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Challenges & Opportunities

of Striving RE target in ASEAN and Thailand

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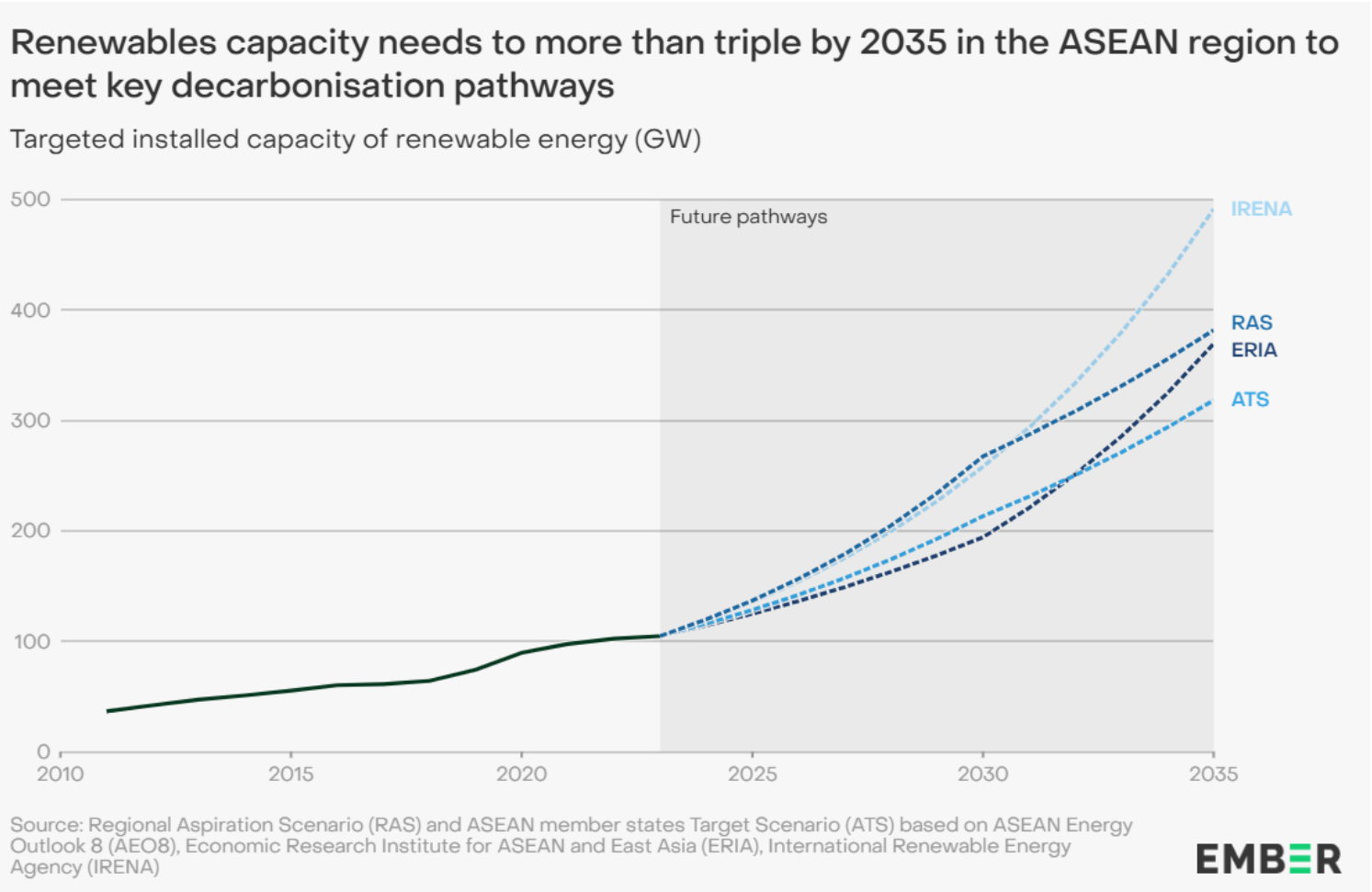
Different Pathways Show ASEAN's Renewable Capacity Needs to Increase 3-5x By 2035

