From emission-intensive to investment hotspots: Championing renewables in 3 ASEAN economies

Viet Nam, the Philippines and Indonesia have the resources and workforce to lead ASEAN's clean energy future, but turning potential into progress hinges on creating stable, predictable policies and taking bold and near-term actions to secure investment and stay competitive.

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Contents

About 3

Key highlights 3

Executive summary 4

Chapter 1: Country snapshots and opportunities 9

1.1 Country snapshots 10

1.2 Clean energy: The emerging opportunity 13

Chapter 2: Market trends & mechanisms 16

2.1 Viet Nam: Tapping into corporate purchase to double renewables share 18

2.2 The Philippines: Opening the market for foreign investors 20

2.3 Indonesia: PPA adjustment as catalyst for renewables boost 22

Chapter 3: Solar project economics in three countries 24

3.1 Project returns values differ among countries, with higher returns in project with batteries 25

3.2 Policy certainty can derisk clean energy investment 29

3.3 Increasing PPA bankability through tariff indexation and clearer risk allocation 30

Conclusion 32

Supporting materials 33

Methodology 33

Acknowledgements 35

About

This report analyses how evolving market trends and policy instruments are shaping energy transition in Viet Nam, the Philippines and Indonesia. By analysing key policy tools such as direct power purchase agreements, auction mechanisms and comparing solar project performance, it maps out pathways to strengthen investor confidence and reduce market and operational risks.

Key highlights

13–73 GW

Solar capacity target range by 2030 for Viet Nam, Indonesia and the Philippines

11%–16%

Internal rate of return range in Indonesia and the Philippines

≤9

Percentage point increase in IRR from solar plus battery integration

Executive summary

Strong policies and clear investment frameworks key to unlocking Viet Nam, Philippines, and Indonesia's clean energy potential

The clean energy transition in Southeast Asia has reached a critical inflection point. Viet Nam, the Philippines, and Indonesia – accounting for nearly 60% of ASEAN's power demand and emissions – are rapidly transforming from coal-reliant, emissions-intensive economies into emerging hotspots for renewable investment. Robust policy frameworks, market reforms and targeted incentives are now setting the stage for these nations to anchor ASEAN's clean energy future.

By 2030, Viet Nam, the Philippines and Indonesia each aim for renewables accounting for over half of their installed capacity – among the boldest commitments in ASEAN. Viet Nam has set a target of 73 gigawatts (GW) of solar, the Philippines 14 GW, and Indonesia 13 GW. However, turning this ambition into actionable progress hinges on overcoming persistent bottlenecks and creating a stable, investment-friendly environment.

The momentum is in the right direction. In 2024 alone, this trio attracted $4.6 billion in clean energy investment, a $1.1 increase from last year's. But even more robust policy frameworks and decisive reforms can derisk and attract private long-term investment.

Viet Nam's move to enable direct power purchase agreements could double its renewable electricity share, offering producers and buyers a clear path to cleaner power and carving out new revenue streams. The electricity market is gradually being liberalised, with policies that invite private and foreign participation and open opportunities for blended finance models.

Similarly, the Philippines continues to champion market openness. It has removed foreign ownership restrictions in the renewable sector and introduced competitive mechanisms for energy procurement, such as the Green Energy Auction, which integrates storage solutions and streamlines project delivery through digital permitting platforms.

Indonesia, in turn, is advancing regulatory frameworks with risk-sharing provisions in power purchase agreements, new ownership models, and policies that give value to carbon credits and other environmental attributes. This signals an emerging recognition that policy innovation and regulatory clarity are fundamentally necessary if Indonesia is to unlock its abundant solar and wind potential and maintain momentum in foreign investment.

Technology and financing will continue to shape the bottom line. Battery storage projects in Indonesia have propelled internal rates of return of solar projects from 14% to 23%, while similar strategies in Viet Nam and the Philippines are yielding competitive returns and underpinning grid reliability.

Even so, the financial viability of projects in all three markets remains extraordinarily sensitive to power tariffs and upfront capital costs; a 10% variation can shift project returns by as much as 45 percentage points (pp). Exchange rates, equipment fluctuations, and persistent permitting delays all pose ongoing risks. Addressing them through further regulatory coherence and financial innovation will help the nations attract more investments.

ASEAN's energy transition depends on cementing stable, predictable policies around tariffs, risk allocation, and auction design; fast-tracking approvals and grid integration; supporting hybrid and storage-enabled projects with the right market signals; and rapidly expanding access to investment through blended and local currency finance. Viet Nam, the Philippines and Indonesia have the opportunity to show leadership in this regard.

By doubling down on execution, market flexibility, and investor confidence, the three countries can accelerate on the pathway to clean energy leadership in the region. With the right market foundations and a spirit of bold, coordinated reform, Viet Nam, the Philippines, and Indonesia can unlock private and public capital on an unprecedented scale, accelerate decarbonisation across the region, and deliver a resilient, competitive energy future for years to come.

01 **Viet Nam's renewable push includes a 73 GW solar goal by 2030, while the Philippines and Indonesia target 14 GW and 13 GW, respectively.**

While all three countries are targeting ambitious renewable energy capacity of 51%–61% in their power mix with solar capacity additions featuring prominently, the scale of their planned build-up varies. Viet Nam aims for a substantial deployment of 73 GW of solar by 2030, while the Philippines targets 14 GW and Indonesia 13 GW. These targets highlight each country's push to unlock its solar potential and position solar as a central pillar of their clean energy transition.

02 **Corporate buyers can drive clean energy investment flow.**

Viet Nam's full implementation of Direct Power Purchase Agreement can roughly double its renewable energy share, from 19% to 42%, assuming that the whole processing sector joins the scheme. Meanwhile, Indonesia's and the Philippines' streamlined permitting and green industrial zones focus can boost renewable procurement by corporates. This demonstrates how corporate participation and market reforms are seen as catalysts for accelerating renewable deployment across the three economies.

03 **Solar plus battery integration can increase project returns by at least 1.2 percentage points in Viet Nam and 9 percentage points in Indonesia, while maintaining steady returns in the Philippines.**

Indonesia records an IRR of 14% for solar projects, the Philippines with a range between 11%–16% and Viet Nam at 6.1%. Integrating batteries significantly increases returns – up to 23% in Indonesia and 7.3% in Viet Nam. This highlights growing recognition of battery storage as a value-adding component in renewable projects, enhancing profitability and system reliability across the region.

04 **A 10 pp change in PPA prices and capital costs can shift IRR by up to 45pp.**

The model shows that project returns in the three countries are highly sensitive to PPA terms and capital costs. A 10 pp change in PPA rates can shift IRR by 33–45 pp, while a 10 pp difference in capital costs can change IRR by 18–41 pp. This highlights how small variations in tariff levels or capital costs can significantly affect project profitability and overall financial viability.

Southeast Asia is firing on all cylinders to build an integrated, competitive, and resilient region – and energy is at the heart of this transformation. Accelerating clean energy deployment will require stronger regional governance, harmonised planning, and coordinated resilience strategies. Bold reforms are essential to place renewables at the forefront of the region's energy security.

Dr Dinita Setyawati
Senior Energy Analyst, Ember

President Prabowo's Asta Cita on energy resilience and downstreaming natural resources are one of the main drivers of national economic growth. Indonesia continues to push for a clean energy transition by optimising all available natural resources. The energy sector holds great potential for job creation, thus, efforts to enhance renewable energy use also focuses, in addition to on-grid electricity, on captive sectors, developing storage systems, biofuel, energy efficiency and clean energy investment.

Dr. Dadan Kusdiana
Secretary General
Ministry of Energy and Mineral Resources,
Republic of Indonesia

Southeast Asia has no shortage of renewable energy ambition but lacks systems that work. A multi-trillion-dollar opportunity is stalled by circular bureaucracy, outdated permitting, and neglected grid infrastructure. With smart governance reforms and decisive execution, megawatt targets will mean something, energy security will be achieved, and foreign investment will flow into the region.

