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Powering Green Energy in Southeast Asia

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Preliminary Findings

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Energy contributes to environmental costs in ASEAN



Energy demand in the region projected to triple by 2050

CO2 Emissions (% of Environmental Costs)



Malaysia ASEAN



Power Generation, responsible for 37% of GhG emissions in Southeast Asia

- ASEAN: CO₂ emissions remains the second leading contributor in environmental costs
- Malaysia: CO₂ emissions was the leading contributor of environmental costs from 1970-1980 but has since been overtaken by natural resource depletion.

The ASEAN Power Grid has made significant progress

- > APG is divided into 3 geographic areas:
 - North system (CAM, LAOS, MYA, THA, VIE)
 - South system (INO, MAL, SIN)
 - East system (BRU, INO, MAL, the PHI)
- > As of Oct 2024: 9 out of the 18 interconnection projects completed
 - mostly through bilateral energy trade and long-term PPA
 - Ministerial level working groups have been established to facilitate cross-border electricity trading projects
- Recently efforts were made to advance APG interconnection through MPT
 - LTMS-PIP recently entered phase III doubling energy trade to 200 MW after agreement with Singapore and Malaysia to import 100 MW.
 - BIMP-PIP is also currently under way
- By 2030, region will need to invest \$200 billion to upgrade both domestic and regional infrastructure to fast track interconnection and energy transition

Baseline scenario: ASEAN economies follow the 2nd Shared Socioeconomic Pathways (SSP-2) which tracks closely with historical trends.

Policy scenarios: Results are expressed as deviations from the baseline

- Scenario 2: ASEAN Power Grid (APG) with Expanded Transmission Lines (ETLs) across 3 Sub-Regions (SRs) based on APG Map (April 2024)
- Scenario 3: APG with ETLs across 3 SRs as above, and incorporate the Optimum RE expansion scenario contained in the AIMS III scenarios
- Scenario 4: APG with ETLs across 3 SRs as above, and endogenous carbon tax to hit conditional NDCs for ASEAN economies
- Scenario 5: APG with ETLs across 3 SRs as above, and incorporate the High RE expansion scenario contained in the AIMS III scenarios

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Results are expressed as deviation from the baseline:

	Scenario 2	Scenario 3	Scenario 4	Scenario 5
GDP and Employment	4.5%	5.2%	6.7%	7.1%
Share of Renewable in Total Energy Mix	25%	31%	34%	59%
Trade of Renewable Energy	0.6%	4.9% ,	7.6%	9.5%
Fall in the Price of Electricity	5.1%	7.4%	9.8%	13.3%
Fall in GHG Emissions	1.5%	6.3%	9.1%	11.2%

 \succ in all the scenarios 2-5 compared to the baseline:

- Net exporters of electricity gain almost 1.3-1.6 times, vis-à-vis net importers of electricity
- Share of renewables in the total energy in the net electricity exporters rises by 1.2-1.7 times more than that in the net importers.
- Rise in renewable energy trade is 1.9-2.4 times higher in the net electricity exporters compared to the net electricity importers.
- Fall in electricity prices is 1.2-1.5 times higher in net electricity exporters than in net electricity importers
- Emissions also fall about 1.7-2.4 times higher in net electricity exporter than in net electricity importers.

All income groups benefit from the APG expansion

- Further decomposition show the regional income shares of 3 income groups in ASEAN:
 - Group 1: High income, high emission countries of Brunei, Malaysia, and Singapore
 - They gain about **32-36%** of all the new income generated.
 - Group 2: Middle to upper middle-income countries of Indonesia, Philippines, Thailand, and Viet Nam
 - They gain about 47-52% of all the new income generated.
 - Group 3: Low middle to low-income countries of Cambodia, Lao PDR, and Myanmar
 - They gain about **12-21%** of all the new income generated.

Three steps are essential to realize the APG benefits Core policy agenda:

- Institutional collaboration: important to build credible commitment, trust, and harmonized regulations
 - ASEAN also leans towards flexible, multi-speed, and multi-track approach
- Strategic planning: robust investment plan to expand energy infrastructure: including clean energy generation, grid interconnections, and investments in large scale batteries are crucial
 - Support from development partners, innovative financing, project preparation facility, and capacity building are needed to unlock private capital
- Market mechanism: Develop a robust but flexible market mechanism to guide electricity trading
- Others: RCI, knowledge and awareness, and capacity building



- Energy connectivity generates large economic and environmental benefits.
 - Energy connectivity makes renewable energy (RE) more profitable.
- Energy connectivity plus carbon tax bring largest benefits due to its trade effects, income effects, and allocative efficiency effects.
- These estimated benefits are indicative in nature and there could be some overestimation of the real benefits.
- Distributional analyses show that net exporters of energy will capture larger benefits than net importers
- > All income groups in the region share in the prospective benefits of APG.
- Strengthening institutional coordination, 2) adopting a clear and strategic plan for infrastructure investment, and 3) creating a flexible but robust market mechanism for electricity trading are essential.
- Knowledge, RCI, and capacity also matters.

Extra slides for additional reference

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Factors Shaping the ASEAN Energy Market

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Rising growth and prosperity

- 5% GDP growth average
- 680 million population
- Energy demand to triple in 30 years to 2050.



Untapped potential for renewable energy

- ASEAN targets 23% of RE share in total primary energy supply by 2025
- 35% RE share in electricity generation capacity by 2025.
- 97% of ASEAN's RE potential remains untapped.
- Region's installed capacity represents less than 3% of estimated potential.