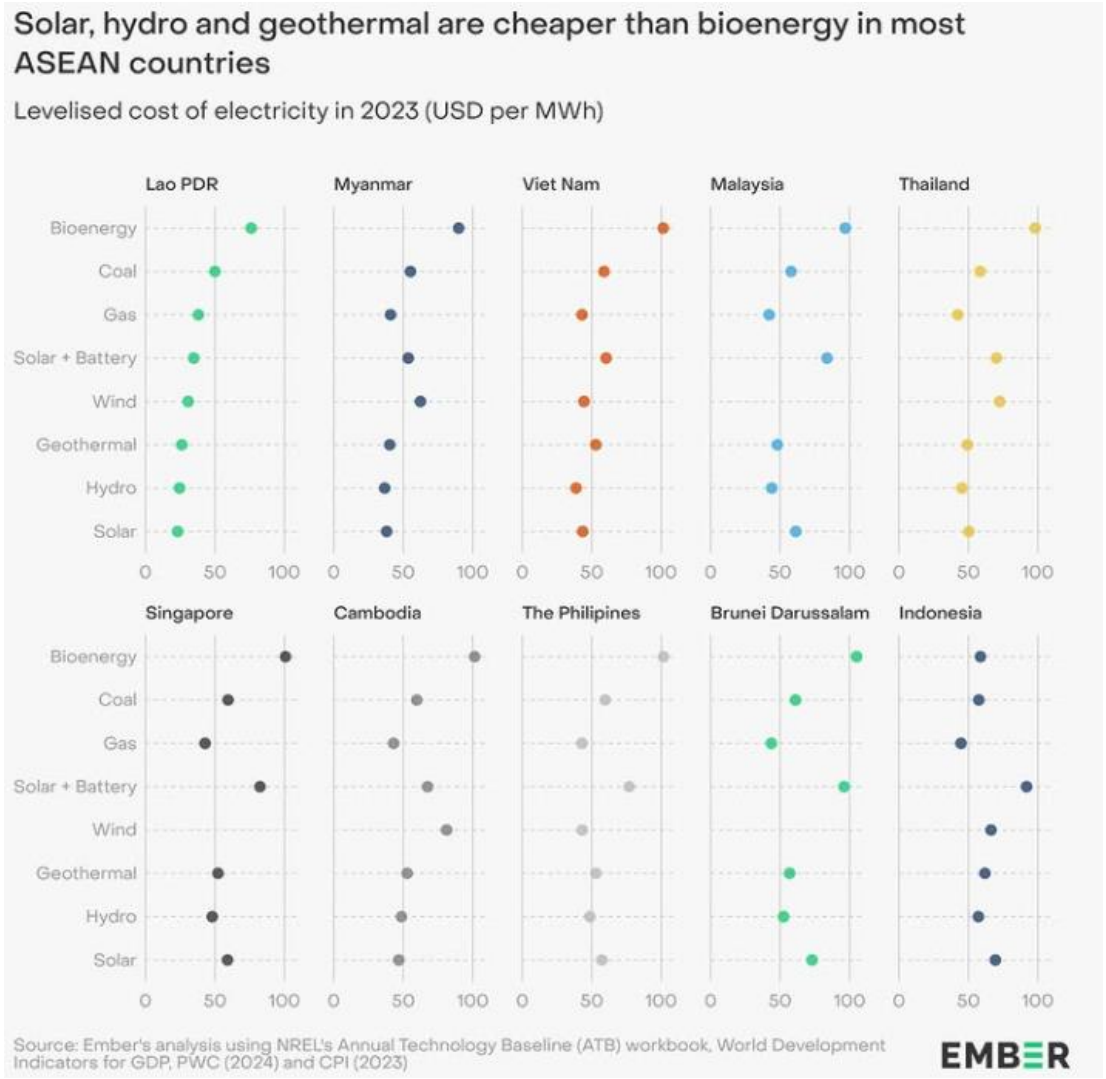


ASEAN is pursuing power sector decarbonization through two pathways:

- **ATS (ASEAN Targets Scenario)**: 69% renewables by 2050 (773 GW).
- **RAS (Regional Aspiration Scenario)**: 72% renewables by 2050 (1 TW), enhancing national goals with a bottom-up approach.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

Solar and Wind Lead the Way In ASEAN with Costs Now Outpacing fossil fuels



- Across the region, solar and wind energy emerge as the most affordable options for electricity generation, consistently outpacing the cost-effectiveness of conventional fossil fuels.
- For instance, countries like Laos, Myanmar, and Vietnam showcase notably lower costs for solar and wind, reinforcing their potential as viable, cost-competitive alternatives for energy generation.
- This highlights the growing economic case for transitioning to cleaner energy systems, as they not only address climate goals but also reduce electricity costs for consumers.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

Growing Confidence in Direct Renewable Purchase

Viet Nam, Thailand and Malaysia are actively developing power wheeling schemes with different stages of implementation

Country	Scheme	Key features	Target sector	Status
Viet Nam	Direct Power Purchase Agreement (DPPA)	• Allows large electricity consumers (22 kV+ connection or 200,000 kWh/month) to directly procure renewable energy • Includes solar, wind, small hydropower, biomass, geothermal and ocean energy • Offers physical DPPA (no capacity/output cap) and virtual DPPA (fixed-price contracts).	Large electricity consumers (industrial, commercial)	Ongoing implementation
Thailand	Third Party Access (TPA) Framework Guideline	• Develops TPA code for distribution system • Attracts private retail entities • Pilot phase focuses on 2 GW renewable energy for data centres.	Data centres	In development
Peninsular Malaysia	Third Party Access (TPA) under CRESS (Corporate Renewable Energy Supply Scheme)	• Renewable energy producers can use the national grid to deliver clean power to regional buyers • Part of PETRA's GREENS MADANI initiative.	Regional buyers	Starting in September 2024

Source: The countries' power wheeling mechanism guidelines

EMBER

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

Viet Nam's Direct Power Purchase Agreement (DPPA)

- This program allows major electricity consumers to directly procure renewable energy from producers via the national grid or private transmission lines.
- The scheme offers both physical DPPAs with no capacity limits and virtual DPPAs based on fixed-price contracts.

Thailand's Third-Party Access (TPA) Framework

- Thailand's Energy Regulatory Committee (ERC) is developing a TPA Framework for distribution guidelines and wheeling charges to enable private retail participation

Malaysia Third-Party Access (TPA)

- The program allows businesses to purchase green electricity directly from renewable energy developers via Malaysia's national electricity grid.
- Developers must register projects, declare energy output, and align it with their maximum electricity sales. They can serve multiple companies, and companies can source green power from multiple developers, up to the EUC-declared capacity.
- The EUC ensures grid connections, handles billing based on meter readings, and processes it monthly.

Incorporating Sustainability tools into Financial Decisions

ASEAN countries adopt diverse economic strategies to create an enabling environment for renewable energy development

Country	National Taxonomy	Green bonds	Tax incentives	Mandatory local content requirements	Foreign participation guidelines
Brunei Darussalam	-	-	Yes	-	Yes
Cambodia	-	-	Yes	-	Yes
Indonesia	Yes	Yes	Yes	Yes	Yes
Lao PDR	-	-	Yes	-	Yes
Malaysia	Yes	Yes	Yes	-	Yes
Myanmar	-	-	Yes	-	Yes
Philippines	Yes	Yes	Yes	-	Yes
Singapore	Yes	Yes	Yes	-	Yes
Thailand	Yes	Yes	Yes	Yes	Yes
Viet Nam	Yes	Yes	Yes	-	Yes

