

## Renewable energy in asean

The ASEAN Member States (AMS), through the ASEAN Centre for Energy (ACE), presented the 8th ASEAN Energy Outlook (AEO8). The AMS endorsed this report at 42nd ASEAN Ministers Energy Meeting (AMEM) on 26th September 2024, hosted by Lao PDR.

The post-Covid-19 recovery presents a key opportunity to reshape ASEAN's energy landscape. With nearly one-tenth of the world's population and rapid urbanisation driving energy demand, the region saw a 15.2% annual rise in energy consumption in 2022, surpassing pre-pandemic levels. Energy security remains a concern due to geopolitical tensions, market volatility, and the low-carbon transition. To strengthen energy resilience, ASEAN must prioritise optimising and decarbonising its energy sector, ensuring access, affordability, efficiency, and security, while contributing to economic growth and global climate goals.

This 8th edition presents a comprehensive analysis of the current state of ASEAN's energy landscape and offers projections for several plausible future scenarios. Drawing on historical data from 2005 to 2022, the report provides forward-looking insights into the evolution of the ASEAN energy landscape until 2050. Building from its predecessor, AEO8 serves a critical reference, gearing up towards the final year of ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 Phase II (2021-2025), guiding the development of the new phase of APAEC 2026-2030, and monitoring the region's energy ambitions.

AEO8 retains two core scenarios: the Baseline Scenario (BAS) and the AMS Target Scenario (ATS). AEO8 introduces two new optimisation-based scenarios incorporating low-carbon and clean emerging technologies. The Regional Aspiration Scenario (RAS) integrates enhanced elements from the APAEC (Regional) Target Scenario (APS) and Least-Cost Optimisation (LCO) Scenario presented in the previous edition. RAS focuses on technology choices in the energy supply mix while adhering to ASEAN's energy efficiency and renewable energy targets. The Carbon Neutrality Scenario (CNS) charts pathway to achieving net-zero carbon emissions by 2050, which serves as an alternative scenario that considers enhanced decarbonisation efforts using the LCO of net-zero technologies.

As ASEAN grapples with the pressing challenges of balancing economic growth with sustainable energy use, Total Final Energy Consumption (TFEC) continues to rise across scenarios. In the BAS, demand is projected to increase by 2.6 times of 2022 level by 2050, and it could decrease by 33% in the ATS through national policies. The RAS and CNS push these TFEC reductions further. The reduction relies on transforming key sectors--transportation, industry, and residential--through greater efficiency and widespread adoption of electric vehicles (EVs) and low-carbon technologies, such as hydrogen.

ASEAN is expected to become a net importer of natural gas by 2027 under the BAS, raising energy security concerns as fossil fuel import increase. While coal exports are projected to continue until 2050, the volume is estimated to decrease over time. The ATS and RAS foresee a shift in the Total Primary Energy Supply (TPES)

as fossil fuel reliance decreases, with renewable energy gaining a larger share. CNS accelerates this transition, integrating advanced technologies, particularly emerging renewable energy sources such as tidal and wave power, reducing fossil fuel dependency significantly by mid-century.

By 2022, ASEAN had achieved an energy intensity reduction of 24.5% based on 2005 level, reflecting progress, but still falling short of the APAEC target of a 32% reduction by 2025. Similarly, the renewable energy share in the TPES reached 15.6%, leaving a significant gap in meeting the APAEC target of 23% by 2025. On the other hand, renewable energy in installed capacity is on track, with ATS projecting the region to exceed the 35% target, reaching 39.6% by 2025. The AEO8 highlights the need for enhanced energy efficiency, greater electrification, and further optimisation of renewable energy resources to close the gaps.

ASEAN's power generation is expected to make a substantial shift towards renewable energy, particularly solar and wind, with the RAS and CNS leading this transition. Energy storage technologies, including Battery Energy Storage Systems, will play a critical role in stabilising the grid and supporting the ASEAN Power Grid. Meanwhile, the region is on track to achieve near-universal electrification by 2040, with efforts to increase access to clean cooking accelerating under the RAS and CNS.

AEO8 examines the socio-economic impacts of each scenario, addressing critical areas such as energy employment (including job creation and losses), greenhouse gas emissions, energy financing, and land use for renewable projects, including biofuels, wind, and solar. This edition also presents forward-looking strategies for shaping ASEAN's regional energy blueprint, with a strong focus on resolving the energy trilemma while driving energy transformation. Key strategies include multilateral power trade, developing gas infrastructure, exploring CCS, smart demand response systems, renewable energy dispatchability, carbon pricing, and emerging technologies.

The report offers actionable insights into making ASEAN's energy system more accessible, reliable, affordable, and sustainable. It also provides policy recommendations to address resource challenges and highlights opportunities for regional cooperation, institutional capacity-building, and data improvement. Additionally, it suggests key model enhancements for future editions to ensure more comprehensive and practical insights for ASEAN's energy transition.

The Ministry of Economy, Trade, and Industry (METI) of Japan, including through the Economic Research Institute for ASEAN and East Asia (ERIA), the ASEAN Climate Change and Energy Project Phase II (ACCEPT II), the United States Agency for International Development (USAID) Southeast Asia Smart Power Program (SPP), the Australian Government through Partnerships for Infrastructure (P4I), and Energy Foundation China (EFC).

ASEAN Centre for Energy (ACE) is an intergovernmental organisation within ASEAN structure that represents the 10 ASEAN Member States' (AMS) interests in the energy sector.

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