

This is not an ADB material. The views expressed in this document are the views of the author/s and/or their organizations and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy and/or completeness of the material's contents, and accepts no responsibility for any direct or indirect consequence of their use or reliance, whether wholly or partially. Please feel free to contact the authors directly should you have queries.



South - South Knowledge Sharing on Air Quality and Carbon Neutrality
Air Quality and Climate Benefits of Energy Policies

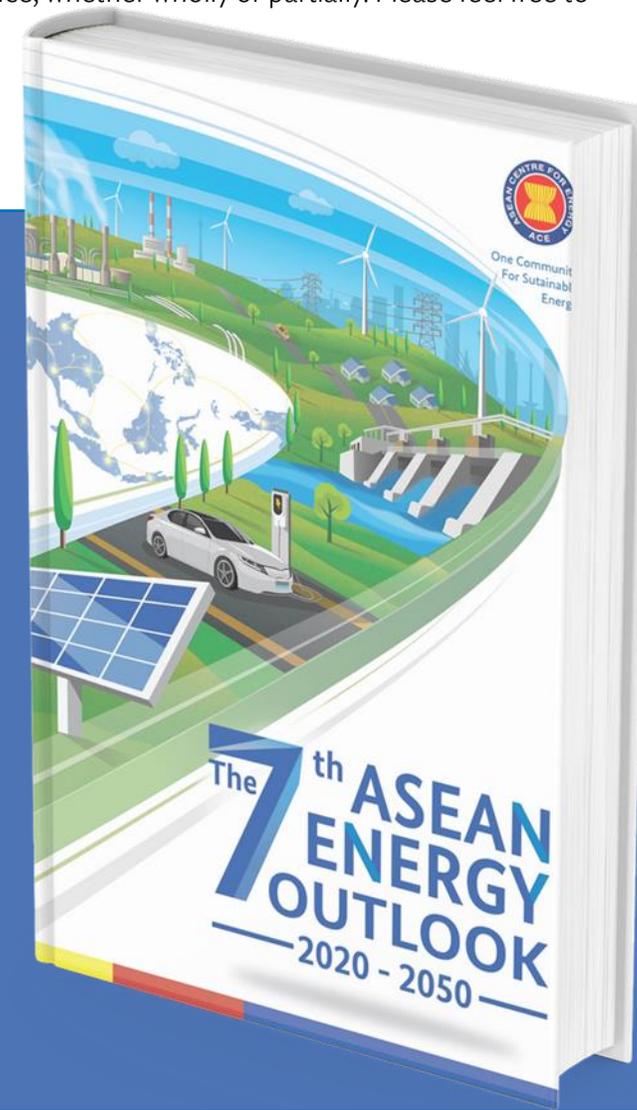
Navigating A Secure Energy Transition in ASEAN

Presented by:

Dr Zulfikar Yurnaidi

Manager, Energy Modeling and Policy Planning (MPP)

ASEAN Centre for Energy (ACE)



Energy Sector 2022:

Highlights to Maintain Energy Resilience and Sustainability



Fluctuation in Energy Supply Security

Evolving fossil fuel role on clean energy transition

The global energy crunch resulted in robust demands and **tight supplies in fossil fuel** sectors. Policy measures related to fossil fuel sectors were implemented to **ease energy price shocks**. The coal, oil, and gas industry also followed the path in the **transition into cleaner and more resilient energy**.



Turmoil amidst Energy Market Uncertainty

Sustainable pathways of power sector

The disrupted energy market has caused **uncertain electricity prices**. The power interconnection is expanded to **maintain energy security** and sustainability. **Adoption of digital technology** is expected to bring significant benefits to the power sector dealing with energy transformation.



Accelerating Initiatives towards Green Transition

Strengthening Regulation and Clean Energy Investment

Commitments to renewable energy have allowed **green economy growth**. The policy framework is improved to **enable the easy adoption of RE**. Solar is still spearheading the **growth of renewables** in the region along with hydropower, while the focus has been branched to the development of biomass.



Energy efficiency reinforcement, with EVs revolution

The focus on energy efficiency has been intensified through several incentives. Range of **energy-efficient technologies** has been installed, including in the transportation sector. The region turned to **join EV revolution** as part of their energy efficiency measures.

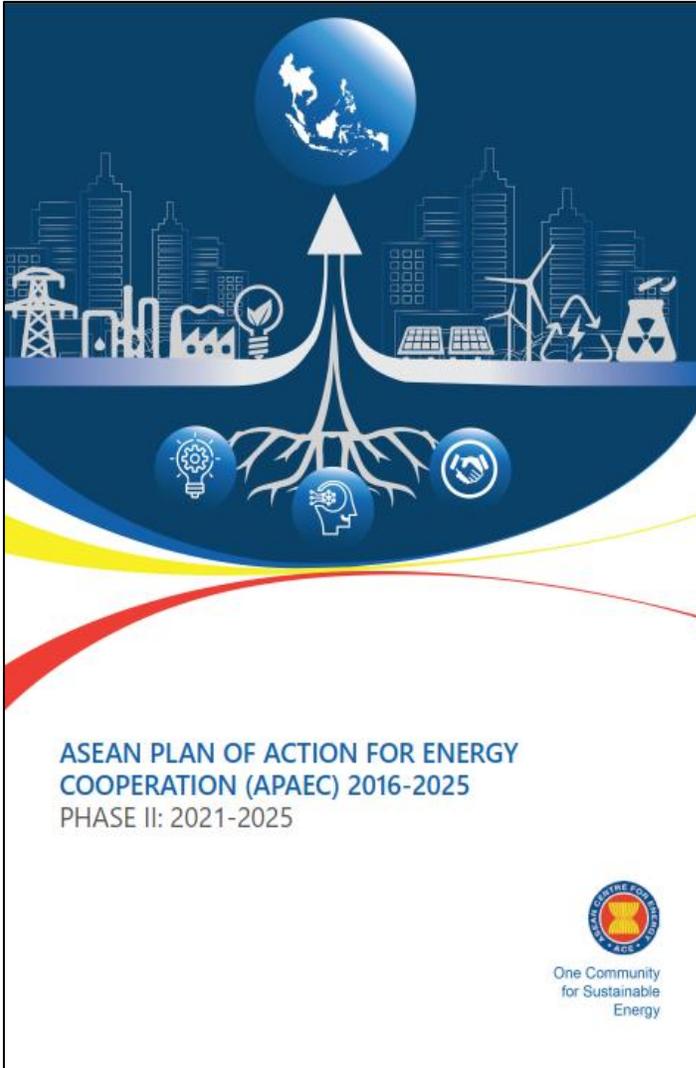
Sources:

2022 ASEAN Energy Clipping News

Regional Energy Cooperation Blueprint

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

Accelerating **Energy Transition** and Strengthening **Energy Resilience** Through Greater **Innovation and Cooperation**



1. ASEAN Power Grid

To expand regional multilateral electricity trading, strengthen grid resilience and modernisation, and promote clean and renewable energy integration.



