Bridging the Gap: Energy Transition Plans vs. Reality

This presentation examines the disconnect between idealistic energy transition goals and the practical realities faced by countries worldwide. We'll analyze the challenges in infrastructure, financing, and technology that create this gap, explore case studies of idealistic versus realistic approaches, and propose strategies to bridge these differences.

Our analysis will provide insights into how countries can develop more effective energy transition roadmaps that balance ambitious climate goals with practical implementation constraints.

by Nuki Agya Utama
AZEC Centre

ERIA
Economic Research Institute
for ASEAN and East Asia

Recent Blackout Cases

Iberian Peninsula Blackout (April 28, 2025)

A sudden blackout disrupted power to millions, triggered by instability when solar PV accounted for 59% of supply.
Voltage oscillations and lack of system inertia caused cascading failures across the Iberian Peninsula.
The blackout underscores how high variable renewable energy (vRE) shares, when unmatched by adequate grid flexibility and system reserves, can lead to widespread instability.

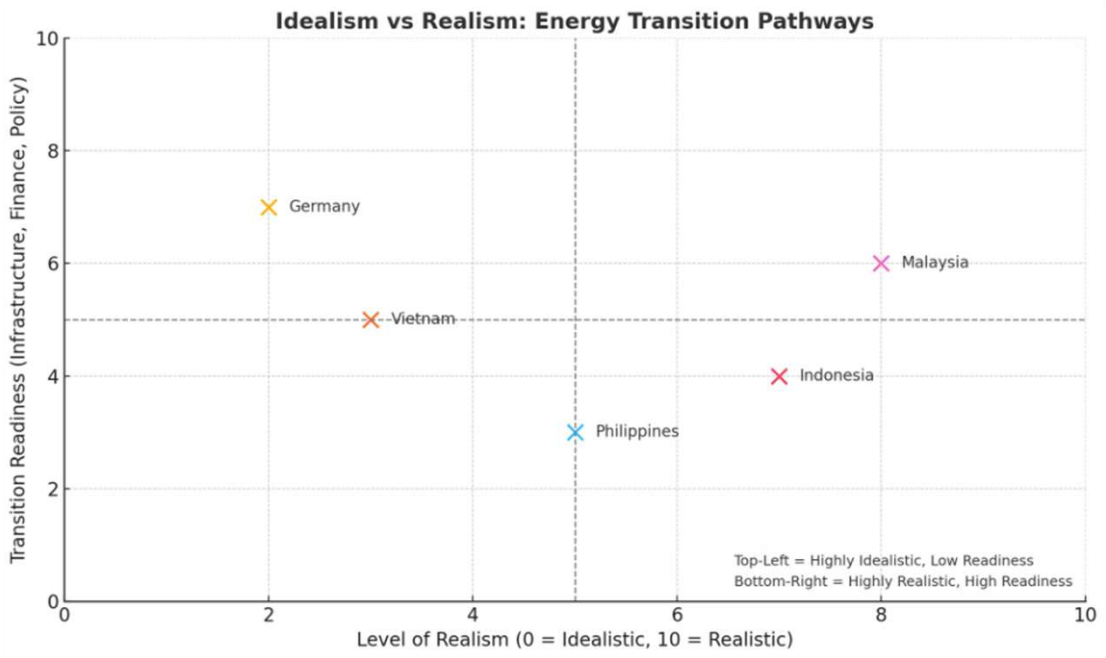
Bali, Indonesia

On Friday, April 26, 2025, a massive blackout began around 3:00 p.m. local time and was caused by a failure in the undersea power cable connecting Java and Bali, according to PLN.
The failure led to a complete shutdown of all power plants on the island, exposing the vulnerability of relying heavily on inter-island transmission without adequate on-site backup or autonomous grid capabilities.
Although unrelated to renewable over-generation, the incident highlights infrastructure dependency and the need for resilience planning in transition scenarios.

Idealistic and Realistic

Germany: Set aggressive coal and nuclear exit deadlines, now facing industrial decline and high-power prices.

Vietnam: Rapidly installed 17 GW of solar within two years but curtailed significant generation due to grid constraints.



Malaysia: Gradually expanding its solar fleet while enhancing grid codes, carbon pricing readiness, and financial instruments to scale investments sustainably.

Indonesia: Plans to reach net zero by 2060, with a pragmatic blend of renewables, CCS, hydrogen, and continued fossil use in the near term.