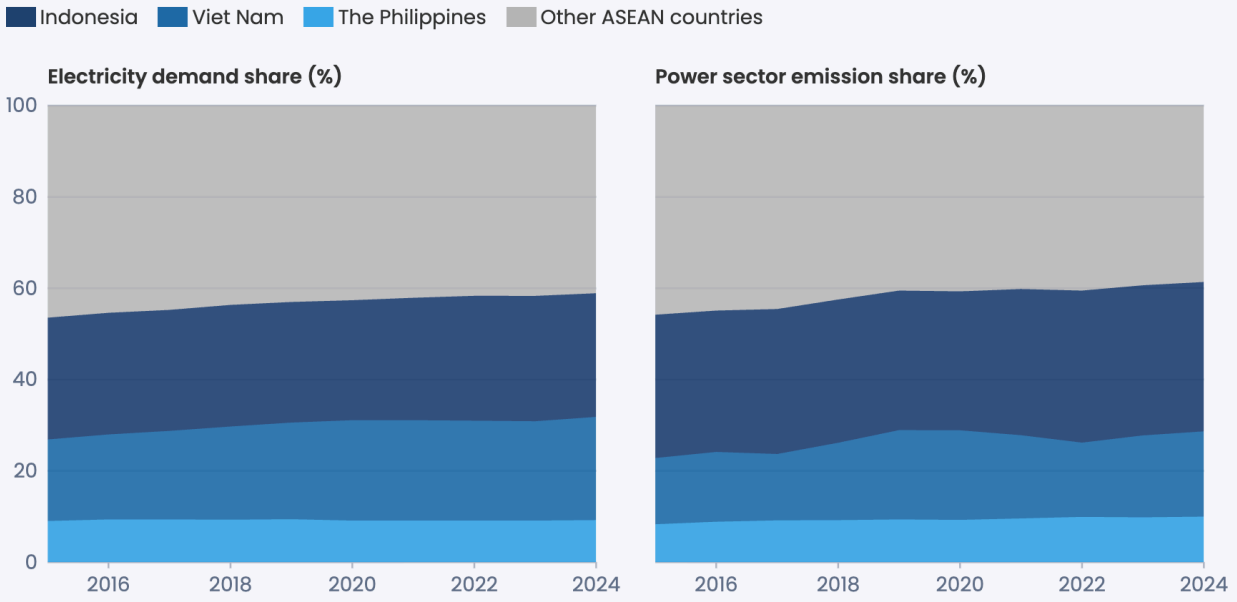
Atem S. Ramsundersingh
CEO, WEnergy Global Ptd Ltd (Singapore)

Three countries, one regional pivot

From emissions-intensive to investment hotspots, Viet Nam, Indonesia and the Philippines are at a defining moment. Together, they drive nearly 60% of ASEAN's power demand and emissions. But these traditionally fossil fuel-reliant nations are also pivoting to clean energy. The three countries attracted $4.6 billion in clean energy investment in 2024. Surging industrial demand from AI, data centres, and electric vehicles creates a unique opportunity to fast-track their energy transition.

Coal still supplied 45% of ASEAN's electricity in 2024, and the three countries drove a 76% share of that demand. Between 2014 and 2024, Viet Nam, Indonesia and the Philippines together accounted for 24-34% of ASEAN's total coal use. In 2024, Indonesia contributed 17%, Viet Nam 11%, and the Philippines 6%.

Indonesia, Viet Nam and the Philippines contribute to about 60% of energy demand and emissions in Southeast Asia in the past decade



Source: Annual electricity data, Ember; Viet Nam's adjusted national power development plan for 2021-2030; Philippine Energy Plan Volume I 2023 - 2050; Indonesia's National Electricity Master Plan 2025-2060; The 8th ASEAN Energy Outlook

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But the three historically coal-dependent countries are beginning to turn the tide. While coal remains central to their energy mix, momentum is shifting as governments raise renewable targets and reform electricity markets.

As nations with growing manufacturing hubs, a young workforce, and growing appeal to energy investors, the three countries can lead the charge on renewable energy.

Based on national power development plans, each country aims for solar, wind, hydro, geothermal and biomass to make up more than 50% of its installed capacity mix by 2030–2034, some of the most ambitious national energy targets in the region.

Under the recently approved APAEC 2026–2030, ASEAN has also raised its collective ambition to 30% renewables in total primary energy supply and 45% in installed power capacity by 2030. For these three economies, the challenge now lies in translating ambition into concrete progress on the ground.

1.1 Country snapshots

Viet Nam

Viet Nam is one of Southeast Asia's fastest-growing economies. Between 2013 and 2023, its gross domestic product (GDP) grew by an average of 6.7%, with the pace reaching 8% in 2022. Rising foreign investment, which surged 9.4% between 2023 and 2024, has reached $25 billion, supporting economic growth. Processing and manufacturing, real estate, energy-related sectors and the digital economy attracted most of this investment. Further, the country was also the third-largest recipient of China's public clean energy investment in Southeast Asia, attracting $694 million between 2013 and 2023.

Rising industrial activity has driven steady growth in electricity demand, averaging 8.2% between 2013 and 2024. In fact, electricity demand increased even during the COVID-19 pandemic, when regional demand declined. Simultaneously, coal-based electricity generation grew 28% between 2013 and 2024 to meet the rising demand.

Viet Nam has also been ramping up renewable electricity generation at the same time. Between 2015 and 2024, it led the region in new wind (+9 TWh) and solar (+12 TWh) generation. The country's first offshore wind farm is now set to operate by the end of this year, signalling plans to export to its neighbouring countries, Singapore and Malaysia.

As more variable renewable energy enters the grid, Viet Nam is also taking measures to maintain grid stability. A key move was the introduction of a new net-metering scheme, aimed at encouraging rooftop solar while ensuring a stable grid. Decree 135 emphasised self-consumption and restricted surplus energy sales of no more than 20%. The government is also evaluating battery storage integration in alignment with the national power development plan (PDP8).

It is also exploring smart grid technologies, such as real-time dispatch systems, demand-side response, and predictive analytics, which are essential tools to manage variable solar output. As renewables expand, battery storage is emerging as a critical enabler for grid stability and solar integration, an area the government has started to prioritise.

These reforms, along with the Direct Power Purchase Agreement (DPPA), signal Viet Nam's pivot toward a more competitive and consumer-driven electricity market, setting the stage for deeper market liberalisation.

The Philippines

The Philippines' foreign direct investment (FDI) inflows reached $8.9 billion in 2024, driven by investments in manufacturing, real estate, renewable energy and telecommunications. The country's market openness continues to attract clean energy investors, accumulating clean-energy investment growth from $2.6 billion to $3.4 billion, between 2015 and 2024.

The Philippines' power mix remains dominated by coal and gas (77%), with other energy sources providing around 22% of generation in 2024. Between 2020 and 2024, solar generation nearly tripled (+2.3 TWh), while wind grew modestly (+0.2 TWh).

Solar additions between 2015 and 2024 was 2.8 gigawatts (GW), while wind capacity saw minimal growth, with additions of just 0.01 GW during the same period. Hydro capacity additions in the past decade amounted to about 0.3 GW.

Policy consistency and market openness are key to sustaining renewable growth. The Philippines operates on a fully liberalised electricity market, with the Wholesale Electricity Spot Market (WESM) running on three main islands. The government's Green Energy Auction (GEA) Program and Green Energy Option Program (GEOP) have driven corporate demands for renewables, which signals a mature environment for foreign investment and private participation.