2. Trans-ASEAN Gas Pipeline

To pursue the development of a **common gas market** for ASEAN by enhancing gas and LNG connectivity and accessibility.



3. Coal and Clean Coal Technology

To optimise the **role of CCT** in **facilitating the transition** towards sustainable and lower emission development.



4. Energy Efficiency and Conservation

To **reduce energy intensity** by 32% by 2025 and encourage **EE&C** efforts, especially in transport and industry



5. Renewable Energy

To **increase the share of RE** to 23% in TPES and 35% in installed power capacity by 2025



6. Regional Energy Policy and Planning

To advance energy policy and planning to **accelerate the region's energy transition and resilience**

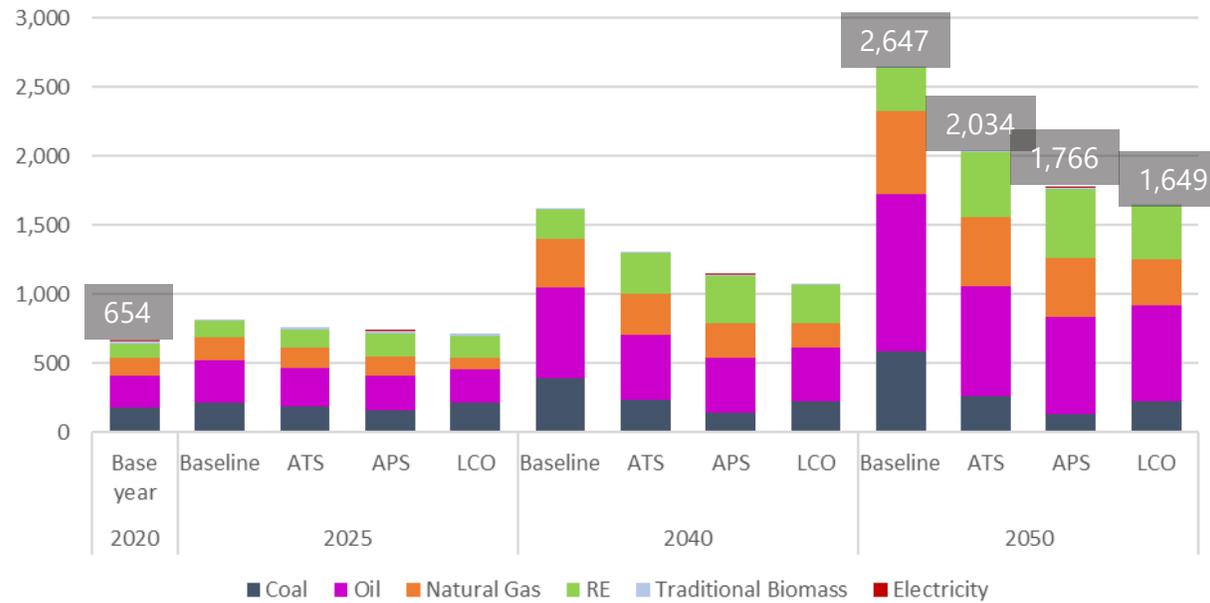


7. Civilian Nuclear Energy

To build **human resource capabilities on nuclear science and technology** for power generation.

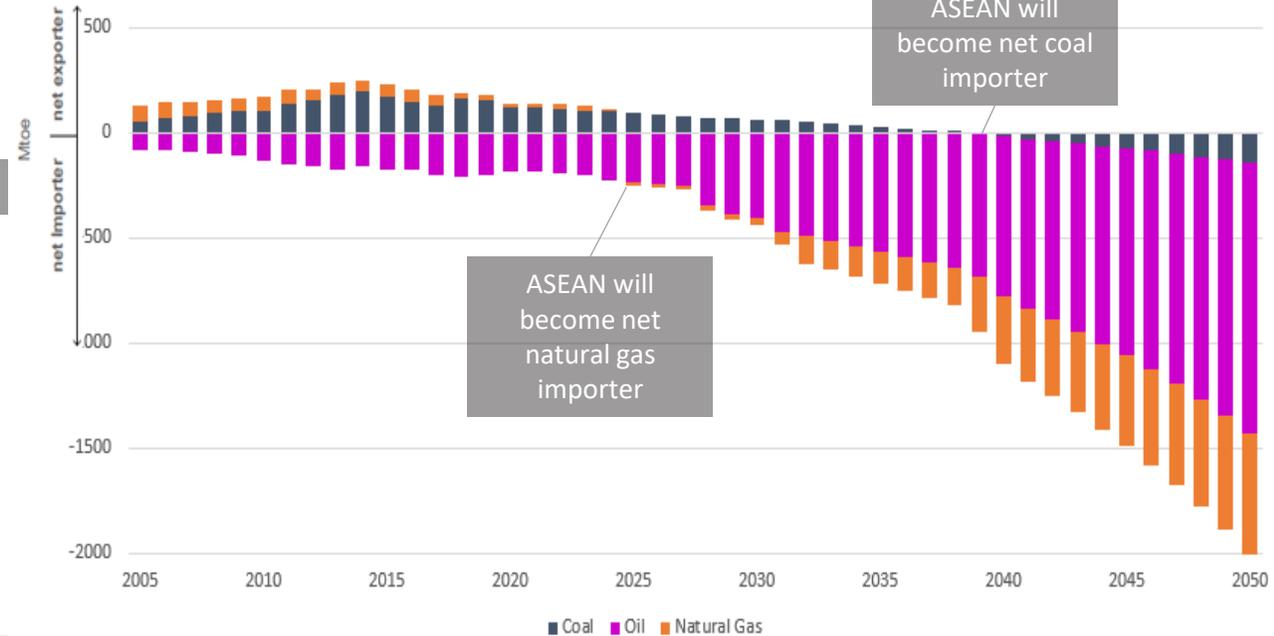
Pathways of ASEAN energy system and energy security

Energy Supply Projection (Mtoe)



- ❑ Baseline Scenario projected a 4x of energy required to fuel the economic growth from 2020 to 2050. Energy efficiency measures reduce the need of energy to 3x and 2.7x in ATS and APS.
- ❑ LCO Scenario reduces the demand further to 2.5x of 2020.
- ❑ In all scenarios, fossil fuels remain the largest component.