Source: National policy documents, 2023 Investment Climate Statements by US Department of State, ASEAN-Germany Energy Programme, Myanmar Energy Monitor, International Renewable Energy Agency, Power Philippines.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

ASEAN's energy transition hinges on investments in security and sustainability, though varying development levels impact investor confidence:

- **ASEAN Taxonomy**: Sets criteria for financing renewables, coal phase-out, and green projects aligned with the Paris Agreement.
- **Financial tools:** Most ASEAN countries (except Brunei, Cambodia, Laos, and Myanmar) use green taxonomies and bonds. In Vietnam, private banks also issue green bonds.
- **Relaxed Local Content Rules**: Indonesia eased solar project rules for investments by 2024 (operational by 2026).

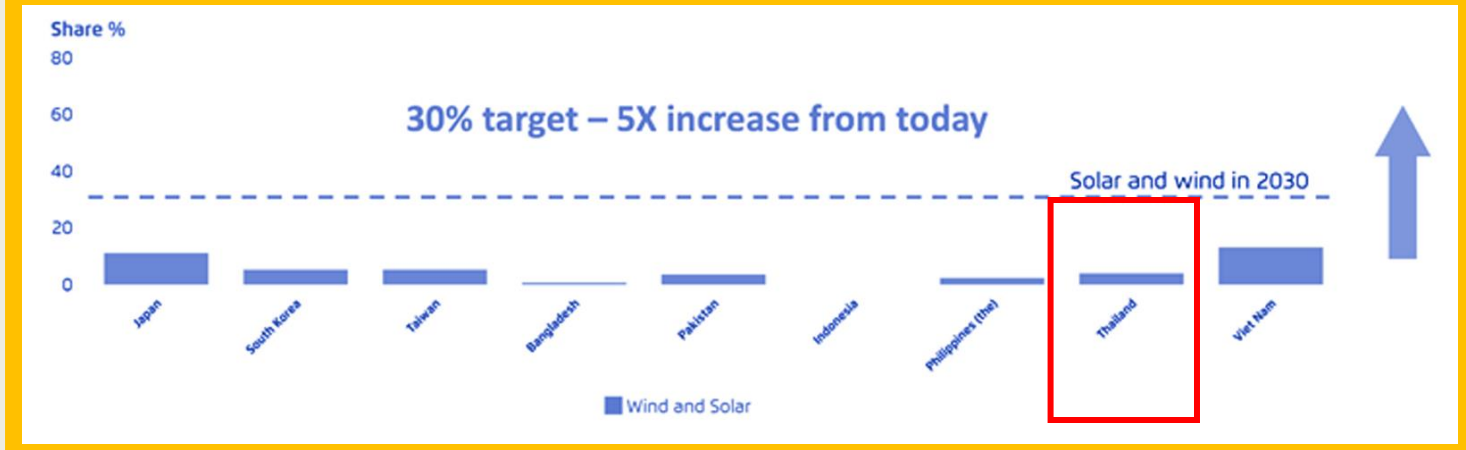
Thailand Urged to Accelerate Renewable Energy Growth with Focus on Solar, Wind, and Decentralized Systems to Boost Energy Independence

Accelerate Renewable Energy Deployment by:

Scaling up renewables like solar, wind, and biomass while leveraging cheaper battery tech. Promote decentralized solutions like rooftop solar and support Smart Microgrids and Demand Response for grid efficiency