Indonesia

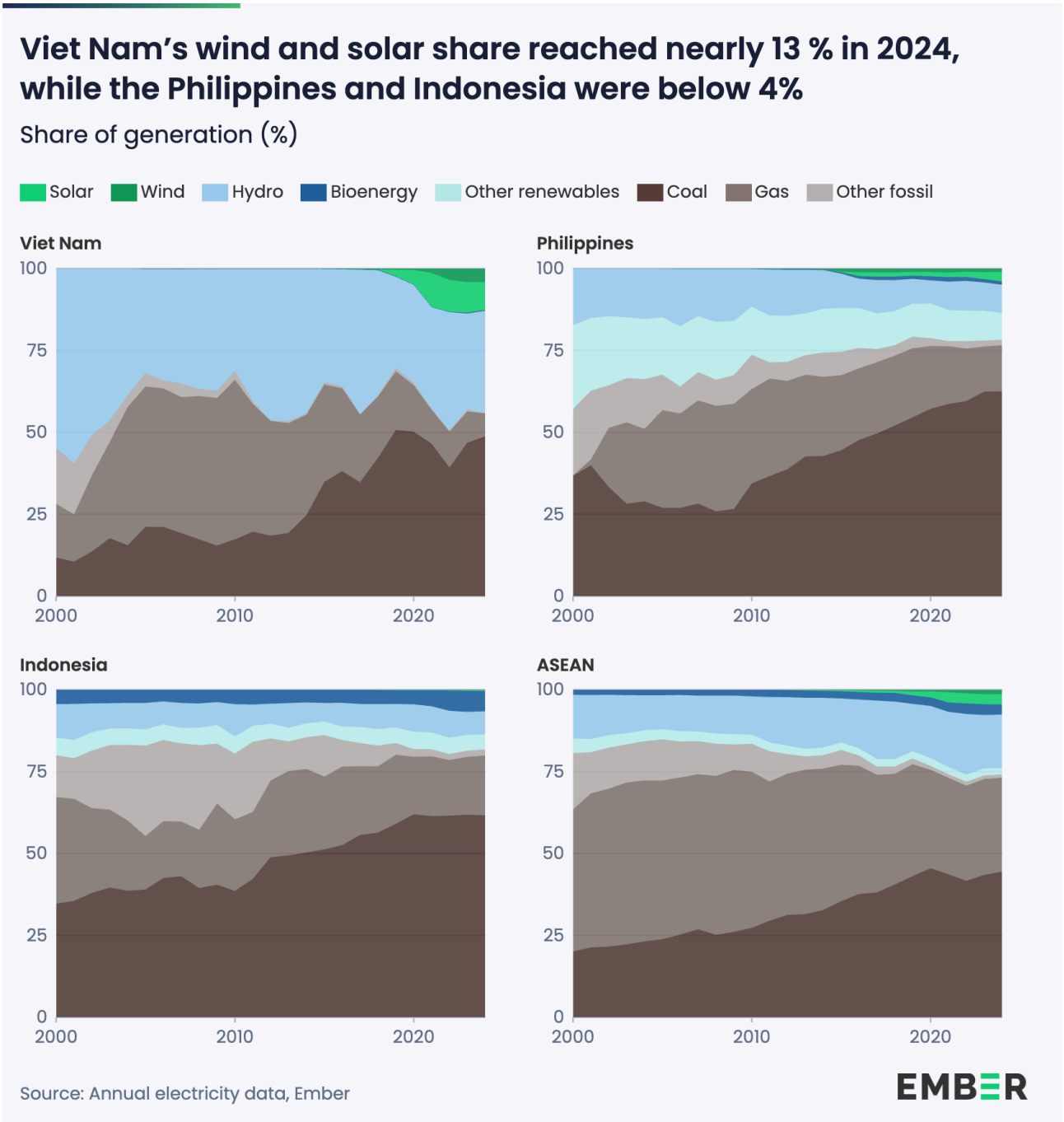
The FDI inflows to Indonesia in 2024 was $24 billion, ranked second after Singapore in ASEAN. Strong investment growth is driven by health care, manufacturing, automotive, and particularly, downstream mineral industrialisation. The government's push to build a regionally competitive electric vehicle (EV) ecosystem is set to further drive up electricity demand.

Indonesia's power mix is heavily coal-dependent (62.5% in 2024), with other energy sources, mainly hydro, bioenergy and geothermal, accounting for the rest. Solar and wind generation grew modestly by 2.4% (+0.88 TWh combined) between 2019 and 2024.

Rapid industrialisation, particularly in the nickel sector, has driven a surge in captive coal plants, now totalling 16.6 GW, accounting for 30% of the country's total coal-fired installed capacity (54.7 GW). This is expected to reach 26.2 GW by 2026.

Despite this, there is new momentum for renewables in Indonesia. The country's floating solar plants in Cirata demonstrated the technical viability of solar technologies in the new terrain and the government plans to install 100 GW of solar across the country, including the 250 MW Mentari Java Project. Under RUPTL 2025–2034, PLN targets 60 GW of new renewables with battery storage.

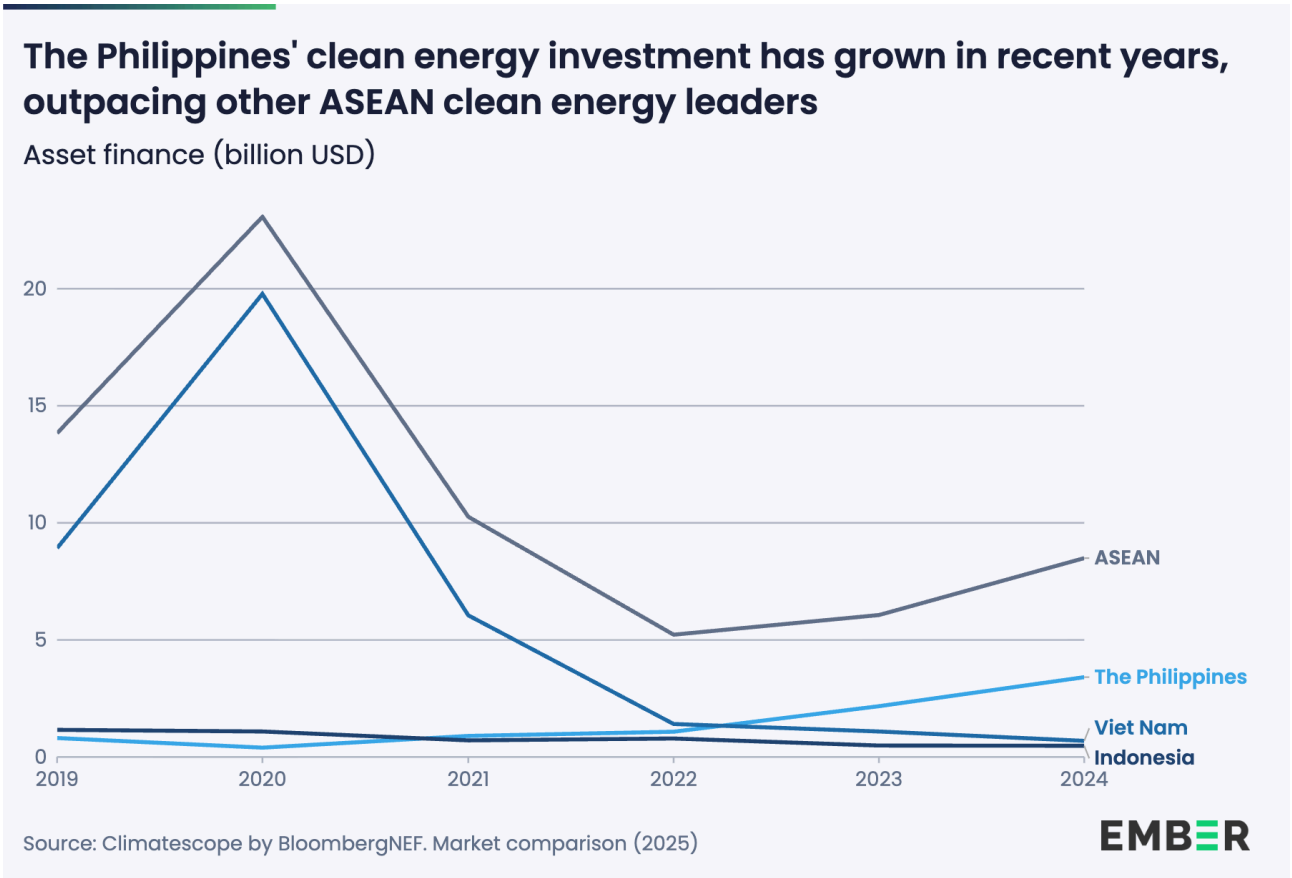
These developments indicate Indonesia's shift from coal dependency toward more diversified, risk-managed clean energy investment, which is a transformation shaped by new PPA reforms.



1.2 Clean energy: The emerging opportunity

Across ASEAN, clean energy investment is gaining traction but remains limited. As of October 2024, Southeast Asia as a whole attracts only 2% of global clean energy investment, despite accounting for 5% of global energy demand.

Over the past decade, capital flows to clean energy investment in Southeast Asia have grown by $17 billion USD with the Philippines ($3.41 billion), Viet Nam ($0.69 billion) and Indonesia ($0.48 billion) among the top investment destinations in 2024.