Net Import, Baseline Scenario

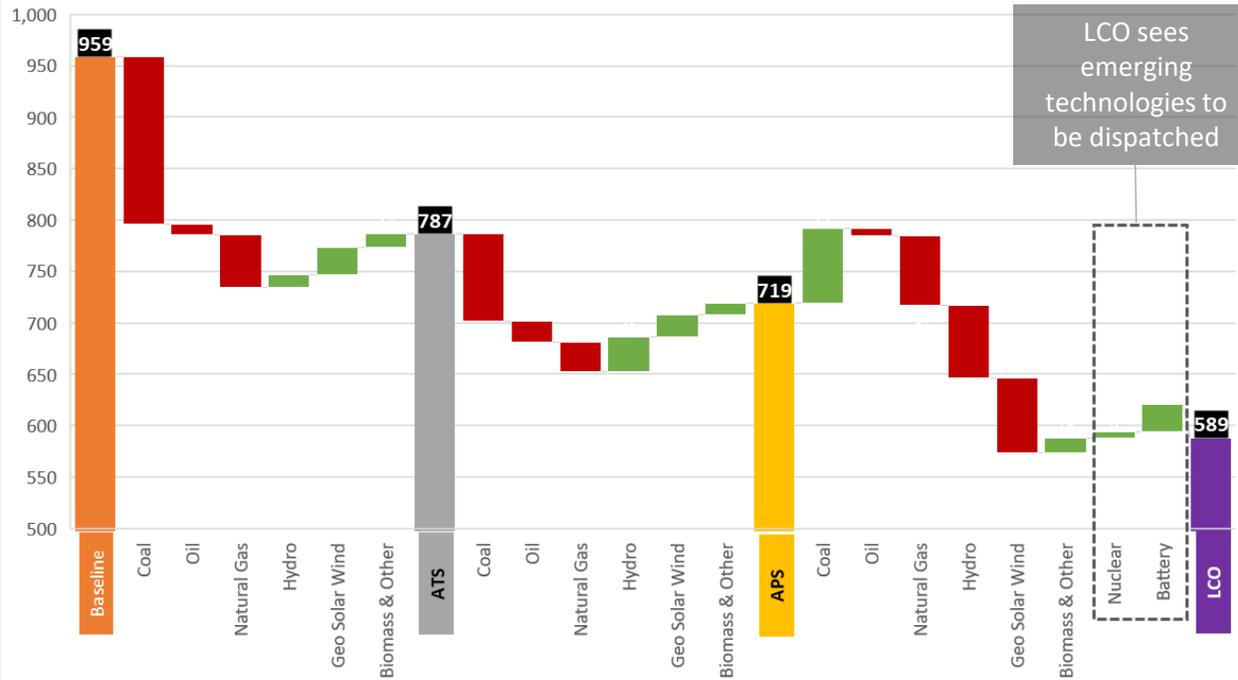


- ❑ In Baseline Scenario, without significant discoveries and/or additions to existing production infrastructures, and with continuous utilisation of fossil fuels, ASEAN would become net importer of natural gas and coal starting from 2025 and 2039, respectively.
- ❑ Previously, AEO6 projected the years to be 2024 and 2035.

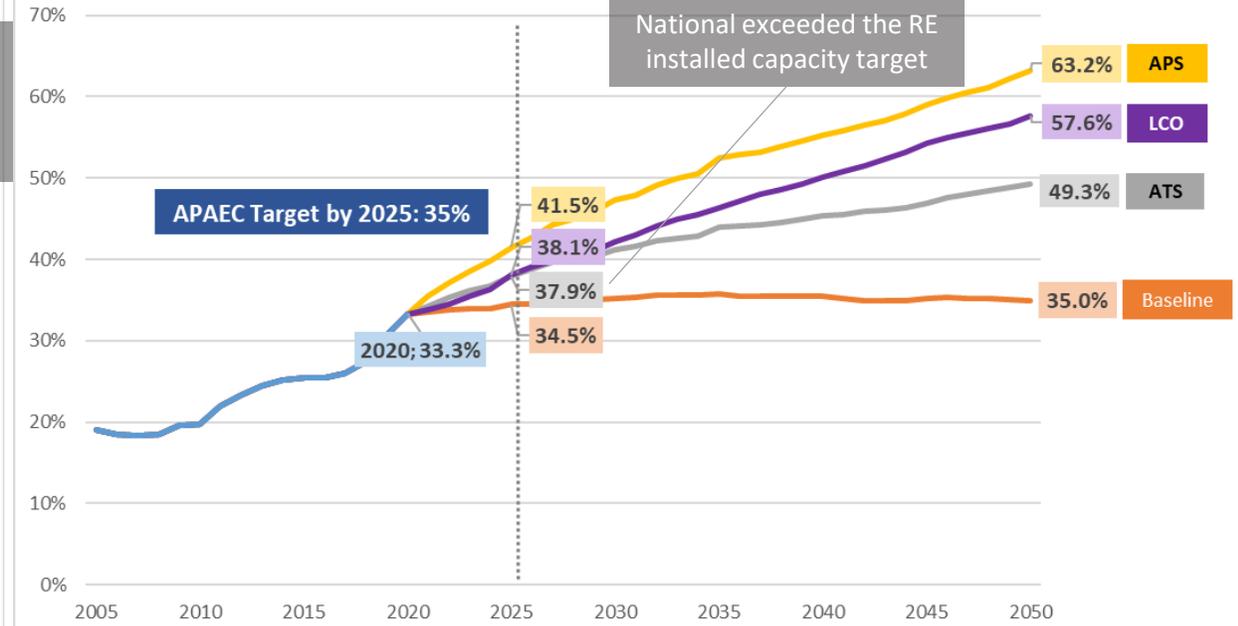
The evolving electricity generation system – capacity