Y-axis (Transition Readiness):

- Low (0–4): Poor grid, limited private sector engagement, unclear policy frameworks.
- High (7–10): Strong infrastructure, clear financing mechanisms, mature governance.

X-axis (Realism Level):

- Far left (0–3): Highly idealistic, fast-transition goals without full infrastructure or financing.
- Center (4–6): Balanced or mixed strategy — ambitious but grounded on real capabilities.
- Far right (7–10): Very realistic, phased approaches based on available finance, technology, and social acceptance.

Contrasting Energy Transition Approaches

Idealistic Approach (Germany, Vietnam)

Very rapid transition speed with aggressive fossil fuel shutdowns

Infrastructure development often lagging behind ambitious targets

Heavy public spending, sometimes with private investment lag

Risks include grid instability and energy price shocks

Realistic Approach (Indonesia, Malaysia)

Gradual, phased transition aligned with actual capabilities

Managed decline of fossil fuels with partial retention (e.g., with CCS)

Blended finance focus, public-private partnerships, international support

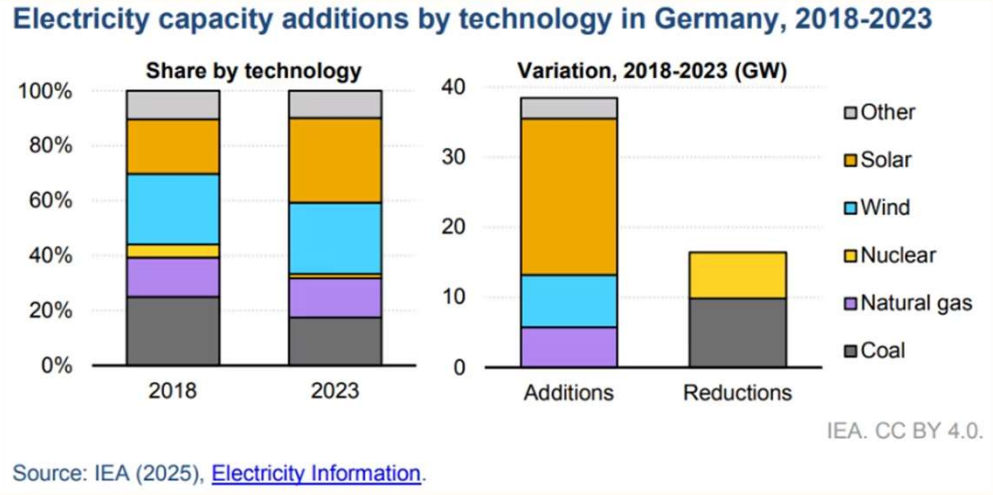
Slower gains but more stable progress

Idealistic Approach: The German Case

Ambitious Targets

Germany aims for GHG neutrality by 2045, with 80% renewable energy in power consumption by 2030 and 100% by 2035. Renewables already account for 54% of gross electricity consumption in 2024.

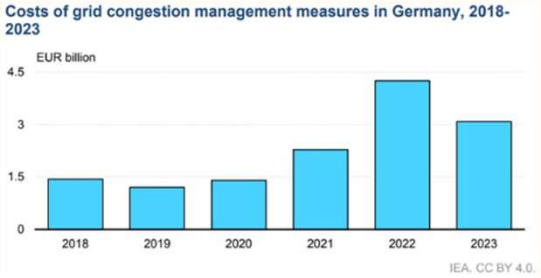
The country has invested heavily in solar and wind capacity to compensate for the phase-out of coal and nuclear energy, supported by strong policy incentives.



Source: IEA (2025), Electricity Information.

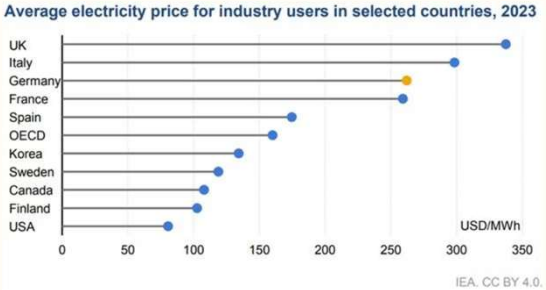
Emerging Challenges

Grid congestion has rapidly increased due to insufficient transmission capacity from northern renewable supply centers to southern consumption areas, closure of southern power plants, and maintaining a single price zone while increasing cross-zonal trade.