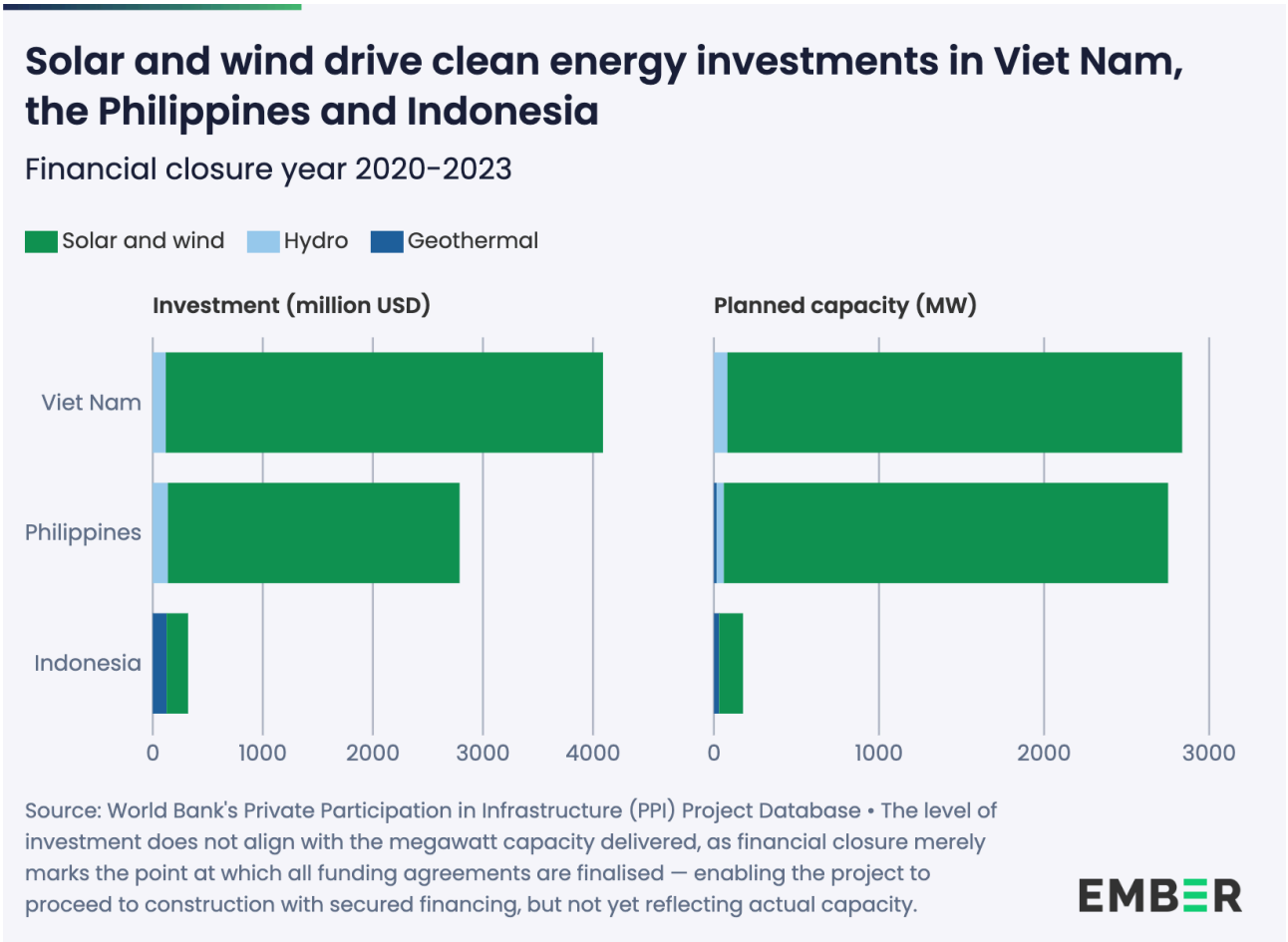
Recent policies and ambitious targets send out positive market signals for clean energy investments.

- Viet Nam aims to expand solar up to 73 GW and onshore wind up to 38 GW by 2030 under PDP8, requiring 27 GW of new solar and 20 GW of wind within five years.
- The Philippines targets 35% renewables in its power mix by 2030 and 50% by 2040, reinforced by GEA rounds pairing solar and batteries.
- Indonesia plans 60 GW of new renewables capacity by 2034, underpinned by grid and financing reforms.

Across the three economies, growing interest in hybrid and storage-integrated projects reflects a growing recognition that flexibility will define the next phase of market competitiveness.

At present, solar continues to attract the largest share of clean energy capital.

Between 2020 and 2023, $6.9 billion in solar and wind projects reached financial closure in Viet Nam, the Philippines and Indonesia, where funding agreements are secured, allowing projects to move to the construction phase.



However, coal investments remained significant over the same period, amounting to $2.3 billion, indicating conventional energy still captures significant private capital.

Looking ahead, the pace of the transition in all three countries will hinge on market reform, which involves opening the power markets to private participation, ensuring fair risk-sharing for investors, and aligning regulatory incentives with system flexibility.

Differing routes to unlocking clean energy investments

ASEAN's clean energy ambitions depend on how effectively its largest emerging economies can draw private investment into renewable projects. Viet Nam, the Philippines, and Indonesia are each charting their own path to opening their power market, ranging from full liberalisation to gradual change. Yet all three face the same challenge: mobilising clean energy investment while safeguarding energy security and keeping power affordable.

Viet Nam, the Philippines and Indonesia differ in geography and market design. These shape their renewable resources and the scale of market access.

New-changing mechanisms are driving energy transitions in each of the three countries. Viet Nam is introducing regulatory reforms to operationalise a wholesale electricity market, aiming for the gradual liberalisation of the sector. The Philippines, by contrast, is fine-tuning its liberalised market to attract more private investment and improve operational efficiency. Meanwhile, Indonesia is prioritising national energy self-sufficiency, aligning industrial expansion with domestic resource utilisation.

ASEAN's market differences open doors for clean power

From fully state-run systems to competitive markets, ASEAN countries are at different stages of electricity market development. Understanding these systems is key to unlocking clean energy, achieving energy security and growing the economy.

State-Regulated: The Single Buyer Model

Vertically integrated electricity markets allow governments to plan long-term energy transitions by coordinating investments in generation and grid infrastructure.

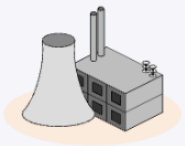
Model used in Indonesia, Brunei, Myanmar, Cambodia, Malaysia, Thailand, Laos, Viet Nam, and Timor-Leste.

Regulations, permits and contracts

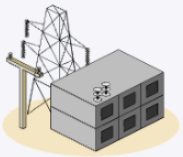
Power flows

National Government via Energy Ministry sets policies, regulations, and long-term targets for generation, grids, and renewables.

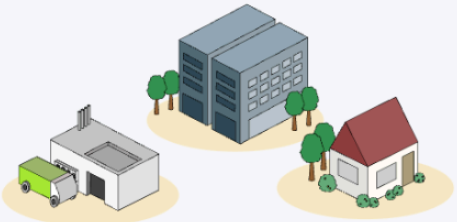
State-Owned Utility buys all electricity, plans grid development, and manages power dispatch.



Power generators produce electricity from fossil fuels or renewables under contracts with the state.



Grid Operators transport electricity from generators to consumers via the transmission and distribution infrastructure.



Consumers receive power through fixed-rate service from the state-owned utility.

Open Access: The Competitive Electricity Market

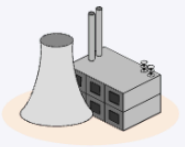
Competitive electricity markets unlock investment and innovation by allowing both private and state-owned generators to trade electricity in real-time and compete on price to sell power and compete on price.

Model used in Singapore and Philippines.

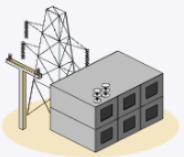
National Government via Energy Ministry oversees market rules, licensing, and fair competition among participants.

Retailers and Distribution Utilities buy electricity from the market or from power generators and sell it to end users.

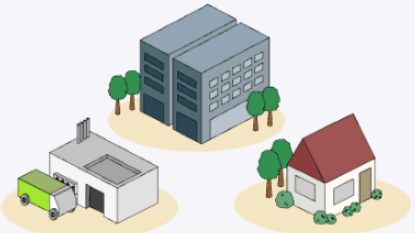
Independent Market/System Operator runs the electricity trading system and balances real-time supply and demand.



Power generators produce electricity from fossil fuels or renewables and sell it through auctions or contracts.



Grid Operators transport electricity from generators to consumers via the transmission and distribution infrastructure.



Consumers receive power in a negotiated rate from retailers and fixed rate from retailers.

Source: Ember
Infographic by Reynaldo Dizon, Alnie Demoral and Lam Pham.

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2.1 Viet Nam: Tapping into corporate purchase to double renewables share

Viet Nam is steadily opening its power market to private and foreign investment. Although the power market still operates in a single-buyer system, the sector has been unbundled of power market operations, and segmentation of generation, transmission and distribution to attract new players. Private and foreign investors now own more than half of the country's installed capacity, showing a gradual shift toward a more open and diversified market. The privatisation of transmission and distribution through Public Private Partnership (PPP) allows more investments for grid upgrades, while the government maintains control over operation.