Recommendations

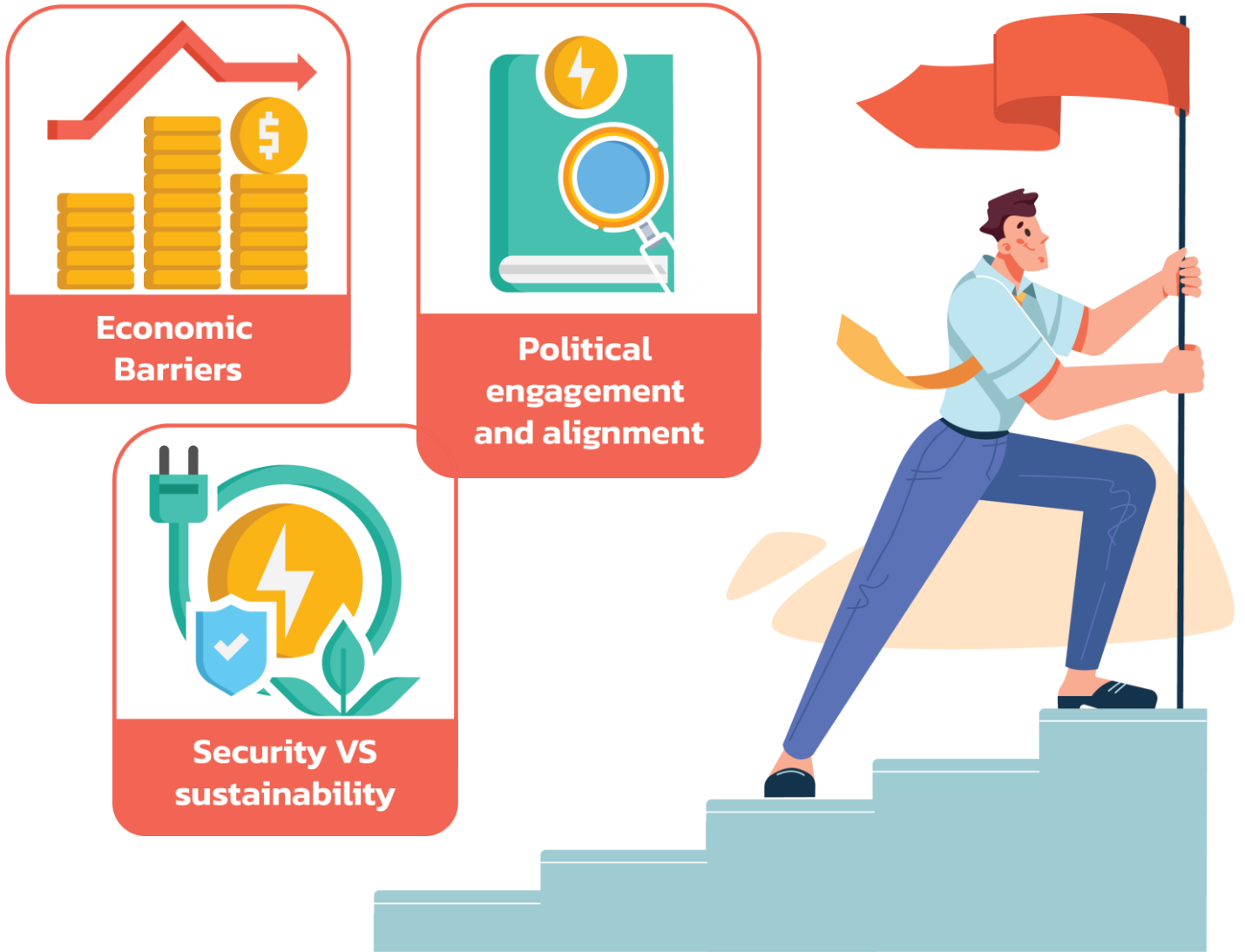
Asia Urged to Quintuple Solar and Wind Energy by 2030 to Meet 30% Renewable Target for Net-Zero Alignment



Source: The Climate Action Tracker, Energy Transition Pathways for the 2030 SDG 7 Roadmap for Thailand (ESCAP), Ministry of Energy of Thailand, Agora

Challenges and Opportunities for Electricity Market in Thailand

- 51% renewables by 2037
- 68% renewable electricity by 2040 and 74% by 2050



Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

Thailand's Energy Transition Stalls Amid Economic, Security, and Political Challenges

1.Economic Barriers

Despite Thailand's exceptional solar potential from favorable location—and falling solar technology costs, solar power still represents only 5.2% of the country's installed capacity, **largely due to limited utility-scale investments in recent years.**

2. Security VS Sustainability

Natural gas is a temporary energy source to ensure security while awaiting the development of alternative investments.

