significantly if not replaced by renewables, while operating at low loads also increases air pollutants due to inefficient combustion and degraded pollution controls.



Way Forwards and Regional Cooperation 2026 – 2030 未来路径与区域合作 (2026-2030)

Reinforcing policy and regulation 完善政策法规体系

To establish a solid framework for consistency between coal transition targets and implementation plans through enforceable regulations and defined timelines. Ensuring a just energy transition emphasises the social dimension and joint strategies for reskilling workers, reclaiming land, and diversifying local economies.

Facilitating Transition finance 促进转型金融发展

Strengthen regional efforts to mobilise transition finance and define ASEAN's clear stance on coal's future role in unlocking funding access.

Capacity Building 能力建设

Regional cooperation with DPs'/IOs to provide policy guidance, technical assistance, training, and capacity building

Harmonizing Policies and Regulatory Frameworks 协调政策与监管框架

Establish ASEAN Coal Transition Roadmap aligns with ASEAN RE Roadmap.



Coal Transition in Southeast Asia:

Challenges, Lessons Learned, and Strategic Insights from the ASEAN RE Long-Term Roadmap

ASEAN CENTRE FOR ENERGY



The **ASEAN Plan of Action for Energy Cooperation (APAEC)** is the key strategic document in which the Association of ASEAN outlines regional energy priorities and cooperation initiatives in support of the ASEAN Economic Community (AEC).

《东盟能源合作行动计划》（APAEC）是该联盟为支持东盟经济共同体建设而制定的关键战略文件，其中明确了区域能源优先事项与合作倡议。



Read more at
go.aseanenergy.org/APAEC2026-2030

Thank you.

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