The country is also liberalising its retail electricity market to attract more investment and ensure a stable power supply through a three-step process. After launching its wholesale electricity market in 2019. The next step focuses on enhancing competitiveness by expanding participation and removing barriers for the private sector's participation in electricity retail.

A key reform under this effort is the DPPA, or corporate renewables through Decree No. 57/2025/ND-CP, which enables corporate-driven renewable energy adoption. The DPPA incentivises corporate purchases of renewable energy and allows them to claim 'environmental attributes,' enabling them to quantify their renewable energy use.

The DPPA aims to strengthen market confidence by ensuring guaranteed offtakers for renewable energy projects and addresses the issue of recent curtailments, where solar generation was being limited due to grid restrictions.

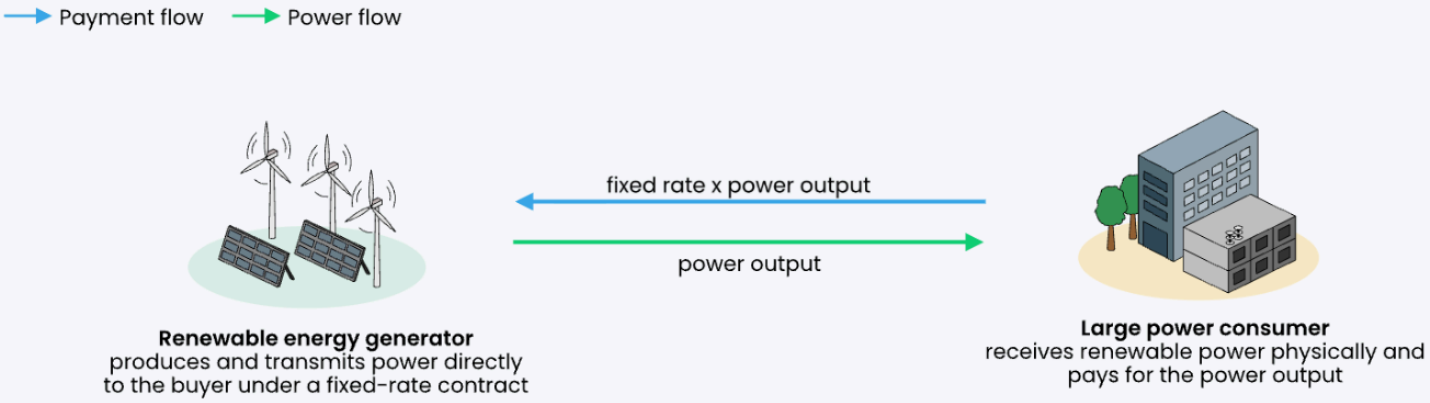
The state utility, Viet Nam Electricity (EVN), continues to manage the electricity market through fixed-price contracts, providing a hedge against global market volatility. To introduce more flexibility, two DPPA models are now available: DPPA Model 1 through a private grid and DPPA Model 2 using the national grid. Under either model, renewable developers can invest in wind or solar projects, generate electricity, sell it to the grid, and wheel the electricity over the grid. This enables consumers to purchase clean electricity directly from producers while using the national or private grid as the delivery channel.

How Direct Power Purchase Agreements work

Direct Power Purchase Agreements (DPPAs) are long-term contracts between electricity buyers and renewable energy producers. They secure stable power prices for consumers and predictable revenue for generators. DPPA structure is defined by how electricity and payments flow: either physically delivered to the buyer or settled through the market.

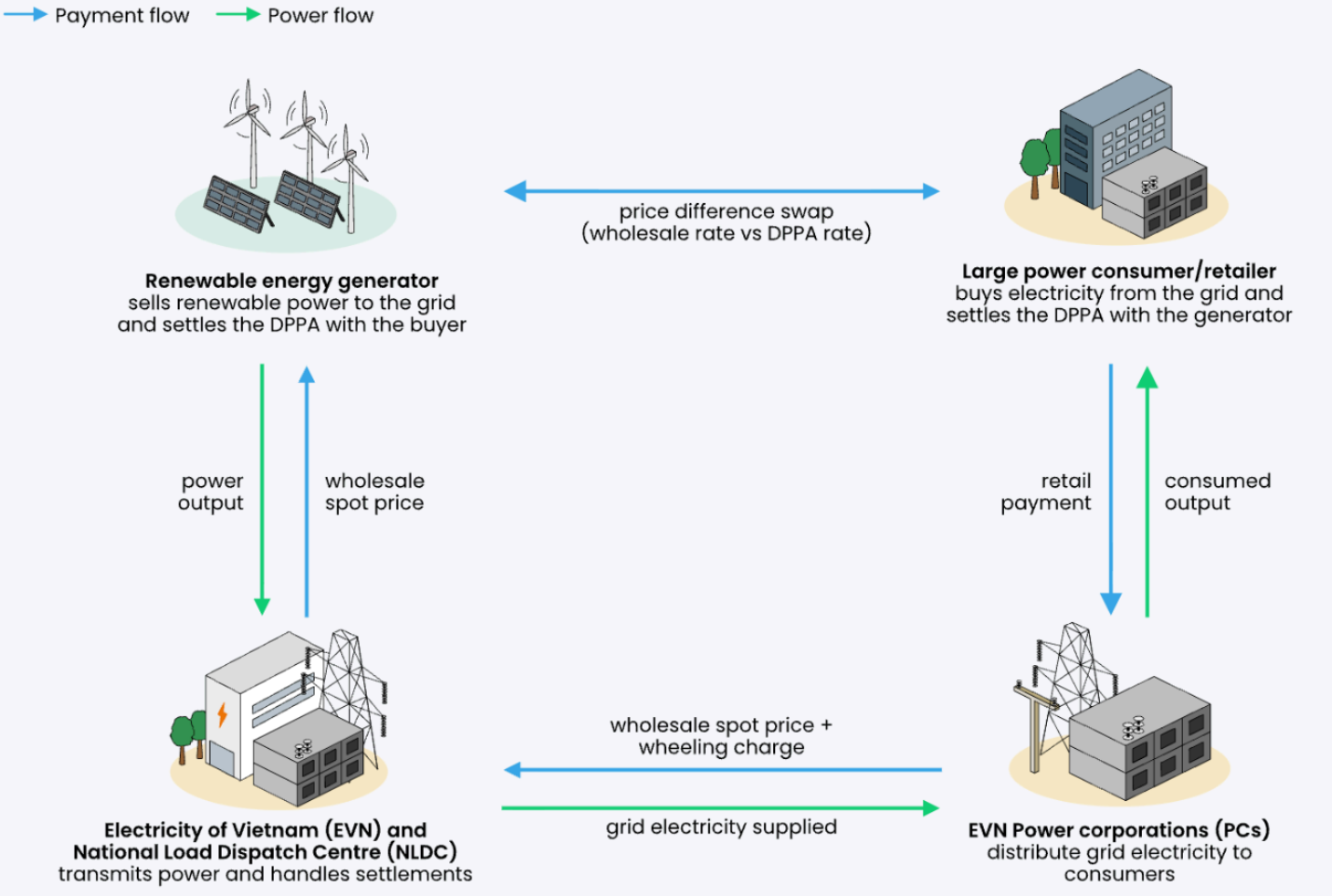
Physical DPPA

A Physical DPPA delivers renewable power directly from the generator to the consumer via a private or dedicated line, bypassing the national grid. This setup offers greater control over sourcing, pricing, and emissions but requires proximity and regulatory approval.



Virtual DPPA

A Virtual DPPA is a financial agreement where the generator sells power to the grid, and the buyer settles the difference between the market price and the agreed DPPA rate. The buyer continues to receive grid electricity but gains a renewable energy claim and a hedge against market price volatility.



Source: Ember's analysis based on Decree 57/2025/ND-CP.
Infographic by Reynaldo Dizon, Dinita Setyawati, Alnie Demoral and Lam Pham.