Heavy reliance on fossil fuel and high carbon intensity

- Fossil fuel is 83% of primary energy supply
- 40% of GHG emissions comes from energy sector

Elevated and volatile oil and commodity prices

- Crude Oil Price
 - May 2022: US\$ 111.91/b
 - May 2024: US\$ 80.26/b
- 2025 Outlook for Crude Oil: US\$ 80.8/b

Regional commitment in clean energy and reduction of GHG emissions



• Current policies will only reach 17.5% renewables of total energy supply by 2025.

- Net-Zero Commitment
- Emissions Gap by 2030
 - Unconditional: 400 MtCO₂e (11% of current forecast)
 - Conditional: 900 MtCO₂e (24% of current forecast)

Boost to regional energy integration.

- Most CBET are bilateral or unidirectional
- Connectivity received boost through LTMS-PIP



ASEAN Power Grid is a tool to meet rising energy demand, attain sustainability commitment, stimulate growth, and promote regional





Decarbonization Policies in ASEAN

Country	Nationally Determined Contribution and Net Zero	RE Targets and Energy Policy	Transport and Urban Policy	Agriculture and Forestry Policy
Indonesia	 31.89% (unconditional), 43.2% (conditional) by 2030 Net zero by 2060 	 23% RE by 2025, 31% by 2050 Carbon exchange, FiTs, ban on new coal 	EV and biofuel focusGreen buildings mandatedPublic transport investment	 Agroforestry, REDD+, peatland restoration, green agri strategies
Malaysia	45% reduction in carbon intensity by 2030Net zero by 2050	 70% RE by 2050 No new coal power plants National Energy Transition Roadmap (NETR) 	 60% public transport share by 2050 EV incentives Sustainable city policy 	 National Agrofood Policy 2.0 Modern agrifood systems, green jobs Bioenergy from palm residues
Philippines	 75% reduction by 2030 (2.71% domestic, 72.29% conditional) No net zero year stated 	 35% RE by 2030, 50% by 2040; Feed-in Tariffs, RE Trust Fund Renewable Energy Act, Biofuels Act 	 Electric Vehicle Industry Development Act (2022) PUV Modernization Program Green Building Code (2015) 	 Organic Agri Act, green farming programs, forest restoration plans
Singapore	 Reduce to 60 MtCO2e by 2030 Net zero by 2050 	 2 GW solar by 2030 Carbon tax since 2019; R&D for Hydrogen/CCUS 	 75% peak hour public transport share by 2030 EV tax support, pedestrianization 	 30% local food production target Agri-food Cluster Transformation (ACT) Fund for sustainable farming
Thailand	 30% (unconditional), 40% (conditional) by 2030 Net zero by 2065 	 51% RE by 2037 Alternative Energy Development Plan 2018-2037, National Energy Plan 2024- 2037 Feed-in tariffs 	 30@30 ZEV goal by 2030 EV manufacturing incentives Urban transport focus 	 Organic farming expansion Agricultural climate action plan Crop insurance
Viet Nam	 15.8% (unconditional), 43.5% (conditional) by 2030 Net zero by 2050 	 20-30% RE by 2030/2045 Feed-in Tariffs, Solar Auctions, Tax Incentives 	 100% EV target Public transport expansion Green urban infrastructure 	 Green growth strategy Smart agriculture, afforestation, farmer credit

ECONOMIC

- creates larger market
- allows greater access to lowest cost resources
- increases supplier competition
- expands energy trade
- lowers electricity prices



ENVIRONMENTAL

- taps the vast renewable energy potential
- increases trade in renewable energy
- optimizes efficiency of energy mix
- lowers carbon intensity of energy
- supports NDC and net zero aspirations

ENERGY SECURITY

- reduces supply disruption
- smoothens demand shocks
- allows reserve capacity sharing
- diversifies supply
- provides better incentives for investments in generation and transmission



REGIONAL INTEGRATION

- increases economic interdependence
- mitigates conflict due to shared interests
- strengthens region's competitiveness

Role of private sector in powering ASEAN green energy

By leveraging its abundant solar, wind, hydro, and geothermal resources, Southeast Asia can cut energy-related emissions by 75% and cement itself as a global renewable energy powerhouse.

KEY OPPORTUNITIES for the PRIVATE SECTOR

Solar PV Manufacturing



Critical Minerals

- Southeast Asia holds large deposits of nickel, tin, and cooper which critical to clean energy technologies.
- Sustainable and transparent mining practices backed by innovation can unlock nearly USD 60 billion in mineral revenues by 2050
- Southeast Asia contributes 10% of the world's module capacity.
- Viet Nam and Malaysia are scaling production.
- Singapore are innovating with tailored rooftop solar solutions for dense urban settings
- Demand for local production, installation, and maintenance of solar infrastructure results in job creation and new market segments for green entrepreneurs.



- Lao PDR is expanding its hydropower sector; the Philippines harnesses geothermal; Vietnam is emerging as a wind energy leader.
- Singapore: Canopy Power is building hybrid microgrids with solar and storage for remote communities in Cambodia and Indonesia
- Thailand's BCPG and Power Ledger are pioneering blockchain-powered peer-to-peer renewable electricity trading



Despite its immense potential, Southeast Asia attracts just a fraction of global renewable investments, with private capital playing a smaller role compared to developed markets. The challenge for the private sector is how fast can we scale up green investments.