Electricity market designs in SEA – opportunities for VRE growth

Indonesia, Thailand, Viet Nam, and the Philippines – Report launch

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NEW CLIMATE INSTITUTE

Energy Research Institute

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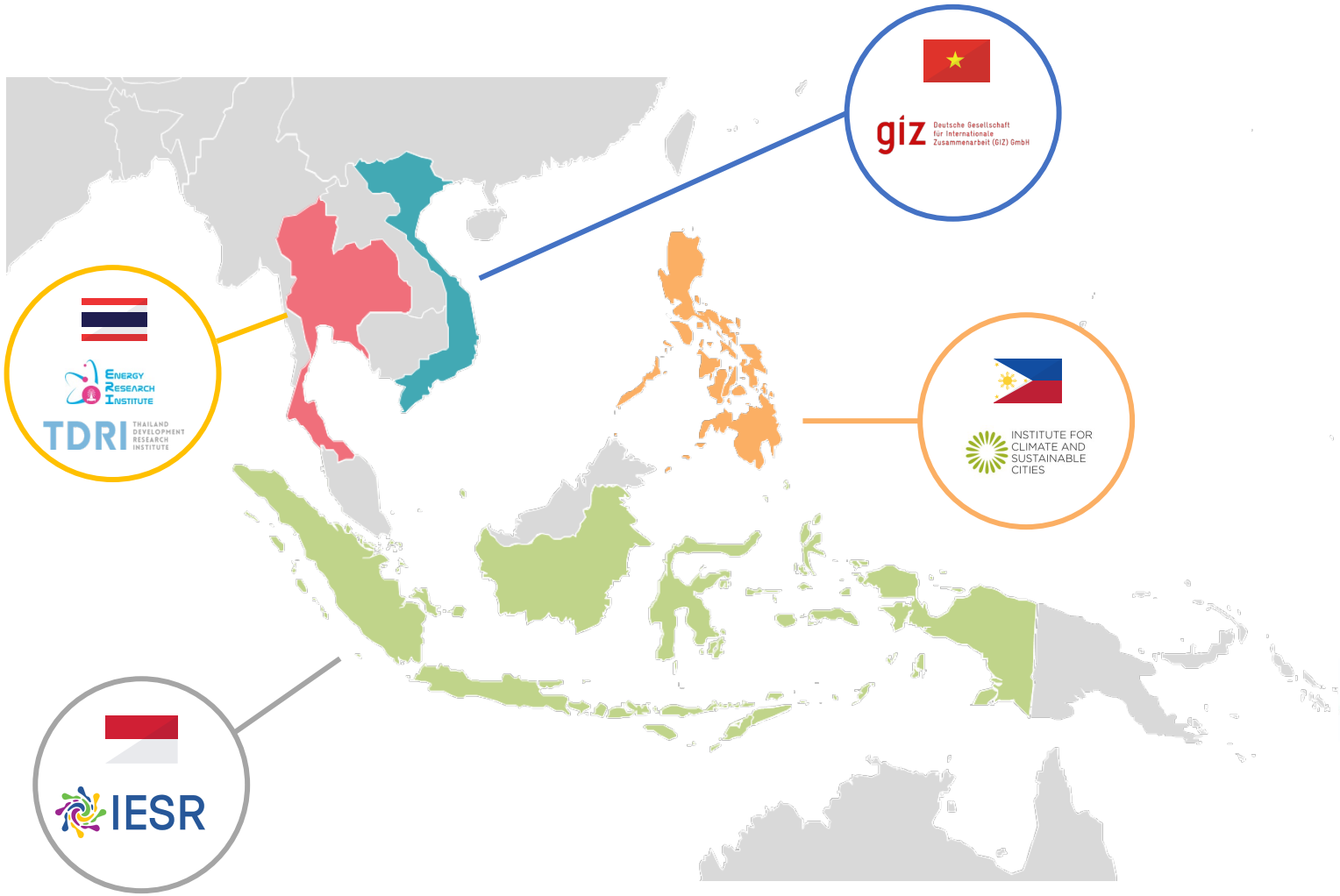


Focus countries

- Indonesia
- Philippines
- Thailand
- Vietnam

Coordinator:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

International expert organisations:

Agora Energiewende

New Climate Institute

Aligned programme

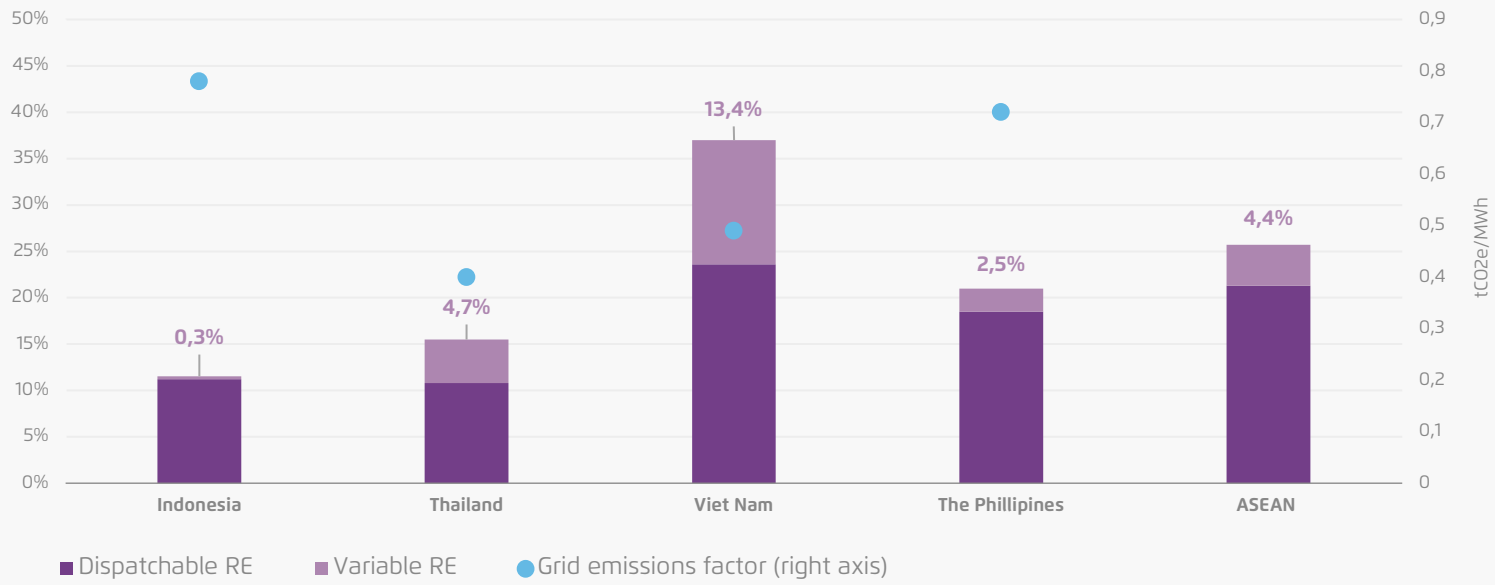
Energy Transition Partnership

Powering Prosperity and Enabling Sustainability in South East Asia

ASEAN's leading economies are in the early stages of VRE deployment – increasing investment certainty for wind and solar is key

At current VRE shares, integration challenges are minimal.
Conducive arrangements are needed to scale deployment.

RE shares for 2023 and emissions intensity of electricity generation 2022



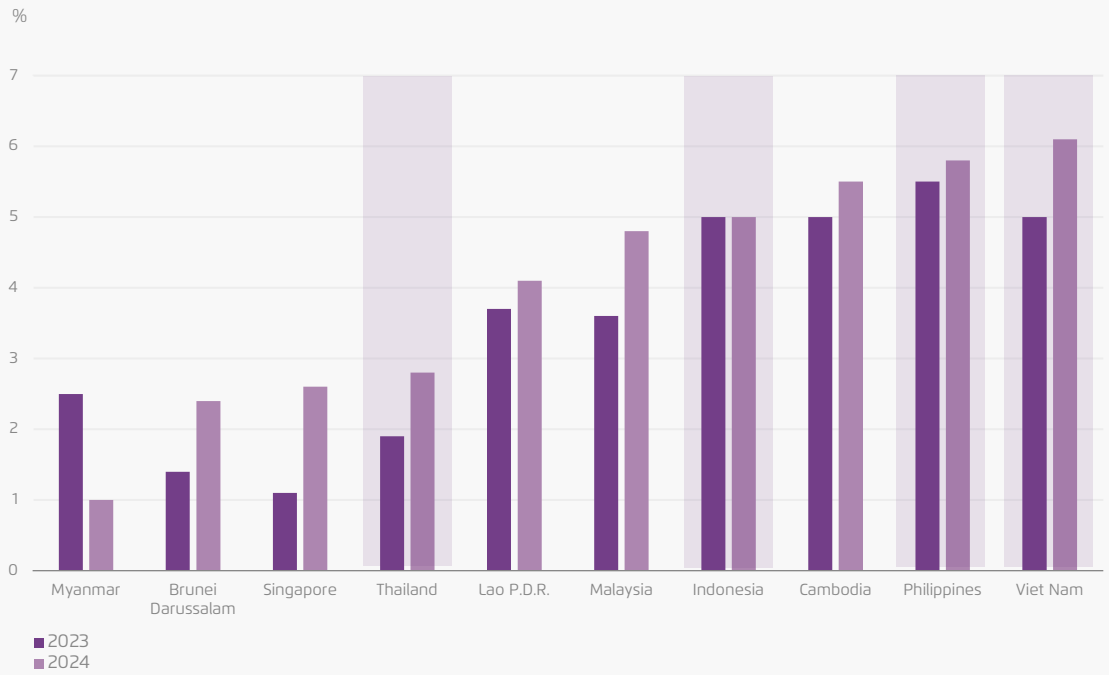
- → VRE shares increased by ~1 percent point in 2023 in Thailand (4.7%) and Viet Nam (13%) (Ember, 2024)
- → Investment certainty for VREs should be *the* priority in the region (policies, bankable contracts, ambitious planning)
- → Priorities for Viet Nam are multi-pronged (integration + investment), having to address high solar in-feed in the south amidst network constraints

Sources: ACE 2024, EMBER 2024, national ministries, regulators, utilities, own calculations

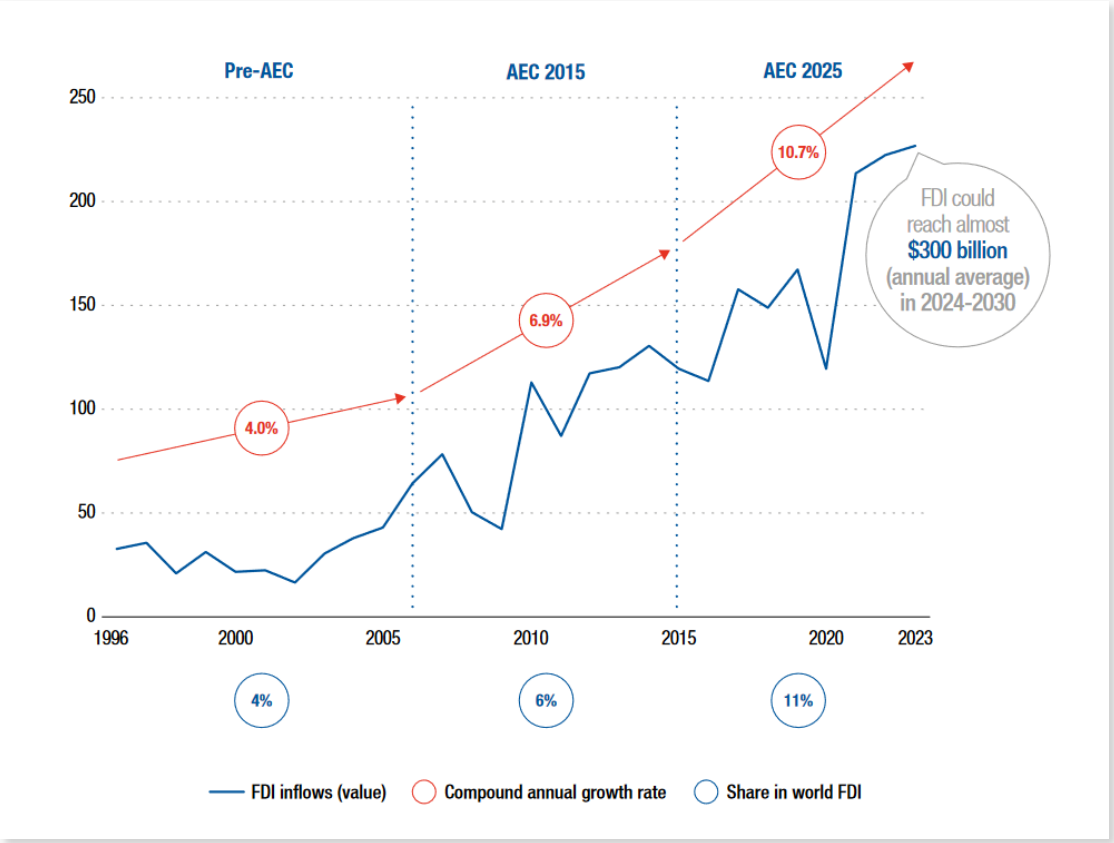
Robust economic growth and investor interest presents a major opportunity for large-scale renewable ramp ups across ASEAN