Source: IEA analysis based on Federal Network Agency (2024), Grid congestion management (Accessed: 24 October 2024).

Following the 2022 energy crisis and resulting price increases, Germany faces declining industrial activity, with firms considering cutting output or relocating abroad. Manufacturing output has decreased, and numerous companies to either reduce production or relocate their operations to countries with more favorable energy costs.



Source: IEA (2024), Energy Prices.

Realistic Approach: The Indonesian Case Case

Long-Term Vision

Carbon neutrality by 2060

Gradual Coal Phase-Out

Plan to eliminate coal by 2056

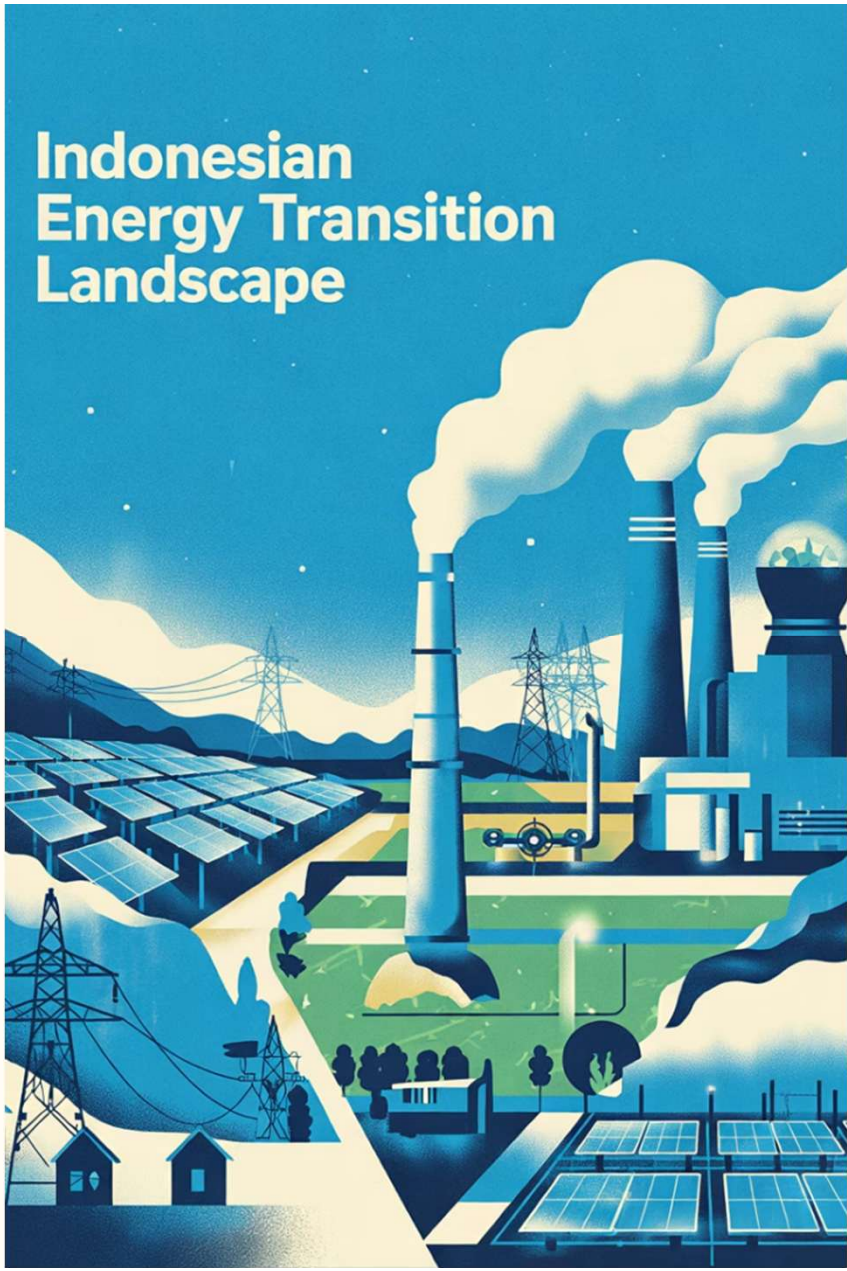
Balanced Portfolio

Incorporating hydrogen, CCS, and nuclear

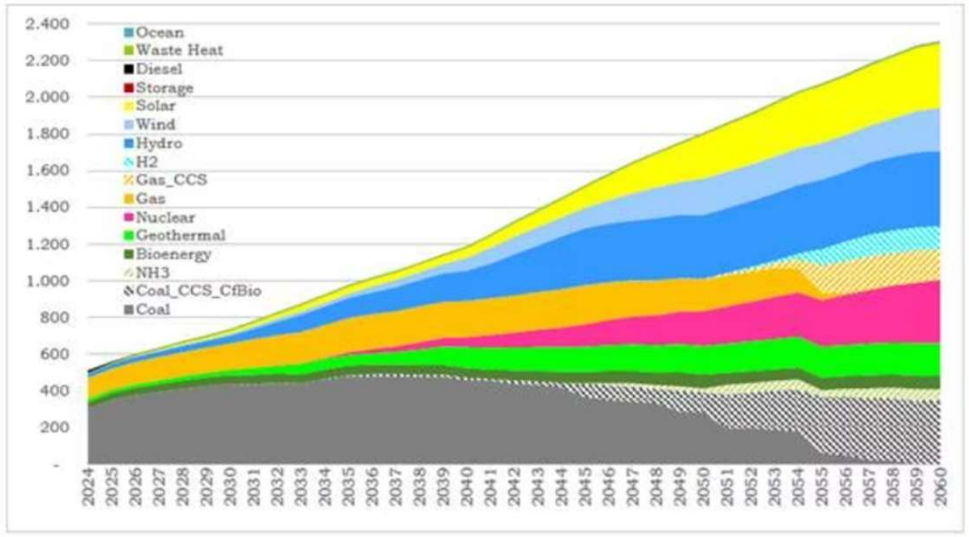
Pragmatic Implementation

Incremental approach prioritizing stability

Indonesia's National Electricity General Plan (RNKN) published in November 2024 demonstrates a pragmatic approach to energy transition. Rather than abruptly shifting to renewables, Indonesia is pursuing a balanced electricity supply portfolio that recognizes infrastructure limitations and economic constraints.



Indonesia's Pragmatic Energy Transition



Gambar 45. Hasil Proyeksi Produksi Tenaga Listrik (dalam TWh) dengan Tambahan Produksi *Green Hydrogen*

Source: Ministry of Energy and Mineral Resources of Indonesia (2024), Rencana Umum Ketenagalistrikan Nasional

> Indonesia's National Electricity Plan demonstrates a pragmatic approach to energy transition, balancing a gradual phase-out of fossil fuels with the need for economic stability and infrastructure limitations.