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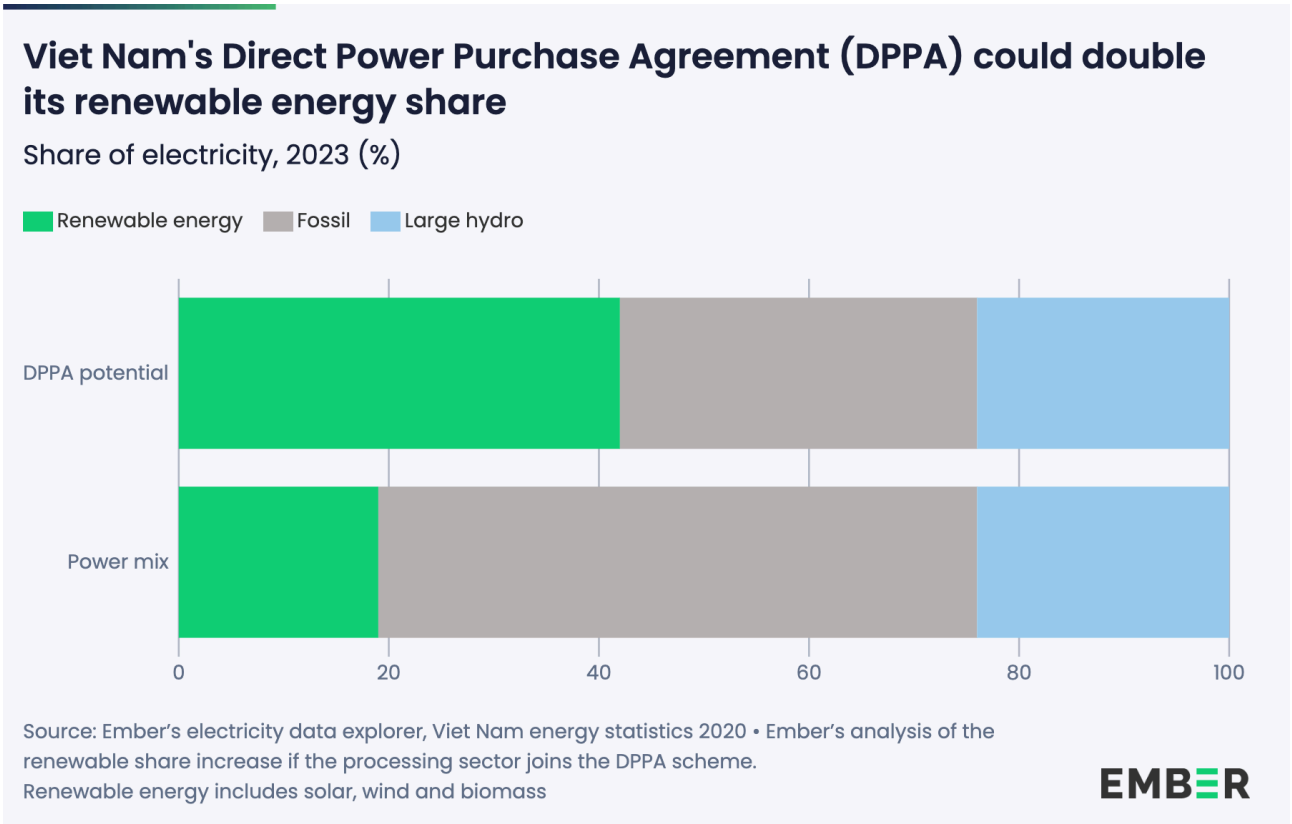
According to Ember, the country's share of renewable energy could at least double if manufacturers in the processing sector purchased electricity through the DPPA scheme. This could potentially raise clean energy consumption from 19% to 42%, based on the latest non fossil energy share and the electricity consumption from the state electricity company of processing companies.



2.2 The Philippines: Opening the market for foreign investors

The Philippines' electricity liberation started more than two decades ago with the Electric Power Industry Reform Act (EPIRA) of 2001, which aims to make electricity more affordable through competition and private sector participation.

EPIRA paved the way for the Wholesale Electricity Spot Market (WESM) and Retail Competition and Open Access (RCOA) framework, allowing users to select their suppliers, and drive efficiency through competition among generations.

Yet despite these reforms, the Philippines' electricity tariff is one of the highest in Southeast Asia, due to structural and institutional barriers. In response, recent policy shifts have focused on scaling renewable investment and improving market efficiency.

Since the launch of GEOP in 2021, corporate demand for clean energy in the country has doubled. Under the program, consumers can directly source electricity from renewable energy suppliers, signalling a strong market appetite for clean power. However, supply has struggled to keep pace, revealing a bottleneck in renewable generation capacity.

To close this gap, the government is using the Green Energy Auction (GEA) as a complementary mechanism to expand supply and meet rising demand from GEOP participants. Competitive auctions can accelerate the development of new renewable projects providing clear price signals and transparent procurement, which in turn enhances investor confidence and bankability.

Recent auction rounds have increasingly focused on energy storage integration to enhance reliability. GEA-3, held in early 2025, prioritised pumped hydro, while GEA-4 introduced the country's first Integrated Renewable Energy and Energy Storage System (IRESS) auction – pairing solar with batteries for 1.1 GW of capacity. By June 2025, GEA-5 marked another milestone, targeting 3.3 GW of offshore wind for 2028–2030.

These innovations are already materialising on the ground. A 197 MWp solar PV plant coupled with a 320 MWh battery energy storage system (BESS) now delivers power beyond typical solar generation hours (6 a.m. to 5 p.m.), effectively allowing solar to serve as a baseload source.

Financing remains a hurdle: only one-third of the renewable energy investment under the national plan can be financed by domestic banks. To attract capital, the Philippines has lifted foreign ownership restrictions by allowing 100% foreign ownership of public services.

Since the market opened to full foreign ownership in 2022, 20 GW of projects have already been awarded to overseas developers. This has helped spur almost a twofold increase in clean energy investment in 2023 compared to the previous year's level. This led the country to be ranked 2nd among 110 emerging markets for green energy investments by Climatescope.

2.3 Indonesia: PPA adjustment as catalyst for renewables boost

Indonesia is riding a wave of economic momentum, attracting investment from mineral downstreaming to infrastructure. The country's president has also announced to transition entirely to homegrown 100% renewable energy in the next ten years, increasing national energy security and anchoring industrial growth in domestic resource potential. However, any policy announcement around this target is yet to materialise.

A major policy shift arrived in 2025 with Ministry of Energy and Mineral Resources (MEMR) No. 5/2025, which introduces risk sharing for currency exchange volatility for energy companies engaging in PPAs. The regulation introduces a new risk-sharing formula for exchange rate volatility: PLN agrees to bear the risk if the exchange rate between the rupiah and foreign currencies fluctuates, while the independent power producer (IPP) takes on convertibility risk.

The regulation also expands project ownership options. It allows the use of Build-Own-Operate (BOO) mechanism, an alternative to the previous regulation that strictly uses Build-Own-Operate-Transfer (BOOT) mechanism. More importantly, the regulation reduces financial risks due to grid constraints with provision of a payment over Deemed Dispatch, based on the amount of curtailed energy under PLN grid maintenance or emergency events.

Indonesia is also aligning PPA reform with its carbon-market ambitions. MEMR 5/25 recognises the rights on environmental attributes or carbon economic value of power plants using renewables, including carbon credits, renewable energy certificates, green labels or other tradable rights. The carbon market is also being regulated under the newly published Presidential Regulation No. 110/2025, which includes provisions on carbon trading, carbon tax, offset, Measurement, Reporting and Verification (MRV), certification, payments and valuations. This regulation further incentivises renewables developers.

Electricity demand is expected to grow rapidly, led by the digital economy. Indonesia is forecasted to add 1.5–2 GW of data centre capacity by 2027, which equals to 5% of the current 40 GW peak demand. Yet physical constraints limit the speed at which new generations can be built. With limited inter-island grid connectivity, limited storage system, significant wind potential concentrated in Sulawesi, limited land availability in Java, and geothermal, hydro and gas projects all have long development timelines.

Against these constraints, solar emerges as Indonesia's most viable near-term option. Its modular nature, technological maturity, wide availability, shorter implementation timelines, and declining costs, combined with its sustainability advantages, make it the most practical pathway for near-term renewable energy expansion. Substantial new solar generation capacities, or 350 GW by 2040, are needed to cover these consumption requirements, as well as increasing electricity demand from the population and industrial growth.

However, policy alone is not enough. Project-level economics ultimately determines how these policies translate into real deployment. Understanding how pricing and development costs affect returns is key to assessing the maturity of these evolving markets.

Solar case study: Pricing structure affect returns, but batteries can enhance performance

We analyse the economics of 10 MW solar projects in selected locations in three countries. Project returns are highly sensitive to pricing, but integrating batteries can boost returns by up to nine percentage points, highlighting their growing value for profitability and system reliability. However, PPA design and capital costs remain critical, as a ten percentage point change in either can shift returns by up to 45 percentage points.

Clean energy investment in ASEAN has averaged $72 billion between 2022–2024 which delivers renewable energy capacity additions. However, this should be almost double to $130 billion to keep the global climate goal within reach. Getting on track for these targets would require reducing the cost of capital for renewable projects, while maintaining flows of investment.