2050 Installed Capacity fuel shifting, Baseline vs ATS vs APS

■ Increase ■ Decrease ■ Total



RE Share in Installed Capacity

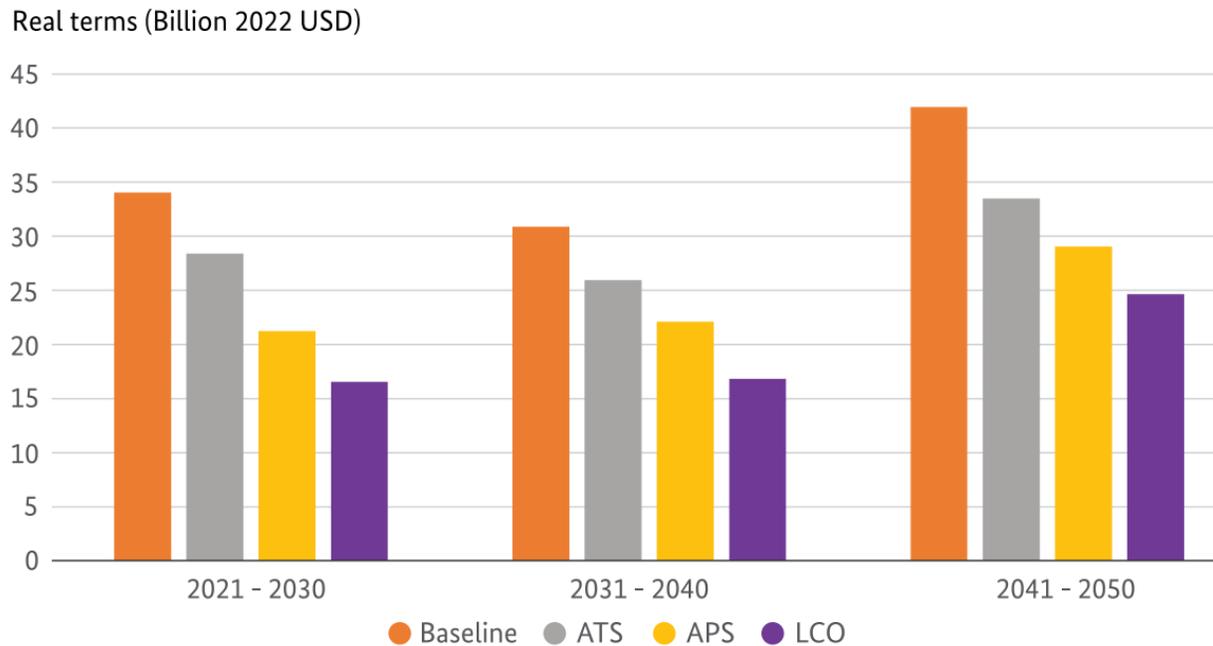


- ❑ As the needs of installed capacity decrease due to energy efficiency, clean energy penetrates the power system.
- ❑ Even with the same level of electricity need in APS, lower installed capacity is required in LCO Scenario. Coal, bioenergy, & nuclear replaces natural gas, hydro, solar & wind with battery penetration.

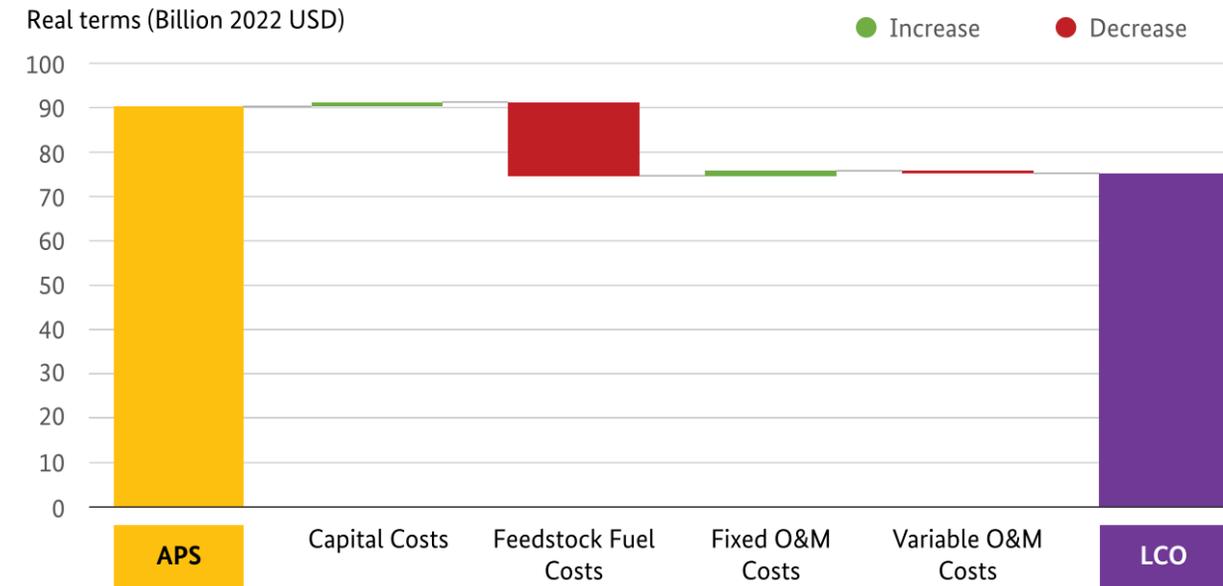
- ❑ In term of installed capacity, continuing national efforts would lead to the achievement of regional target, 37.9% of RE.
- ❑ In APS, 41.5% share can be achieved in 2025
- ❑ In the long term, a maximum of 63.2% RE share can be achieved in 2050. The LCO Scenario is set to maintain the regional targets.