Unlike some countries that have adopted more idealistic energy transition strategies, Indonesia's plan recognizes the realities on the ground. The country must navigate the complex challenges of meeting growing energy demands, upgrading aging infrastructure, and ensuring affordable and reliable electricity supply for its population and industries.

This balanced approach allows Indonesia to make steady progress towards its long-term climate goals, while also addressing the immediate economic and practical concerns that come with a rapid energy transformation. By taking a measured and well-considered path, Indonesia aims to achieve a just and equitable transition that supports its development priorities.

Strategies to Bridge the Gap between Ideals and Reality

Integrated Transition Roadmaps

Develop pragmatic, phased approaches

Align Financing with Transition Stages

Deploy transition finance: green bonds, blended finance for coal retirement and renewables.

Innovative Financial Mechanisms

bridging the gap between energy transition ambitions
and implementation realities

Develop pragmatic, phased roadmaps tailored to local contexts, considering infrastructure readiness, financial capacity, and socio-economic impacts.

Balance idealism with actionable interim targets, allowing continuous progress evaluation and adaptation.

Integrated Transition Roadmaps

Context Assessment

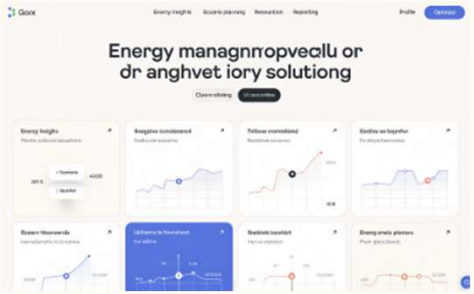
Evaluate infrastructure readiness, financial capacity, and socio-economic impacts specific to each country or region.