Most ASEAN countries‘ economies are growing > 4 % per yr

GDP growth in ASEAN's economies 2023–2024



FDI flows in ASEAN are reaching record highs

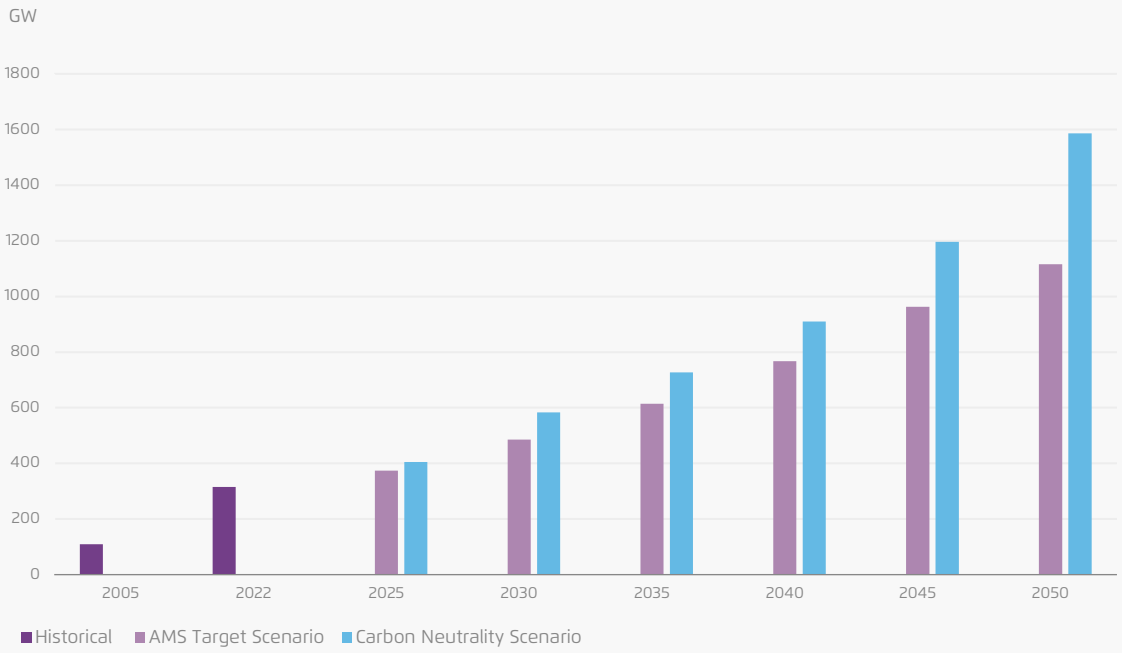


 | Source: IMF (left), ASEAN Investment 2024 (right)

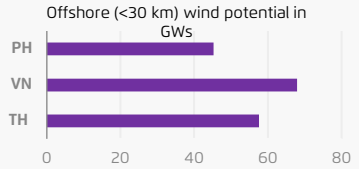
And so do electricity demand growth and renewable resource potential

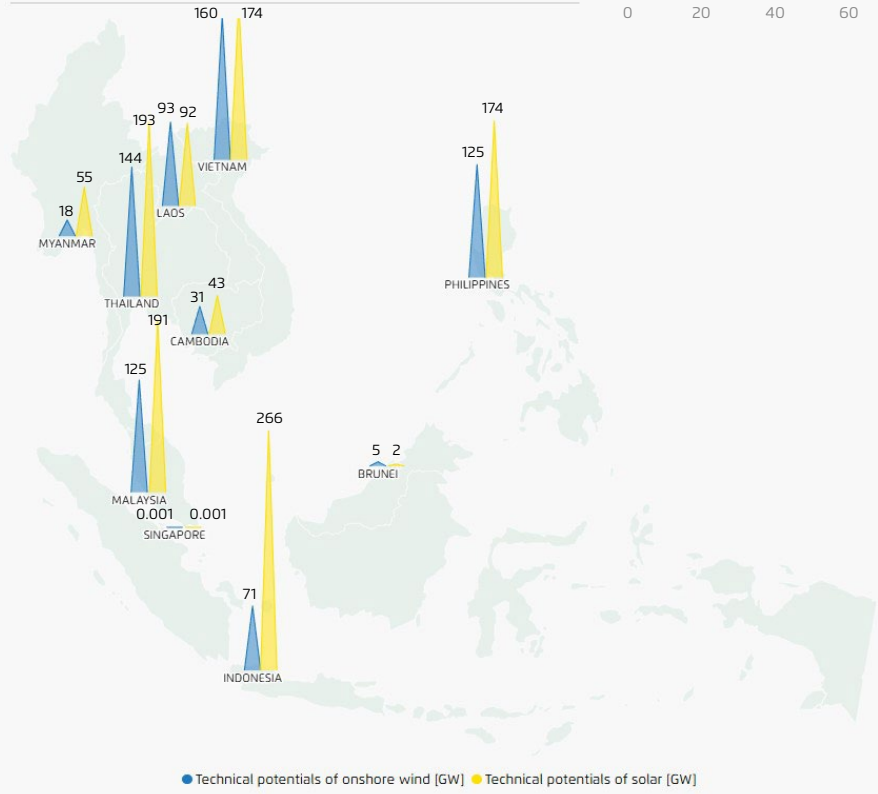
Electricity demand growth drives power system expansion of major scale