To better understand the dynamics of these markets, we analyse economic viability of solar PV projects across Viet Nam, the Philippines and Indonesia to identify factors that influence project performance, comparing the technical parameters across sites with similar solar potentials (16%–17% capacity factors), capital and operating expenditures, PPA structures and financial assumptions. The result shows PPA price and capital expenditure are dominant factors shaping project profitability.

What are PPA ceiling prices and IRRs?

PPA prices are the pre-determined prices between energy producers and buyers under the power purchase agreements (PPAs) contracts over a fixed period, between 15-30 years. By guaranteeing a stable revenue stream based on the project's technology, size, and location, PPAs price provides investors with certainty for renewable energy developments.

The PPA ceiling price is the maximum agreed price for PPA contracts, stipulated in regulations, for example Indonesia's Presidential Regulation 112, and Circular No. 12/2025.

Internal Rate of Return (IRR) illustrates the solar project's expected return by identifying the discount rate at which the present value of project's lifetime costs equals the present value of its lifetime revenues, resulting in a net present value (NPV) of zero. Investors then compare the IRR to their minimum acceptable rate of return to assess whether the project is financially attractive.

3.1 Project returns values differ among countries, with higher returns in project with batteries

Differences in PPA pricing resulted in a wide range of Internal Rate of Returns (IRR) values, despite variations in the capital costs of 10 MW solar projects. Our study selected Indonesia's Sumatra, North Viet Nam, and the Philippines' Mindanao as representative locations with similar solar capacity factors.

The Philippines applies a uniform PPA ceiling price nationwide, while Viet Nam and Indonesia vary their rates by location

PPA ceiling price of ground mounted solar (USD cents/kWh)

Source: Viet Nam: New Circular 12/2025/TT-BCT New Circular 12/2025/TT-BCT, the Philippines: Green Energy Auction Reserve (GEAR) prices, Indonesia: Presidential Regulation No. 112/2022 • Viet Nam's PPA includes escalation for exchange rate and inflation. Indonesia PPA ceiling price drop from year 11 to 20.
Note: PPA stands for Power Purchase Agreement.

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The PPA ceiling prices for solar projects in these locations range from $0.09/kWh in Sumatra – with a reduced rate of $0.049/kWh applied during the 11th–20th contract years – to $0.076/kWh across the Philippines and $0.053/kWh in North Viet Nam.

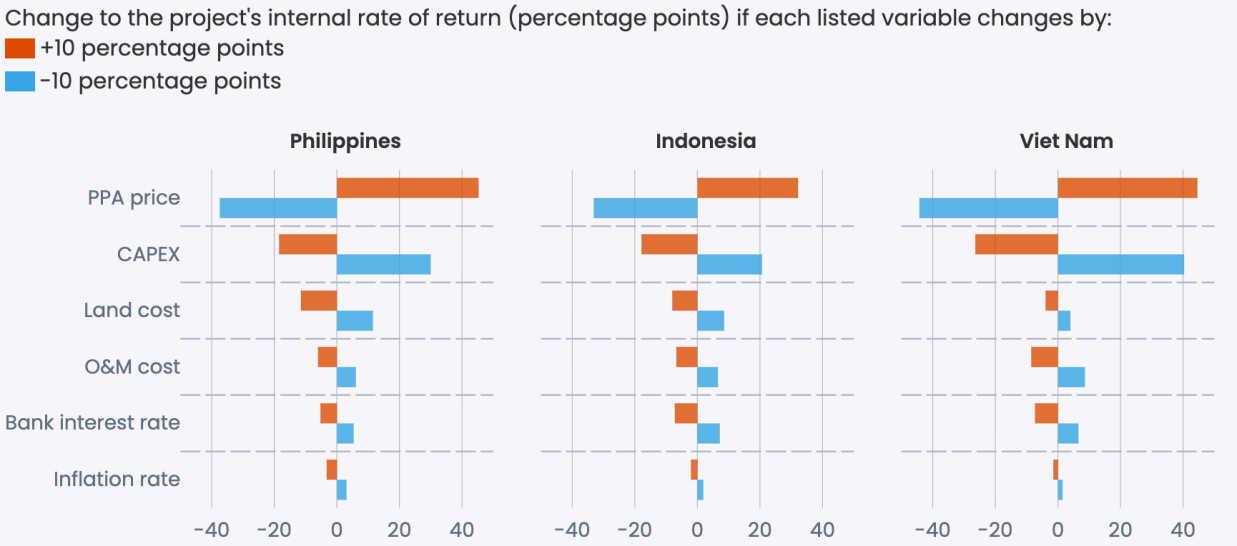
In comparison, the PPA prices for solar plus battery projects are up to $0.145/kWh in Sumatra – with a reduced rate of $0.079/kWh applied during the 11th–20th contract years – to $0.092/kWh across the Philippines and $0.06/kWh in North Viet Nam.

Capital costs for 10 MW solar projects range from $4.3–$6.4 million, based on IRENA's study, EREA & DEA report, and Bloomberg assumptions. Integrating batteries will typically add to the capital cost around $0.7 million to over $2 million.

Among the three countries, the IRR for solar projects under maximum PPA varies. Indonesia records 14%, the Philippines records a range between 11%–16% and Viet Nam 6.1%. Integrating batteries will raise the IRR significantly for Indonesia, to up to 23% and Viet Nam's IRR to up to 7.3%. Meanwhile, the Philippines' project returns remain the same.

PPA design, pricing and capital costs determine whether energy projects can hit a 10% IRR – and which models make the cut. The model shows project returns in the three countries are mostly influenced by PPA terms and capital cost. For example, a ten percentage point change in the new PPA prices can change the IRR to up to 33–45 percentage points; a ten percentage point difference in capital costs can incur a change of 18%–41 percentage points change in IRR.

Solar project returns in Viet Nam, Indonesia and the Philippines are strongly linked to power purchase agreement prices and capital costs



Source: Ember's analysis of 10 MW solar projects in North Viet Nam, Indonesia's Sumatra and the Philippines' Mindanao, using System Advisor Model (SAM)

Indonesia offers the strongest price signal for storage. Its PPA ceiling price for solar plus battery is about two-thirds higher than that of solar, indicating the government's prioritisation of increasing its storage capacity. In practice, utilities and developers will negotiate the actual PPA price that might be lower than the ceiling price.

The Philippines takes a different approach. It applies a uniform ceiling price through the Green Energy Auction Reserve (GEAR) prices, which is 21% higher than the ground-mounted system. But while the Philippines shows a comparatively lower ceiling price for solar plus battery systems relative to Viet Nam and Indonesia, this should be interpreted with caution. The Philippines has an incentive structure including import duty and tax exemptions, and a clear framework supporting its operations, which are designed to reduce project-level cost.

Capital costs also shape project viability. For Viet Nam, the capital cost of 10 MW solar projects would need to fall by about 20 percentage points to reach a 10 % IRR dropping from $6.1 million to $5.1 million for solar plus battery projects, and $5.5 million to $4.4 million for solar projects. In contrast, the current capital cost for Indonesia and the Philippines has already corresponded to a minimum of 10% IRR.

Viet Nam has a modest PPA pricing compared to the other markets. In recent years, the country has experienced a solar boom, driven by attractive Feed-in-Tariff (FiT). The rapid expansion of solar and transmission bottlenecks resulted in curtailment of solar generations. At the same time, FiT has been revised several times in a downward trend, making solar projects with battery integration the most economically attractive. Currently, the Vietnamese government is incentivising the development of rooftop solar, and focusing on onshore and offshore wind.

How could results differ for other technologies?

Onshore Wind Utility Scale

- CAPEX is around $1,968/kW
- PPA price range 6.25 to 10.32 USD cents per kWh
- Expected IRR 10%
- Selected locations with high wind potential and diverse capacity factors
- Power system integration needs and grid constraints
- Social acceptance, NIMBY (Not in My Backyard)

Geothermal

- Higher upfront CAPEX and significant exploration risk
- CAPEX range is $3,478–8,765/kW
- PPA price range 8.51 to 12.7 USD cents per kWh in the first 10 years and drops to 5.1 after that in Indonesia. Viet Nam and the Philippines do not have PPA for geothermal
- PPA tenor and contract-term considerations
- Longer development lead times and exploration risks

Offshore wind

- Capex range is $5,411–7,349/kW
- PPA price range 11.7–15.1 USD cents per kWh in Viet Nam. The other two countries do no have PPA range for offshore wind
- Longer development lead times
- Grid, offtake, and port-infrastructure constraints
- Key IRR drivers, including supply chain constraints, at an order-of-magnitude level

3.2 Policy certainty can derisk clean energy investment

Clear and consistent policies are essential to derisk clean-energy investment across the three economies. The demand for clean energy warrants a clear business case for solar buildout in the three economies. They can rely on a fast deployment of solar projects to meet electricity demand from hyperscalers, like data centres.