Cost characteristics of power generation system

Annual Power Investment Cost



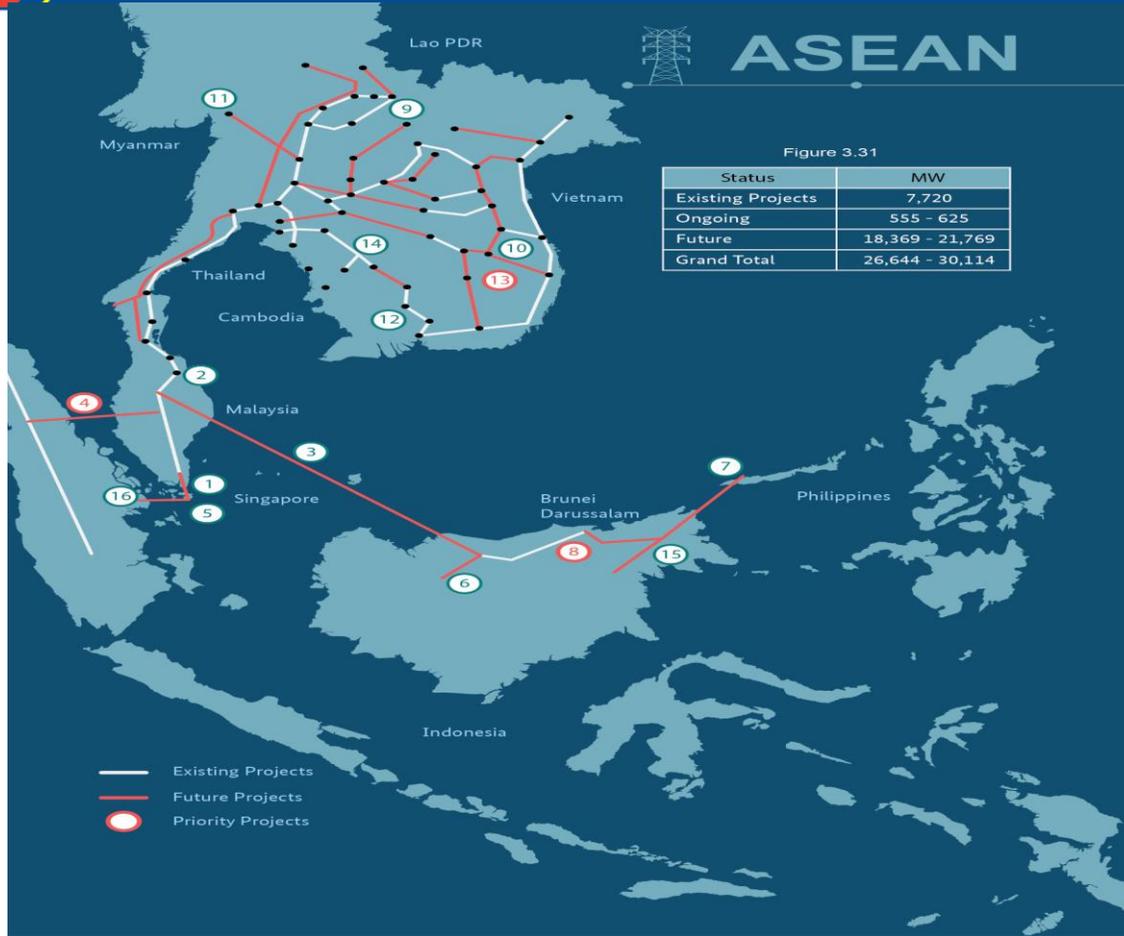
Power System Cost Shifting in 2025, APS vs LCO Scenario



- ❑ In the short term, investment cost gets higher from Baseline to ATS and APS due to higher penetration of RE. But in the long term, energy efficiency measures reduce the investment cost.
- ❑ Cumulative investment in 2021-2050 – Baseline: USD 1,070 billion; ATS: USD 879 billion, APS: USD 726 billion, LCO: USD 582 billion.

- ❑ Throughout the projection period, LCO Scenario cumulatively saves 80%, compared to APS. Note that this is while keeping APAEC target of 23% RE share in TPES.
- ❑ Highest reduction in term of production cost comes from the saving in fuel cost, followed by capital cost.

Significance of interconnection grid



ASEAN Interconnection Project Expansion Plan, LCO Scenario

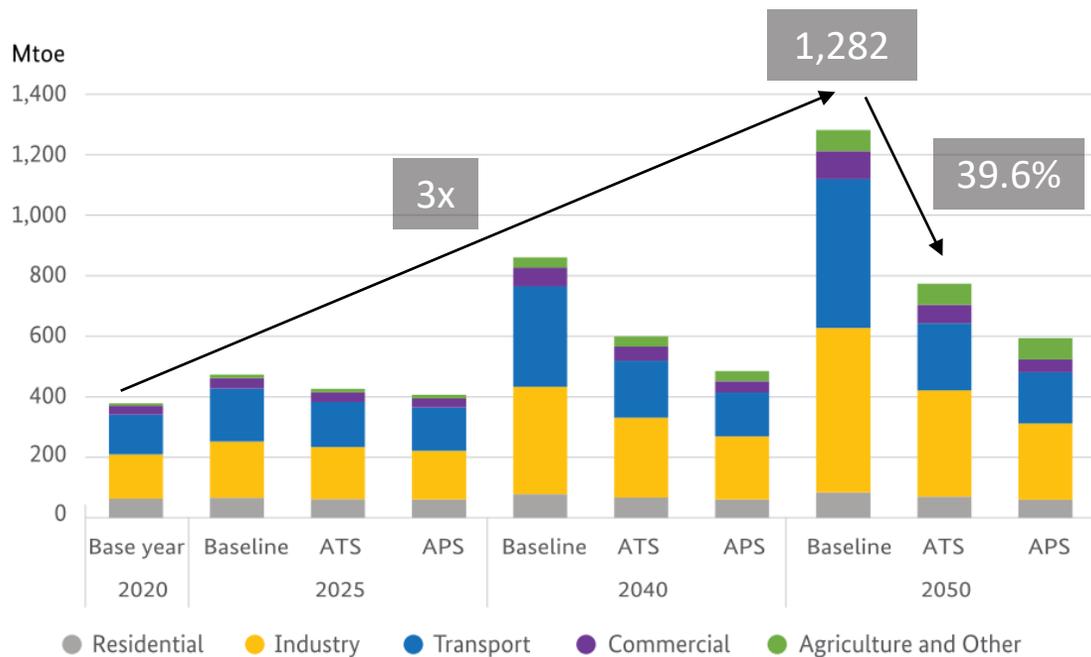
Future Projects	Construction Year (Capacity)	Total Construction Capacity (MW)
Thailand – Peninsular Malaysia	2025	400
Peninsular Malaysia – Sumatra	2025	600
The Philippines – Sabah	2030 (70 MW) 2031 (230 MW) 2032 (200 MW)	500
Sarawak – Brunei Darussalam	2025 (180 MW) 2026 (120 MW)	300
Lao PDR – Vietnam	2025	4,462
Thailand – Myanmar	2025	1,104
Thailand – Cambodia	2025 (590 MW) 2036 - 2043 (1,604 MW)	2,200