3. Political engagement and alignment

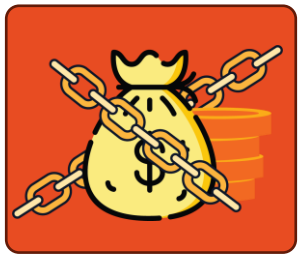
Thailand's power transition is stalled by weak alignment, inconsistent policies, delayed projects, and fragmented oversight. Regulatory hurdles and poor stakeholder collaboration hinder progress. Strong coordination is essential for sustainable energy development.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

Summary of Key Issues in the 2022-2030 Renewable Energy Power Purchase Program ("RE Big Lot")

No Announcement of Key Criteria

No scoring criteria have been announced for the selection process, leaving broad discretion in deciding which private entities are chosen.



Fixed Price with No Adjustments Allowed

The purchase rate for electricity is set at the price determined in 2022, without using any price competition method, **despite the continuously declining costs of renewable energy, especially solar**. For instance, the International Renewable Energy Agency estimates that between 2010 and 2022, solar power costs fell by up to 83%.

Contracts Last 20–25 Years with no flexibility

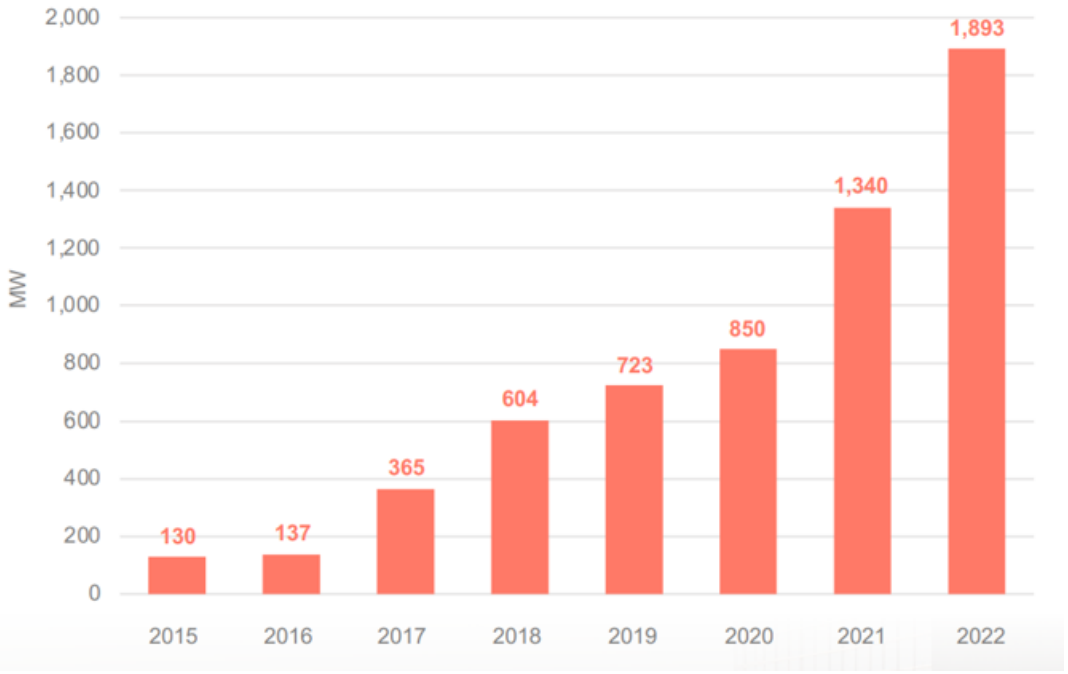
The contract term is set at 25 years, **which not only misses opportunities to procure cheaper electricity from emerging technologies but also risks declining performance and quality of power generation equipment over time**—potentially threatening the continuity of supply.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