Yet multiple bottlenecks still slow investment. For example, Viet Nam experienced solar curtailment of up to 40% in 2022, resulting in revenue reductions of up to 40% for affected developers. In the Philippines, several commissioned renewable energy plants remain unable to dispatch due to delayed transmission studies, approvals and interconnection projects.

Permitting challenges add further delays. In Indonesia and the Philippines, overlapping land rights and multi-layered local approvals can extend timelines by more than a year, reducing the project IRR by 0.6% , and this loss compounds with every subsequent month of postponement.

Currency and equipment price fluctuations also undermine returns. If the local currency weakens against the US dollar, everything bought in dollars, such as solar panels or foreign loans, costs more in local currency, which shrinks the project's profit margin.

Policy continuity is equally critical. Viet Nam's suspension of its Feed-in Tariff scheme left 173 projects, representing approximately $13 billion in investment, awaiting tariff confirmation, effectively immobilising cash flows. Financial policies like credit guarantees could mitigate risks posed by inflation and volatile wholesale rates.

Streamlined permitting could be the next major tailwind for the three countries. The Philippines has the Energy Virtual One-Stop Shop (EVOSS) is an online platform established under Republic Act No. 11234 (the EVOSS Act of 2019) to streamline and digitalise the permitting process for energy projects in the Philippines.

It allows developers to apply, track, and secure all necessary permits and clearances from multiple government agencies through a single digital portal, instead of filing separate applications to each agency. Strengthening the EVOSS system to integrate the land-related permitting process could shorten project development timelines.

In parallel, the Philippines has also introduced Green Lane Certification, stipulated under Executive Order No. 18, which expedites the approval process for various energy projects and bypasses bureaucratic delays through streamlined inter-agency coordination and local government endorsements. The certification programme results in 176 projects with green lane access as of December 2024, of which 141 projects are solar, hydropower, wind, geothermal and biomass worth over $70 billion.

3.3 Increasing PPA bankability through tariff indexation and clearer risk allocation

Recently, the Philippines has taken important steps of indexation of Green Energy Tariff for GEA projects. Further refinements, such as a fully transparent indexation formula, structured foreign exchange-hedging support, and clearer provisions for foreign-funded projects, would help solidify these reforms and enhance long-term investment certainty.

Indonesia has taken parallel steps to improve PPA terms. Presidential Regulation No. 112/2022 established ceiling prices for energy projects, depending on the technology and geographic location to control procurement costs and enable faster project contracting through direct selection or appointment by PLN. Complementing this, MEMR Regulation No. 5/2025 provides long-term (up to 30-year) PPA clarity and codifies key provisions such as deemed dispatch and change-in-law clauses. The regulation also stipulates risk allocations between PLN and IPPs, including load risk, transmission risk, currency exchange rate volatility, commissioning delay and permits, effectively reducing uncertainty.

Together, these measures mark a positive step toward improving transparency and contractual stability in Indonesia's renewable energy sector.

Further refinements are still possible. Updating the ceiling price methodology to allow limited upward adjustments tied to verifiable cost fluctuations or indexation triggers, ensuring projects remain both competitive and financially sustainable.

Viet Nam is also taking major steps to improve its market's competitiveness. The Viet Nam's Electricity Law in February 2025 was the next step to boost the electricity market's competitiveness. The law stipulates the procedures for the bidding process for power projects within the scope of PDP 8, excluding those developed by state-owned enterprises. These projects include energy sources such as solar, wind, and biomass, as

well as electricity generated from green hydrogen and green ammonia. Offshore wind projects for both domestic consumption and electricity export are also being prioritised, allowing foreign investor participation.

Decree No. 58/2025/ND-CP also incentives for rooftop solar development, storage and research and development in clean energy technologies. This represents the initial stage of resource assessment, forming the foundation for competitive auctions and the selection of winning bidders.

Blended-finance initiatives are already helping to expand access to local-currency financing and improve project bankability. Viet Nam's ceiling prices also include an escalation rate, partially protecting developers from rising input costs over time. To further strengthen investor confidence, Viet Nam could consider explicit foreign exchange protection mechanisms for long-term PPAs or government-backed hedging and guarantee instruments, alongside clearer rules on payment currency for DPPAs.

The Ministry of Industry and Trade (MOIT) has also introduced location-based tariffs and storage incentives, signalling a shift toward market segmentation and flexibility.

Tariff stability and predictable regulation will be crucial. Avoiding retroactive tariff adjustments and defining transparent criteria for tariff reviews would preserve the bankability of existing contracts. Moreover, since current PPA practices place curtailment risk largely on producers, with compensation often handled on a case-by-case basis, Viet Nam could enhance investor assurance by introducing standardised deemed dispatch and curtailment compensation provisions, supported by EVN liquidity backing or a central compensation mechanism.

Conclusion

Powering progress by creating enabling environments

Southeast Asia's clean energy transition will benefit from allowing market forces to lead, via competition, price transparency and risk-sharing mechanisms.

Viet Nam, the Philippines and Indonesia's energy reforms begin to send stronger signals. The rise in battery storage PPA rates, for example, reflects the growing recognition of the need for increased flexibility and reliability in renewable systems. This upward adjustment makes storage-integrated projects more financially viable, helping developers recover CAPEX costs while ensuring grid viability and energy security on a national level. This also signals that the renewable market is becoming more mature, as it is now rewarding technological advancements and long-term alignment with national energy goals over short-term price competition alone.

However, sustaining the momentum requires addressing key bottlenecks that inflate project cost, delaying construction and deterring smaller players. Policymakers can help ease the development pressures by streamlining permitting procedures, improving grid access planning, and facilitating a blended financing model that distributes risk more effectively.

By reinforcing these market foundations, the three countries can champion renewable deployment, turning them from emission-intensive to investment hotspots.

Supporting materials

Methodology

Electricity demand and emission share

ASEAN's power sector emission projections are based on The 8th ASEAN Energy Outlook, while data for the Philippines, Indonesia, and Viet Nam comes from each country's respective national plans: the Philippines' Power Development Plan 2023-2050, Viet Nam's Adjusted Power Development Plan 2021-2030 and Indonesia's National Electricity Master Plan 2025-2060. Emissions between 2025 and 2030 were calculated using the Compound Annual Growth Rate (CAGR) method.

Electricity demand projections for ASEAN were derived using a CAGR based on the 3.7% historical growth rate between 2022 and 2023. For the Philippines, Indonesia and Viet Nam, demand projections were sourced from the respective planning documents, with the Philippines' from The Philippine Energy Plan Volume I 2023-2050. CAGR was applied to calculate demand growth for Indonesia and Viet Nam, while the Philippines' projection was explicitly stated in the plan.

Solar PPA modelling and assumptions

System Advisor Model (SAM) was employed to simulate the internal rate of return of solar utility investment including systems with batteries. Specifically, PVWatts and single owners Power Purchase Agreement (PPA) models were selected for the simulation.

Site selection: announced projects from Global Energy Monitoring (GEM) were used to scope only technically viable projects within the countries then we select the median solar irradiation projects of the regions based on Global Solar Atlas data as regional representations.

Cost assumptions for base case: Viet Nam was based on Viet Nam technology and storage catalogues 2023, Indonesia was based on Renewable Power Generation Costs in 2024 while the Philippines was based on Bloomberg assumption. Some financial parameters are taken from Loan Thi Do et al (2025). Cost is interpolated for the year of 2025. Generator fixed O&M costs are also drawn from these reports.

The IRR was used as an indicator for project profitability computed based on various parameters which base case assumptions drawn from publicly available sources: PPA price, CAPEX excluding land cost, operation and maintenance cost, annual land cost, inflation rate and bank interest rates. This study also conducts sensitivity analysis of these parameters on IRR. Battery capacity of Viet Nam uses the requirement of 10% solar capacity and 2 hours duration, or 1 MW/2 MWh based on regulations Philippines battery capacity is 20%, 4 hour duration based on DOE, which is same for Indonesia as of assumption of DEA

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Cover image

Aerial view of solar panels and highway in the Philippines.

Credit: Nothing Ahead / Pexels