Generation capacity expansion in ASEAN (8th ASEAN Energy Outlook)



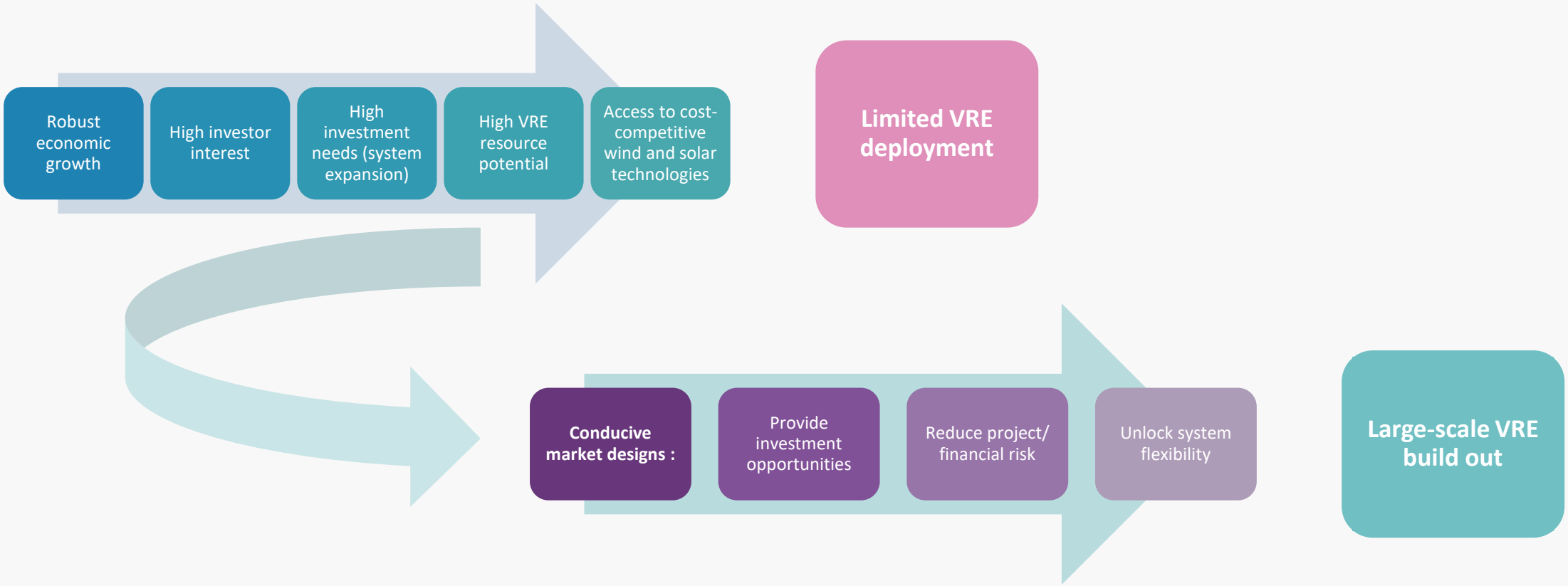
Most of Southeast Asia‘s wind and solar potential remains unexploited





 | Source: ASEAN – 8th Energy Outlook (left); Agora-Atlite model incl. land constraints (right)

Tackling Southeast Asia‘s renewable energy paradox – from high potential, low deployment to large-scale buildouts