Thailand's Rooftop Solar PV Lags Behind Huge Potential, Calling for Stronger Policies and Incentives

Thailand's rooftop solar PV has 226,000 MW technical potential by 2037 but only 1,800 MW installed by 2022. Despite grid parity since 2019, requiring **stronger policies** and **incentives**

Cumulative installed capacity of rooftop solar systems from 2013-2024



Cumulative installed capacity of rooftop solar systems from 2013-2024 by program types

Year implemented (status)	Programme	Customer target group
2013-2015 (completed)	FiT	Residential Commercial & Industrial
2017 (completed)	Self-Consumption only (Pilot Project)	Residential Commercial & Industrial
2018 (ongoing)	Self-Consumption only (No export)	Residential, Commercial & Industrial
2019-2020 (completed)	Net-billing with buyback rate of 1.68 THB/kWh	Residential (≤ 10 kW)
2021-2024 (ongoing)	Net-billing with buyback rate of 2.2 THB/kWh	Residential (≤ 10 kW)

Shall we move forward to Net-Metering for another incentive approach

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024 CASE

Key concerns Why “NOT YET NET-METERING” and Mitigation approach in Thailand

Key Concerns

Revenue Impact on Utilities

If a significant number of customers reduce or offset their electricity purchases, utilities earn less income to maintain and upgrade the grid.

Cost-Sharing Inequities

If solar adopters pay less or zero for electricity usage, the financial responsibility for grid upkeep may fall disproportionately on those who cannot install rooftop solar, leading to fairness concerns.

Key Mitigations

Utilities' revenue loss can be reduced if net metering includes a fixed fee for consumers to help cover grid maintenance, ensure energy security, and maintain grid reliability.

Suitable tariff mechanisms and policies, such as financing options for households to install rooftop solar panels