Realisation of ASEAN’s cross-border interconnection system with higher penetration of variable renewable energy (solar and wind), under the ASEAN Power Grid.

In LCO Scenario, shows a high preference for utilising existing and ongoing interconnections, particularly in neighbouring AMS.

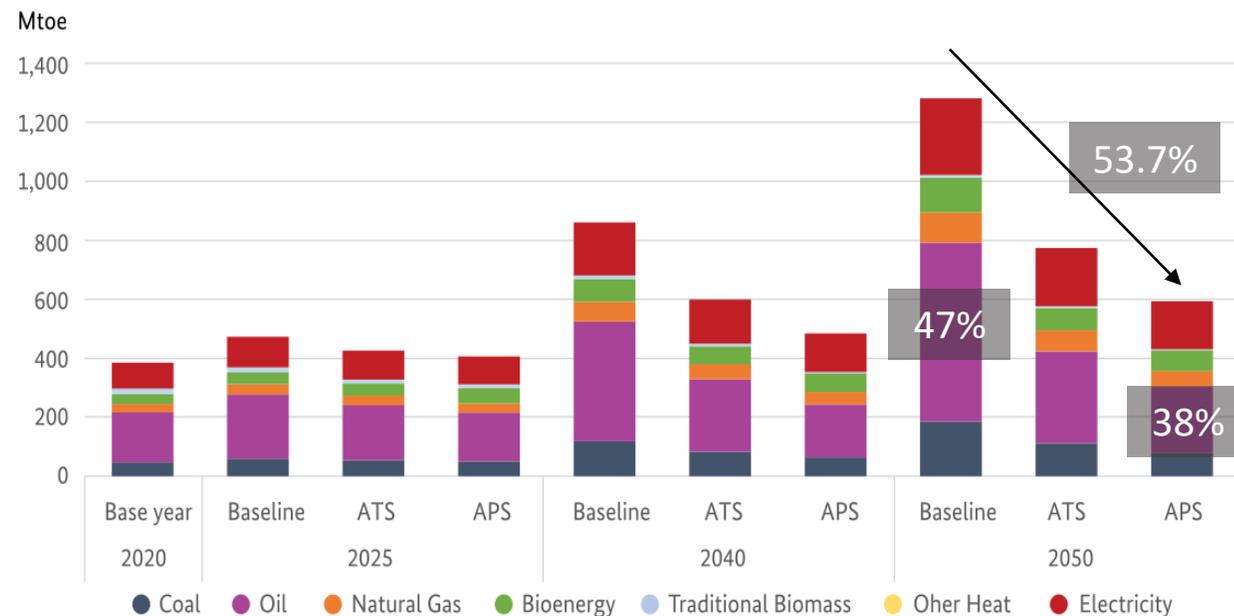
ASEAN energy demand: Industry-Transport and Oil

By Sector



Industry and transport sectors continue to be the highest energy consuming sectors in the region

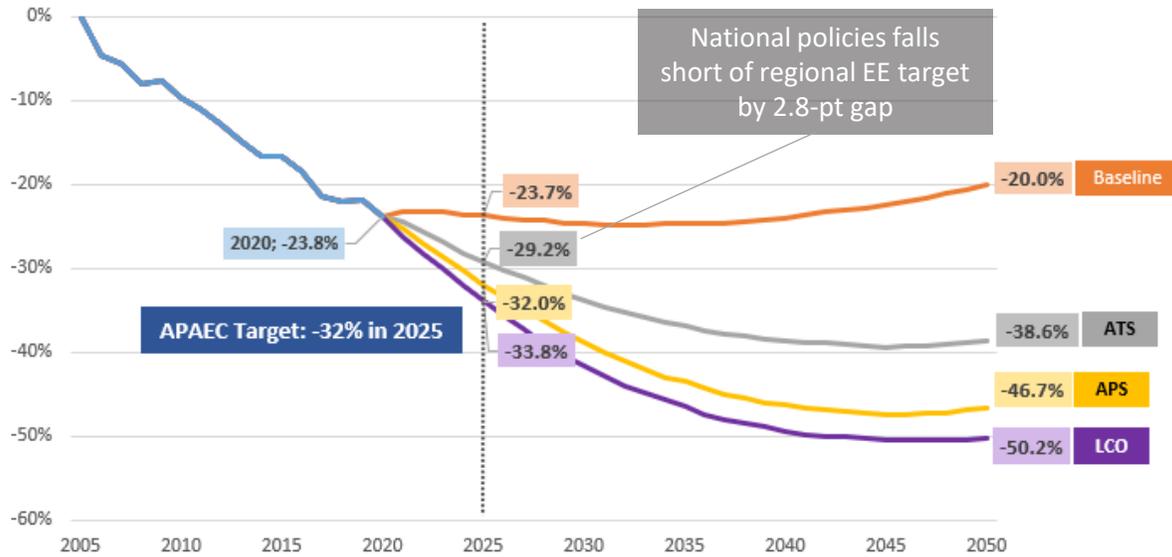
By Fuel



Oil products remain the largest to be consumed, with 47% share in 2050 Baseline Scenario, and reduced to 38% in APS for the same year