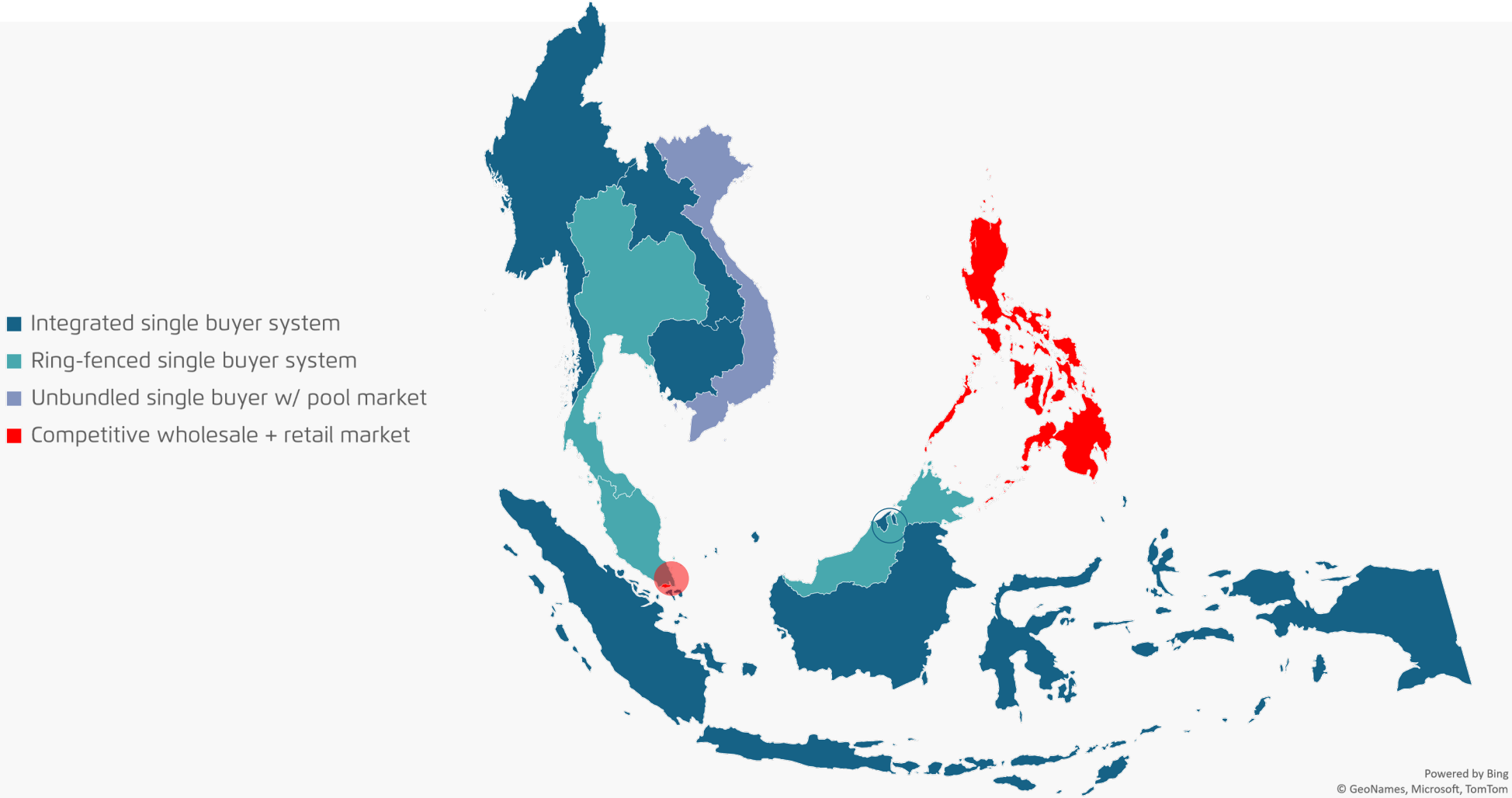


Outcome-based principles for renewables-based transitions

Electricity market designs should deliver on a revised set of power system transformation objectives

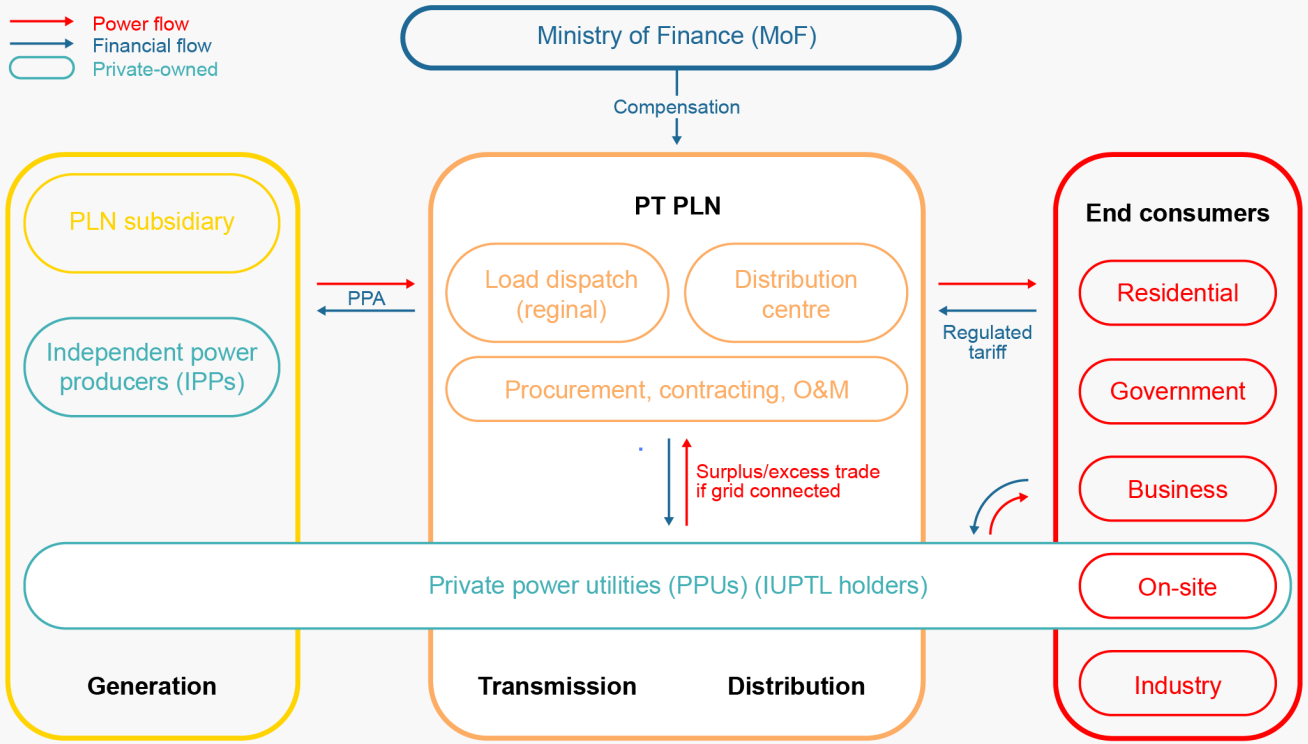
- Provide long-term investment certainty for variable renewable energies (VREs)
- Enhance system flexibility to integrate variable renewables into the system at the least cost
- Safeguard system adequacy in line with long-term decarbonisation and flexibility needs
- Provide clarity on and efficiently manage the retirement of inflexible and carbon-intensive assets
- Ensure affordable electricity for consumers while maintaining the sector's financial sustainability