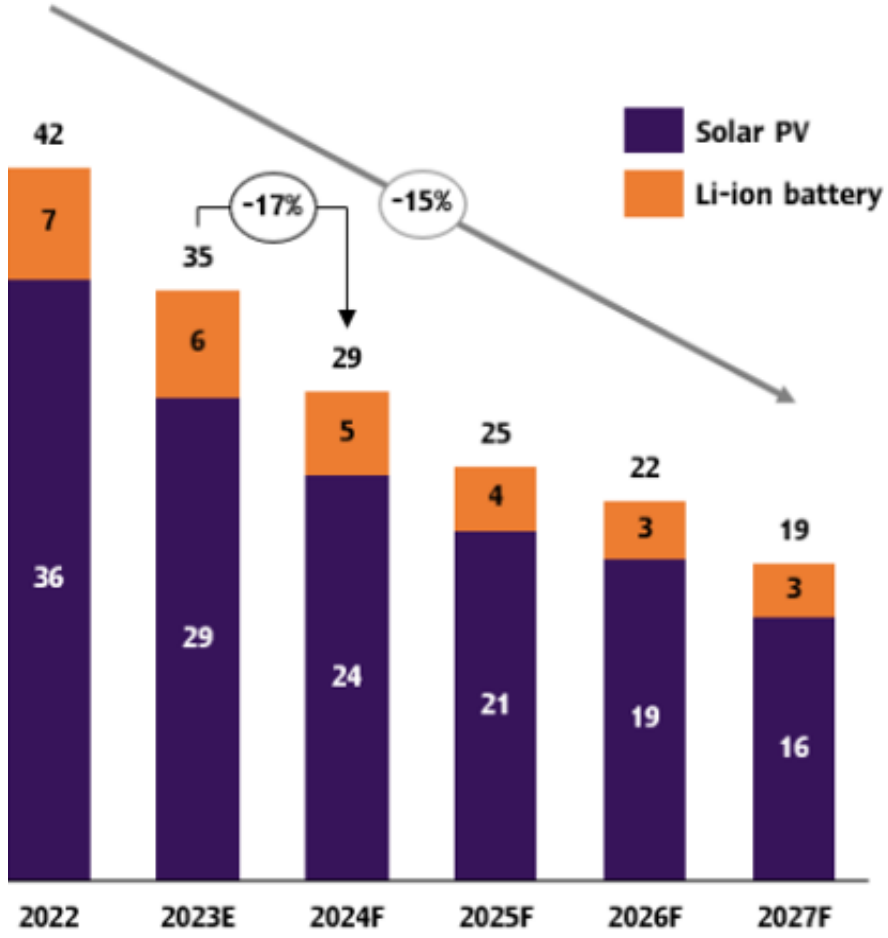
Policy recommendation

Reform regulations to ensure cost-reflective electricity pricing, implement tariff methodologies, and provide transparent subsidies to keep electricity affordable for vulnerable communities.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024 CASE

The Battery Prices Have Decreased, Supported Higher Investment as A Better Return

CAPEX for Solar PV and battery projects per 1 MW in the years (2022-2027F)



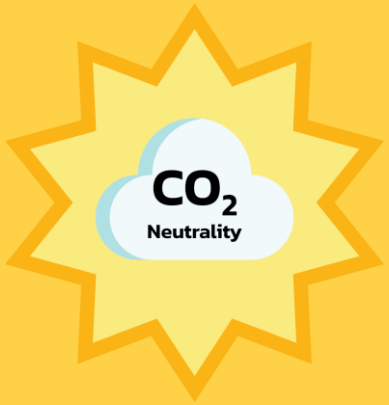
Source: SCBEIC

- Thailand's Solar+BESS electricity production gained momentum with a 1,000 MW government auction offering higher prices than solar alone, receiving full bids.
- Falling battery and solar panel costs are expected to reduce project costs by 15% annually (2022-2027).
- SCB EIC estimates a 15% IRR for 2023 COD, rising to 19-33% in 2024-2027, enabling cost management and lower electricity delivery costs by 2030.

Thailand Embraces Three Windows of Opportunity: A Unified Energy Plan, Carbon Neutrality by 2050, and Public Engagement

New National Energy Plan (NEP)

- Integrates five energy plans (PDP, AEDP, EEP, Oil, and Gas) into one strategic framework.
- Employs both top-down and bottom-up approaches to ensure alignment with broader national strategies.



Carbon Neutrality by 2050

- A well-defined strategy to transition away from LNG while maintaining energy security and affordability.

Public Engagement

- Recognizes the importance of public discourse, especially among the younger generation advocating sustainability.
- Encourages youth participation to drive innovation and broader societal support for renewable energy adoption.

Source: Asia Insider, Ember 2024, Bangkok Post, IEA 2024

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Key messages

Renewable Targets

ASEAN needs to **expand renewable capacity 3-5x by 2035,** with RAS aiming for 72% by 2050. Solar, hydro, and geothermal are increasingly cost-effective, especially with falling solar costs.

Thailand's Challenges:

Achieving 68% renewables by 2040 requires overcoming economic, political, and fossil fuel dependence barriers. **Weak alignment, inconsistent policies, and limited investments slow progress**, despite high solar potential.

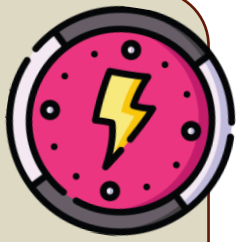
Policies Supporting Growth

Initiatives like Vietnam's DPPA, Thailand's TPA framework, and financial tools like the ASEAN Taxonomy and green bonds **drive renewable growth and investments**

Feed in Tariff Issues:

Lack of transparency, fixed pricing, and state enterprise restrictions hinder Thailand's renewable energy innovation and efficiency

Net-Metering and Energy storage , Are the HERO for Thailand Solar's adoption?



- Rooftop solar remains underutilized due to high costs, regulatory barriers, and weak policy support.
- Limited BESS deployment threatens renewable energy growth and fossil fuel phase-out.
- Falling solar and battery costs create opportunities for Solar+BESS projects with strong returns by 2030, advancing Thailand's renewable goal