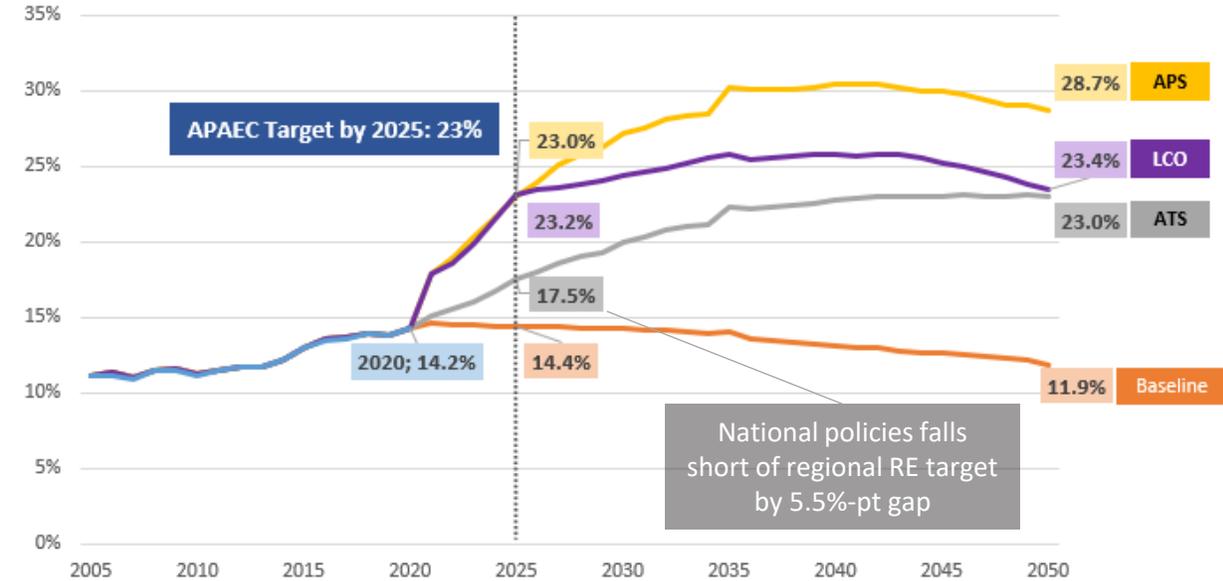
Progress and projections of APAEC EE and RE targets

AEO7 EE target monitoring across scenarios



In 2020, **Energy Intensity (TPES/GDP) reduction** reached 23.8% based on 2005 level, due to the economic contraction caused by the pandemic. Even so, AMS is projected to not reach the 2025 target, with a 2.8%-point gap

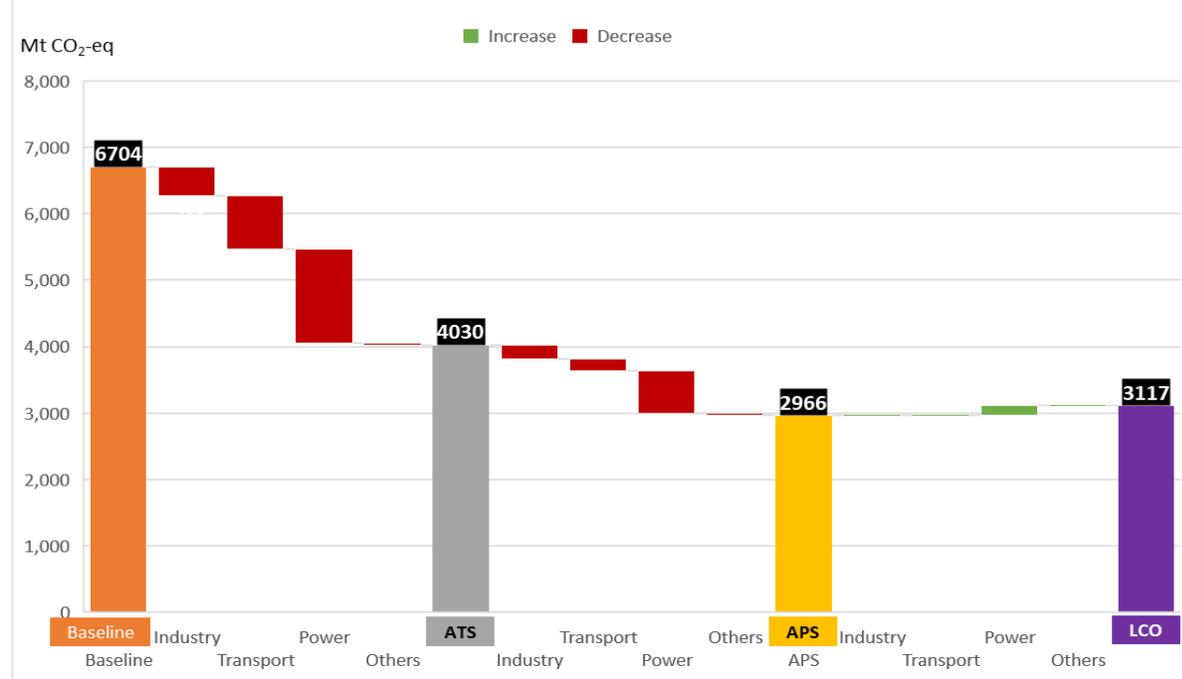
AEO7 RE target monitoring across scenarios



Amidst increasing installed capacity, **RE share in TPES** reached 14.2% in 2020. The same trend of national policy would result in 17.5% of share in 2025, 5.5%-point gap of the aspirational target