The single-buyer model prevails in differing forms in ASEAN



Indonesia – an integrated single-buyer model

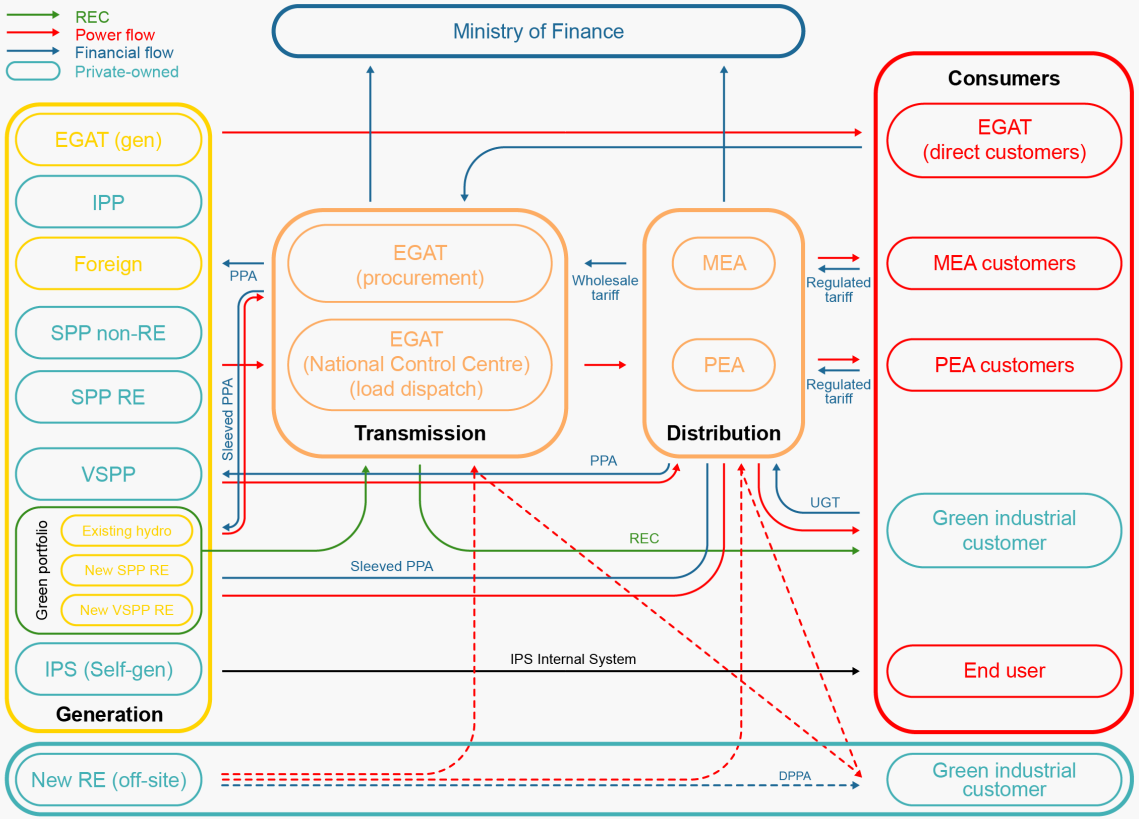
Indonesia‘s electricity market model



- Utility (PT PLN) w/ integrated SB activities (procurement, purchase, sale) and system operations
- Long-term PPAs for independent producers
- Subsidized end-user tariffs
- Private power utilities for on-site industrial demand
- Limited scope for market reform
- Low VRE share so far (<1%) despite major system expansions overall
- **Opportunity: Replicate investment model for VRE buildout through conducive offtake contracts, larger procurement pipeline, less restrictive LCRs**

Thailand – a ring-fenced single-buyer model

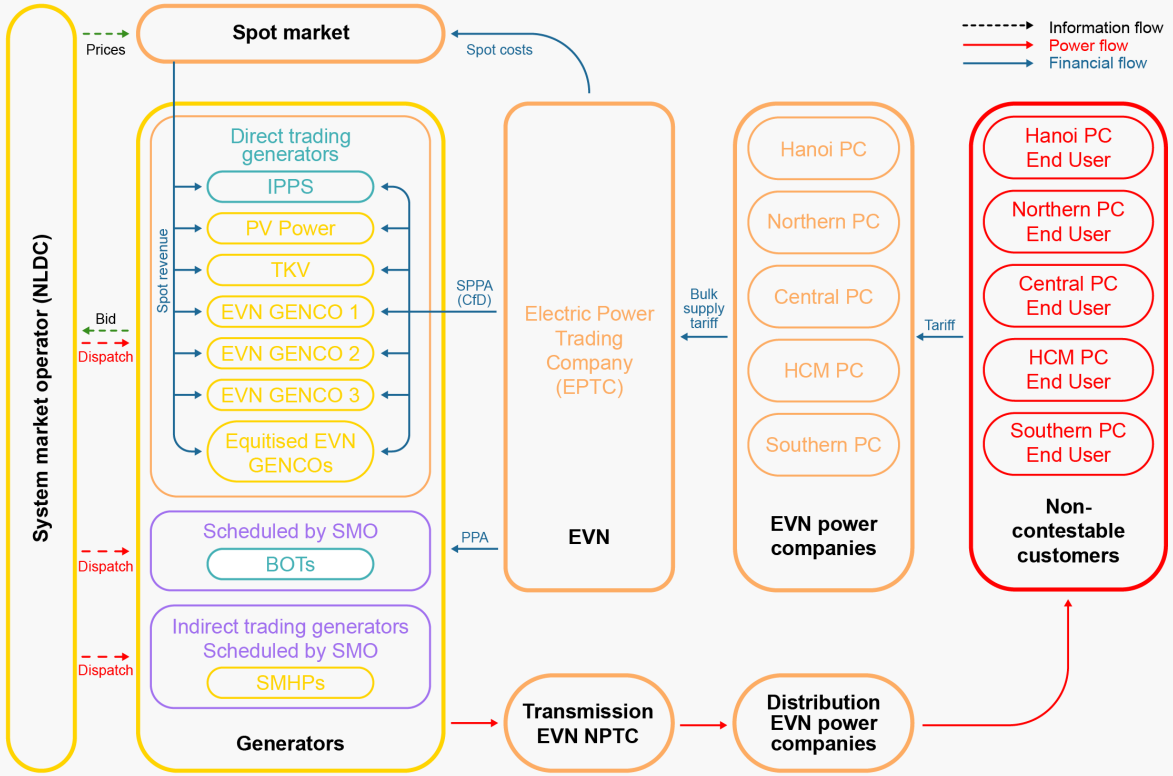
Thailand‘s electricity market model



- Separate TSO (EGAT) and DSOs (MEA, PEA) under supervision of energy and interior ministry resp.
- Ring-fenced system operations
- Long-term PPAs for independent producers
- Direct (corporate) PPAs pilot approved – to be introduced
- RE tenders infrequent but oversubscribed – high demand for new projects
- **Opportunity: Scale procurement and introduce contractual reforms to use gas fleet more flexibly**