Phased Target Setting

Establish realistic interim milestones that build toward ambitious long-term goals, allowing for continuous progress evaluation.

Stakeholder Engagement Engagement

Involve industry, communities, and experts in roadmap development to ensure buy-in and practical implementation strategies.



Adaptive Management Management

Build flexibility into plans to accommodate technological advancements, economic shifts, and changing energy demands.

Pragmatic roadmaps must balance idealism with actionable targets, recognizing that energy transitions are not one-size-fits-all. Success requires tailoring approaches to local contexts while maintaining alignment with global climate objectives.

Financial Constraints and Investment Gaps

382GW

Required capacity

Projections suggest that to align with global climate goals, ASEAN's renewable capacity needs to increase 3–5 times by 2035

$56B

Annually

ASEAN requires approximately from 2023 to 2030 to meet its power sector investment needs.

$ 43B

In 2022

only ASEAN attracted clean energy investments, highlighting a significant shortfall.

Public Funding Shortfall

Indonesia's PLN faces financial strain while Vietnam halted its feed-in-tariff program due to budget limitations

Mobilizing private capital remains challenging due to currency fluctuation risks, inconsistent policy signals, and limited project bankability. Most ASEAN countries still struggle to create attractive investment opportunities that meet international standards for green financing.

Innovative Financial Mechanisms

Blended Finance

Combine public, private, and international funding sources to distribute risk and maximize investment impact. This approach can leverage limited public funds to attract larger private capital flows.

Green Financial Instruments

Develop specialized green bonds, transition bonds, and carbon markets tailored to energy transition projects. These instruments can help monetize environmental benefits and attract ESG-focused investors.

Risk Mitigation Tools

Implement guarantees, insurance products, and currency hedging mechanisms to address investor concerns about political, regulatory, and market risks in emerging economies.

Financial innovation is essential to close the substantial funding gap for energy transitions, particularly in developing regions. By creating investment vehicles that align with both profit motives and sustainability goals, countries can accelerate capital flows toward clean energy infrastructure.

Bridging ASEAN's Energy Transition Finance Gaps

To realistically transition ASEAN's energy systems toward cleaner infrastructure while ensuring affordability and security, we must address key financing challenges:

Early-Stage Finance

Critical funding needed for feasibility studies, technology pilots, and new grid models that lay the groundwork for successful projects.

Risk Mitigation

Tools to address political risks, off-taker risk, and currency risks that often prevent investment in emerging markets.

Local Bank Readiness

Addressing limited knowledge on renewable energy and project finance among local financial institutions.

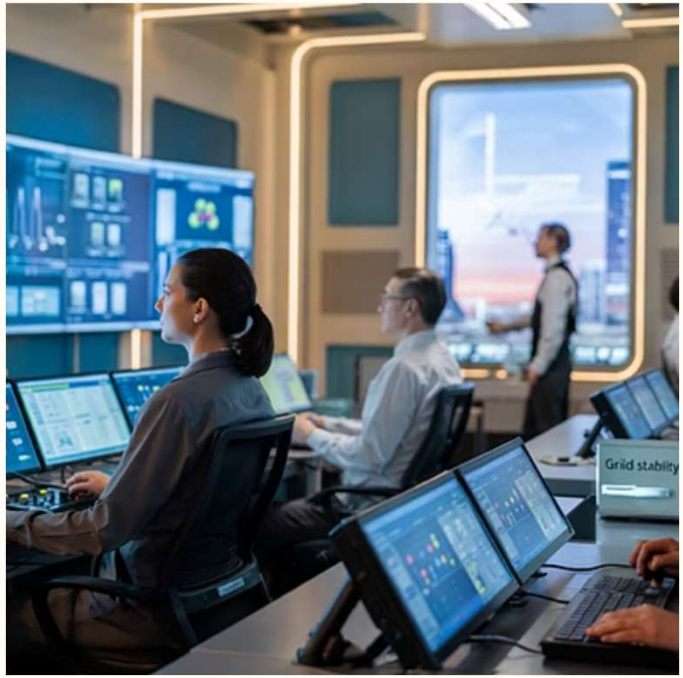
Private Sector Engagement

Transparent PPAs and long-term offtake contracts are essential to attract private investment and scale solutions.

Transition Finance Solutions

Blended finance, policy clarity, carbon pricing, and regional cooperation will enable both green projects and help grey sectors evolve.