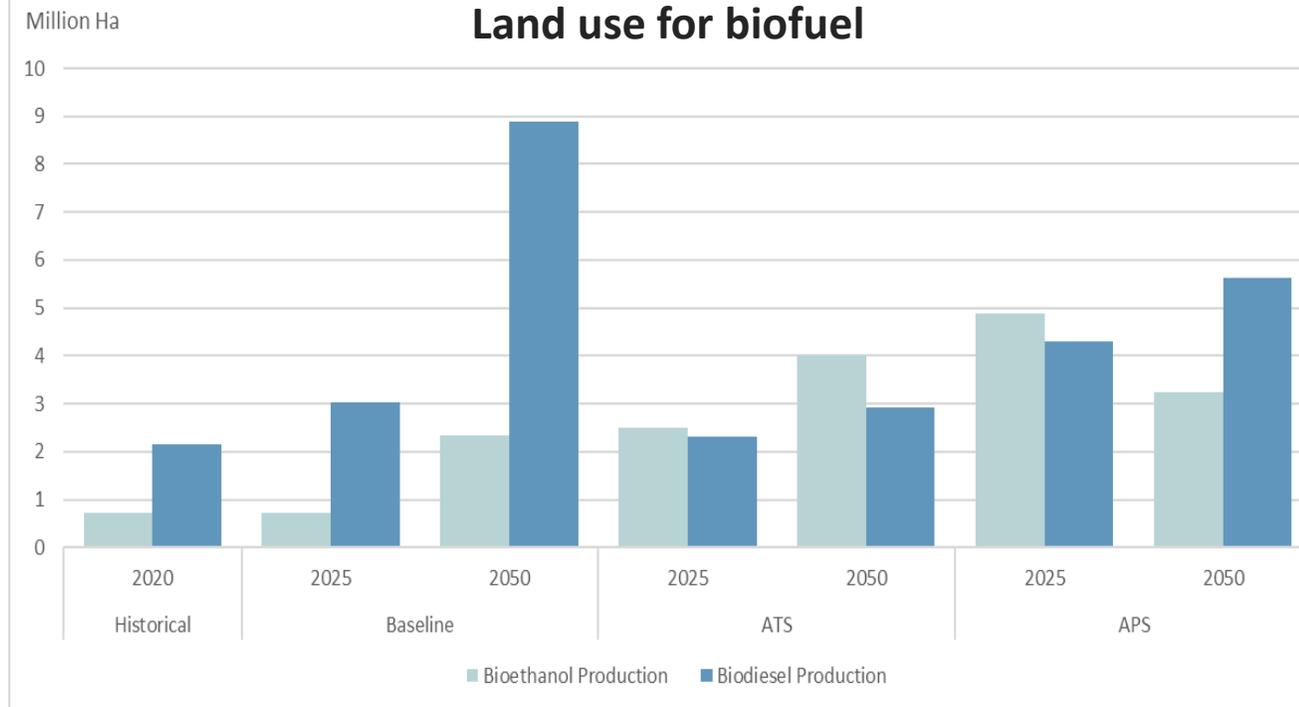
Sustainability: Emission and land use of biofuel

2050 ASEAN GHG Emissions



In 2050, the annual GHG emissions from energy system would reach 6.7 Gt CO₂-eq in Baseline Scenario

Land use for biofuel



In 2050 Baseline Scenario, 8.8 million Ha of land is required to produce biodiesel (oil palm) and 2.3 million Ha for bioethanol (sugarcane), or about 2.5% of the AMS land mass

Efforts to meet APAEC targets – demand side



Electric vehicle



Fuel economy



Mass transport



Clean cooking



**Efficient cooling
and lighting**



**Industrial
efficiency**

Efforts to meet APAEC targets – supply side



Grid infrastructure



Grid flexibility & interconnection



Power digitalisation



Hydropower



Geothermal



Bioenergy

Key Insights from the 7th ASEAN Energy Outlook

- Power and Supply – RE penetration should go beyond capacity, and translate to higher generation; All RE options should be optimized; For vRE, storage should be developed; Grid modernization and interconnection towards stability, flexibility, and resiliency is key; Securing energy should also consider geopolitics, materials availability, and reserve.
- End use sectors – Higher energy efficiency is a must (fuel economy, energy-efficient appliances), demand should be managed, electrification should be pursued (EV, cooking, etc.), and shift to more use of bioenergy (biofuel, biomass co-firing) and solar heating.
- Navigating secure and resilient energy transition should be the theme of the region energy system. All technology and policy options should be assessed in a comprehensive way, including efficiency, resource and materials availability, and end-of-life management.

Indonesia's ASEAN Chairmanship 2023



ASEAN
INDONESIA
2023  ASEAN MATTERS:
EPIPHANY OF GROWTH

Declaration on Sustainable Energy Security through Interconnectivity

- Power Interconnection

High-Level Policy Dialogue to Achieve Energy Security and NDCs

Thank You



ASEAN Centre for Energy
One Community for Sustainable Energy



Outlook on ASEAN Energy 2023

Key Insights about ASEAN Energy
Landscape and Trends in 2023



SCAN ME



@aseanenergy



@aseanenergy



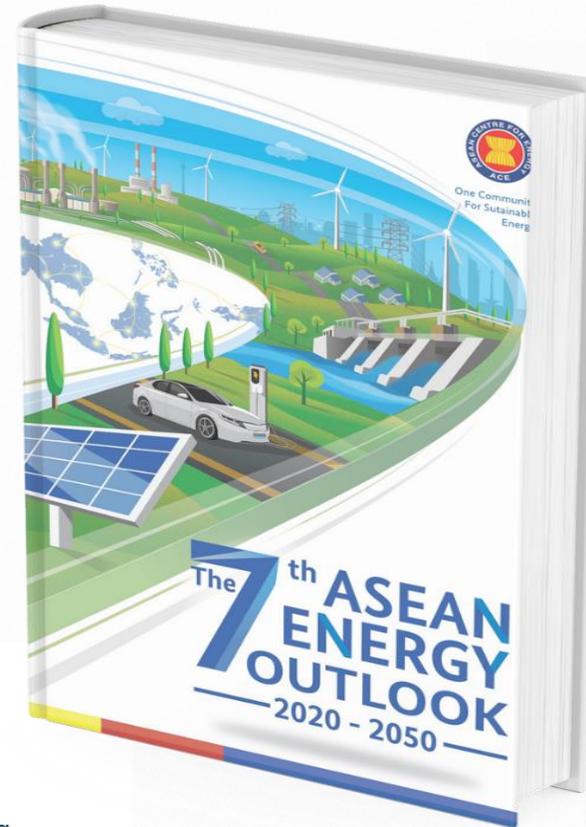
aseanenergy.org



@aseanenergy



aseancentreforenergy



SCAN HERE



[go.aseanenergy.org/AEO7](https://aseanenergy.org/AEO7)

<https://aseanenergy.org/outlook-on-asean-energy-2023>