Viet Nam – an unbundled single-buyer model

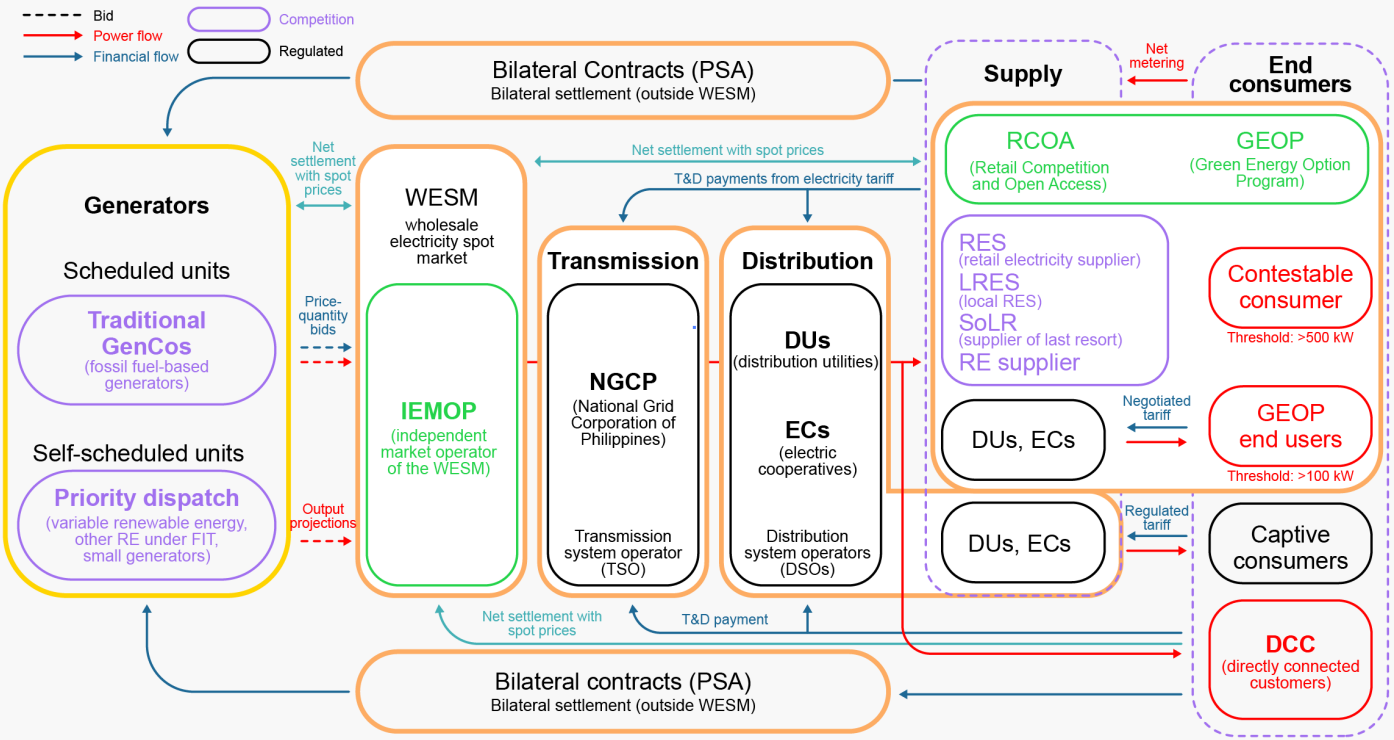
Viet Nam‘s electricity market model



- Legally unbundled utility (EVN)
- Cost-based pool market (VWEM)
- Build-own-transfer power plants contracted under PPAs – indirectly participate in VWEM
- Subsidized end-user tariffs
- Direct (corporate) PPA mechanisms are being implemented
- Utility procurement VRE on halt – new mechanism to be introduced
- *Comprehensive market design roadmap in place – transitioning to a competitive gross pool market*
- **Opportunity: expose BOT players to short-term market dynamics**

The Philippines – a restructured system with market competition

Electricity market model of the Philippines



- Unbundled system
- Competitive VRE procurement through auctions (GEAP)
- Mandatory gross pool market (WESM) (energy/reserve co-optimization)
- Bilateral contracts market (i.e. PSAs) with delivery obligations
- Bilateral delivery obligations interfere with central dispatch mechanism
- **Opportunity: 1) convert bilateral PPAs into financial contracts and shift to a fully central dispatch model, or 2) move to a voluntary net pool market (self-dispatch)**

Single-buyer models in SEA have ensured supply security in rapidly expanding systems but need tweaks to propel the clean technology shift

Key strengths of SB models in SEA

- → System adequacy
- → System reliability
- → Security of supply
- → Mobilisation of private capital
- → Energy access