Leveraging Technology and Innovation



Technological advancement is crucial for bridging the gap between energy transition ambitions and implementation realities. Priority areas include:

Grid Modernization

Invest in smart grids and advanced management systems to enhance renewable integration capacity and improve system flexibility.

Emerging Technologies

Scale up promising innovations like green hydrogen, advanced battery storage, and carbon capture to complement variable renewables.

R&D Support

Fund research initiatives focused on reducing costs and improving performance of clean energy technologies to accelerate commercial viability.


Our Aspiration
Empowering Asia's Sustainable Future:
Collaborate, Innovate, and Lead the
Pathways to Zero Emissions

Economic Research Institute for ASEAN and East Asia

Headquarters:
The ASEAN Secretariat, Heritage Building, 4th Floor
Jl Sisingamangaraja, 70A, Jakarta Selatan 12110, Indonesia

Annex Office:
Sentral Senayan II, 5th, 6th, and 15th Floor
Jl Asia Afrika No. 8, Gelora Bung Karno
Senayan, Jakarta Pusat 10270, Indonesia

Scan here to access the report

Technological Readiness and Scalability Issues Issues

Renewable technologies vary in maturity

Solar, wind, hydrogen, storage exist but vary significantly in maturity and cost competitiveness.

Manufacturing capacity challenges

Transition requires substantial scaling of manufacturing capacity, supply chains, and skills training.

Early stage technologies

Offshore wind, hydrogen, and CCUS are in early stages across ASEAN.

Import dependencies

Most countries rely on imports for solar PV modules, inverters, and battery storage, primarily from China.

Workforce shortages remain a barrier—ASEAN needs 2.5 million new skilled clean energy workers by 2030.

Vietnam Case: Over 15 GW of solar and wind capacity is regularly curtailed due to insufficient grid capacity and control systems, demonstrating the danger of pushing too much RE capacity without complementary investments.

Ambitious Targets vs. Current Infrastructure

Bold Commitments

Many ASEAN countries have set ambitious goals, with Vietnam targeting 70% renewable energy by 2050 and Indonesia aiming for net-zero emissions by 2060.

Fossil Fuel Dominance

Despite these pledges, fossil fuels still account for approximately 82% of ASEAN's total primary energy supply as of 2022.

Infrastructure Limitations

Outdated or fragmented grid infrastructure, especially in archipelagic regions like the Philippines and Indonesia, impedes efficient renewable integration.

Storage Challenges

The intermittency of solar and wind requires significant investment in storage and flexible grid management, yet ASEAN countries currently lack large-scale battery systems.

Strategy 3: Policy Harmonization and Regulatory Clarity

Regional Coordination

Harmonize regulatory frameworks across national boundaries to create larger markets for renewable energy and enable cross-border power trading. This coordination reduces investment barriers and improves resource allocation efficiency.