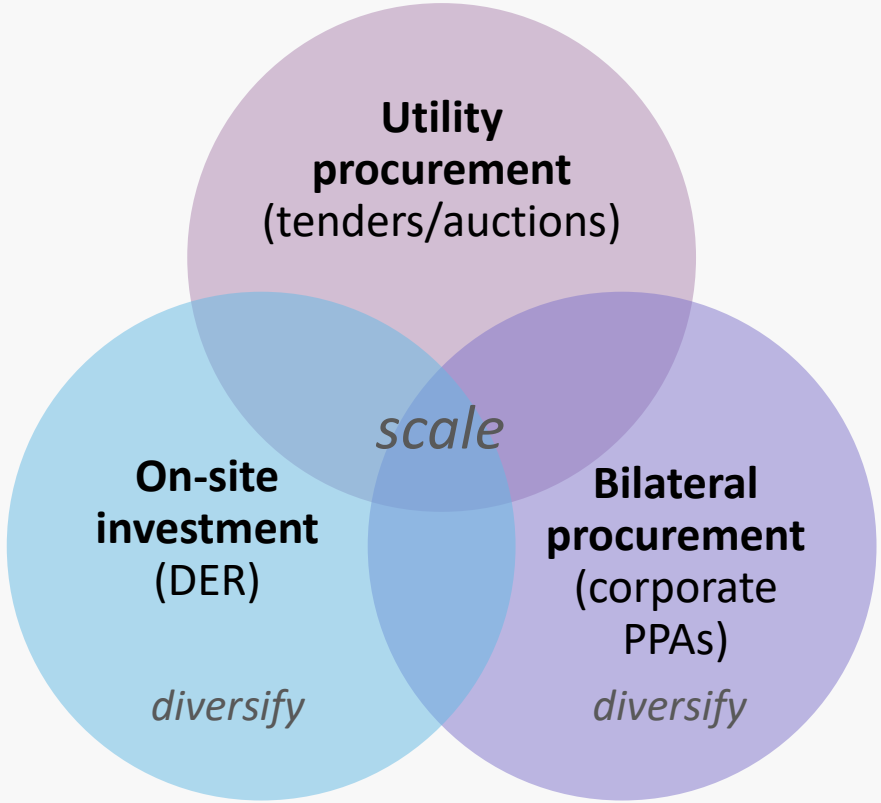
PH ✓

Challenges to VRE growth in single-buyer systems in SEA

- → **Utility business model:** Limited incentives for cost-optimization with a tendency to over procure baseload capacity; VRE undermines utility's asset utilization; financial constraints limit network infrastructure investments
- → **System operations:** Need for shorter dispatch intervals, intraday unit commitment to complement day-ahead dispatch, enhanced VRE forecasting models -> support VRE integration and reduce reserve requirements
- → **Contractual arrangements** limit cost-effective utilization of flexibility from fossil fuel power plants
- → **Utility procurement of VRE:** Tenders small in size, need more transparency and long-term clarity (aligned with net-zero pathways)
- → **Market regulations** have so far prevented bilateral VRE procurement (corporate PPAs); TH and VN have taken the steps in 2024 to unlock private RE markets

Insight #1: VRE procurement pipelines are increasing and new investment avenues are being unlocked, but more is needed

VRE investment in all four countries will need to be scaled and diversified



- → The Philippines – so far the only ASEAN country with competitive auctions - awarded 5.4 GW of new capacity over two consecutive auction rounds 2022/2023
- → Thailand tendered 5 GW (with high participation) in 2022 and may launch another tender in 2024 (postponed)
- → Viet Nam added > 5 GW wind power and ~17 GW solar power over 2018-2023 – deployment has since stalled
- → Indonesia falls short with < 1 GW in total VREs

- → **Utility procurement must be scaled in all four systems**
- → **Corporate PPAs** are underway in Viet Nam and Thailand
- → **DER potential so far untapped** in all four countries: < 500 MW (regulatory barriers)

Insight #2 : Power purchase agreements expose VREs to greater market risk than fossil fuel plants – new long-term arrangements are key

Supply structures of RE PPAs

→ Fixed volume PPAs

→ Pay-as-nominated/forecast

→ Pay-as-produced PPAs

→ Fossil fuel assets in IDN, TH, VN, PH benefit from effective de-risking measures in long-term PPAs, these include **purchase guarantees** or **capacity payments** – securing revenue irrespective of energy delivered.

→ VRE plants typically face some degree of **volume risk** (no guarantee that all output will be purchased) and/or **price risk** (may receive a lower price if selling above contracted levels)

→ VREs are not compensated for curtailment in any of the four countries. Limited compensation does apply to VREs in IDN (“deemed dispatch”)

→ There are also smaller aspects like currency and exchange rate risk where discrepancies between VRE and fossil power investments are observed

→ Adoption of **pay-as-produced PPAs** for renewable could mitigate the risk to VRE investments by providing purchase guarantees at a fixed offtake price (stable revenue flows)

Insight #3: PPAs for fossil power plants are designed for baseload availability and are at odds with VRE-driven transitions

Key system flexibility sources

→ **Dispatchable assets**
→ Network capacity
→ Storage solutions
→ Demand-side response

Main fossil fuel source (TWh)

→ **IDN** coal power – 67%
→ **TH** gas power – 53%
→ **VN** coal power – 45%
→ **PH** coal power – 58%

Indonesia

- Fixed capital recovery through capacity-based payments – up to 40% of overall revenue → *system costs*

Thailand

- Minimum take requirements specified over daily/hourly periods → *dispatch inflexibility*

Viet Nam

- Minimum take for power plants financed under built-operate-transfer arrangements → *dispatch inflexibility*

Philippines

- Capacity payments to coal plants (under bilateral contracts) increase with lower running hours (+ bidding behaviour WESM) → *dispatch inflexibility & system costs*
- **Contractual renegotiation for existing fossil fuel assets must be a priority to support least cost renewables transitions**

Insight #4: There's been a tendency to over-procure baseload capacity, limiting the potential for major (V)RE ramp-ups over the mid-term

Current reserve margins

- → Thailand – about 40%
- → Indonesia – 50% in Java-bali system
- → Viet Nam – 25%, with VRE 73%
- → Philippines – 33%, 44%, 82% in Luzon, Visayas and Mindanao

- → System planners have been successful in ensuring supply security in rapidly growing systems, with annual demand growth in the range of 3% (TH) to 10% (VN)
- → Utilities face few incentives for cost optimisation (pass on the cost of regulated asset base to consumers) but are held accountable for security of supply
- → Tendency of over procurement, which in some countries has held back VRE deployment (IDN, TH)
- → Fossil fuel fleets must be reorganized to 1) create market space for VRE to entery and 2) accommodate variable output

Three R's for efficient fossil asset exits: Retire, Reserve and Repurpose

Contractual renegotiation is at the core of any coal transition pathway

Retire older, least efficient assets	Supported by novel financial instruments	**Early termination of PPAs**	• Legal obstacles (investment treaties, PPA protection) • Risk allocation between investor and utility (government) to determine compensation
Reserve assets with less system value	To reduce their operating costs to a minimum, create space for VRE deployment, ensure back-up supply	**Renegotiation of PPAs**	• No minimum take obligations • Capacity payments
Repurpose newer, efficient assets for flexibility provisions	With new contractual arrangements that value such services	**Renegotiation of PPAs**	• Lower minimum-take defined over longer time horizons • Ramp service premium • Ancillary services • Reformed capacity payment structure

VRE transitions need not require sweeping reforms; targeted measures can get countries firmly underway

1. **Scale VRE procurement pipelines in line with long-term targets through transparent tender or auction mechanisms** (ensure long-term certainty)

2. **De-risk renewable energy PPAs – consider introducing pay-as-produced offtake structures** (mitigate risk and reduce capital costs)

3. **Introduce and accelerate Direct PPA arrangements and mitigate barriers to on-site investment** (open new investment opportunities)

4. **Reform existing PPAs for baseload power plants to induce a value shift from baseload availability towards system flexibility** (unlock system flexibility)

5. **Reorganize fossil fuel fleets according to their system value: Retire, Reserve, and Repurpose** (efficient phasedown pathways through system transformation)

Thank you for your attention!

Do you have any questions or comments?

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