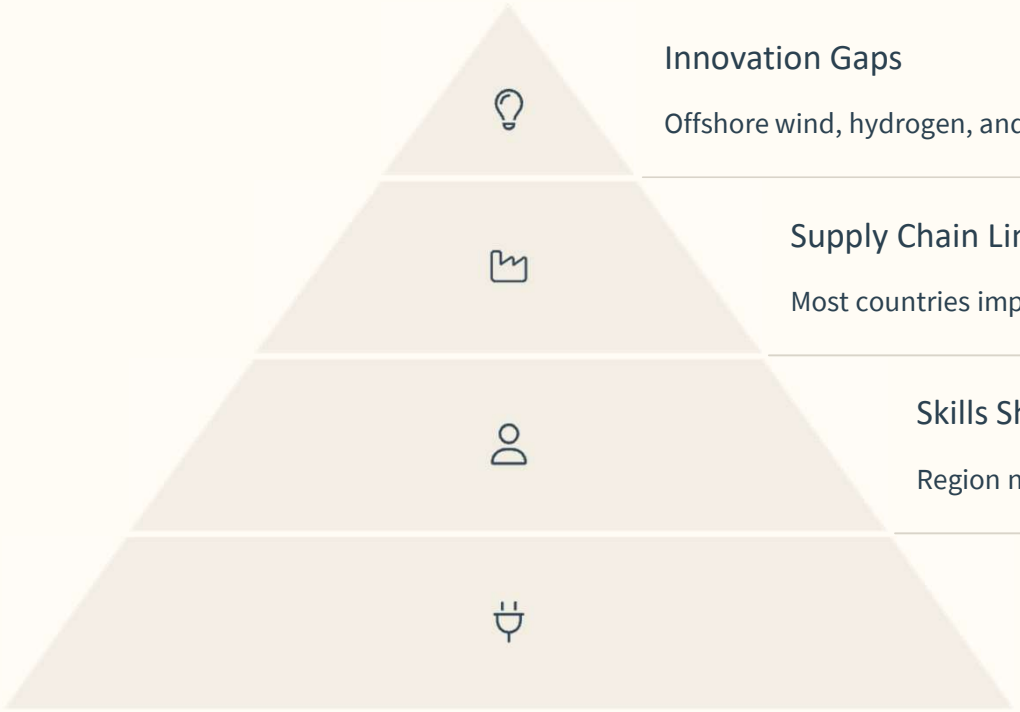
Transparent Frameworks

Enhance clarity and stability in policy design to improve investor confidence and reduce regulatory risk premiums. Long-term policy visibility allows for better planning and capital allocation by market participants.

Collaborative Governance

Foster inclusive dialogue among policymakers, industry, and stakeholders to ensure policies address practical implementation challenges while maintaining ambitious goals.

Technological Readiness and Scalability Issues



Innovation Gaps

Offshore wind, hydrogen, and advanced storage remain at pilot stages

Supply Chain Limitations

Most countries import renewable components, mainly from China

Skills Shortages

Region needs 2.5 million new clean energy jobs by 2030

Infrastructure Lag

Vietnam's 15 GW of solar/wind faces curtailment due to grid overload

While solar PV and onshore wind have achieved commercial viability in ASEAN, the rapid deployment of these technologies has outpaced supporting infrastructure development. Technical education and vocational training programs are not producing skilled workers fast enough to meet industry demands.

Examining the Gap between Ideals and Reality

1

Ambitious Targets vs. Current Infrastructure

Most countries set ambitious renewable energy targets aiming for rapid transitions.

Existing infrastructure, heavily reliant on fossil fuels, often lacks flexibility to accommodate rapid integration of renewables.

Grid stability and energy storage remain key technical challenges.

Why This Bridging is Critical:

If countries stay idealistic without readiness:

- **Blackouts**, **price shocks**, **investor distrust**, and **public backlash** (Germany, 2022

If countries are too slow:

- **Missed climate goals**, **lost competitiveness**, and **stranded fossil assets**.

Balanced adaptation is key — updating strategies based on data, technology progress, and regional cooperation (ASEAN Power Grid, green finance hubs).

Step 1: Prioritize Infrastructure First First

> *"Transition dreams must stand on transition-ready foundations."*

- Invest in **flexible grids**, **smart transmission**, and **large-scale storage**.
- Match grid capacity with renewable deployment to prevent instability.
- **ASEAN Example**: Strengthen ASEAN Power Grid for regional renewable flows.

Step 2: Align Financing with Transition Stages

> *"Finance ambition wisely: secure today, innovate tomorrow."*

- Deploy **transition finance**: green bonds, blended finance for coal retirement and renewables.
- Start with concessional support, then phase in private capital as bankability improves.
- **ASEAN Example**: Scale Just Energy Transition Partnerships like Indonesia's model.

Step 3: Build Adaptive Policy Frameworks

> *"The best energy policies evolve with innovation and society."*

- Design **phased policies** with recalibration every 3–5 years.
- Secure investor trust through **predictable regulations** — avoid retroactive changes.
- Incorporate **transition management**: workforce reskilling and community support.
- **ASEAN Example**: Vietnam adjusting its renewable roadmap; Malaysia's carbon market approach.

Bridging Idealistic and Realistic Approaches

Learning and Adaptation

Idealistic countries adopt more incremental approaches while realistic countries leverage proven innovations

Phased Implementation

Regular assessments and flexible policies adaptable to technological and economic shifts

International Collaboration

Knowledge sharing and transfer of best practices between different approach types

Hybrid Strategies

Combining ambitious vision with practical implementation timelines

The most effective energy transitions will likely combine elements from both idealistic and realistic approaches. Countries can maintain ambitious long-term goals while implementing pragmatic short-term measures that address immediate infrastructure, financial, and technological constraints.