

ENERGY TRANSITION IN ASIA

Speed, progress, bottlenecks

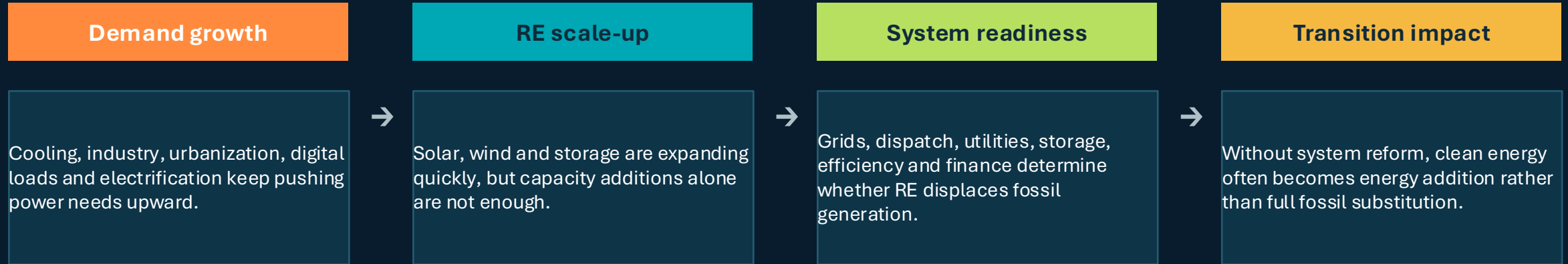
South Asia • Southeast Asia • Central Asia • Middle East

Clean power is scaling fast. The decisive constraint is now the system around it: efficiency, grids, storage, finance, utility reform and implementation capacity.



The core storyline

Energy transition is moving from a generation-capacity question to a whole-system delivery question.



Key implication

Transition policy must give equal weight to energy efficiency, demand management, storage, grid flexibility, utility finance and investment pipelines - not only to new renewable megawatts.

Where the evidence points

Access is near-universal in many parts of Asia, but clean energy use and efficiency remain off-track.

98.6%

electricity access in Asia-Pacific (2023)

78.9%

clean cooking access; around 1 billion
still use polluting fuels

16.3%

renewables share of total energy
consumption in Asia-Pacific

0.9%/yr

energy intensity improvement vs
around 4% needed

2.3-2.5°C

warming with full NDC implementation

What this means

The region has largely advanced electricity access, but the transition challenge is now clean, efficient and affordable energy use across households, buildings, industry and power systems.

Why efficiency matters

Every unit of energy saved reduces new generation needs, eases grid stress, cuts import bills and lowers the storage/flexibility burden.

Bottom line: the transition is not only a renewable energy scale-up agenda; it is also a demand-reduction, reliability, affordability and implementation agenda.

Four regional pathways, one common bottleneck

National circumstances differ, but system readiness is the recurring constraint.

South Asia	Scale, access and demand growth	Southeast Asia	Import exposure and fast demand
Large markets, coal reliance, DISCOM/utility stress, rising cooling and industrial loads.		Fuel price shocks, hydro/drought risk, growing urban demand, interconnection opportunity.	
Priority: Efficiency + grid-responsive RE + storage procurement + utility reform		Priority: RE+BESS, floating solar, ASEAN Power Grid readiness, efficient cooling	
Central Asia	Winter reliability and regional trade	Middle East	Diversification in high-cooling systems
Ageing assets, hydro-fossil systems, winter peaks, cross-border power trade potential.		High solar potential, cooling/desalination demand, fossil-export legacy, strong capital capacity.	
Priority: Regional market rules, grid modernization, clean heat and storage pipelines		Priority: Solar integration, demand response, cooling/water efficiency, green finance	
Common bottleneck: renewable generation is moving faster than grids, storage, institutions, tariff systems and finance pipelines.			

Power demand is outrunning transition impact

Renewable additions are fast, but they do not automatically reduce fossil generation when demand keeps rising.

Energy addition pathway



Result: RE meets part of new demand, but fossil generation does not fall fast enough.

Fossil-substitution pathway



Result: clean supply displaces fossil generation while reliability is maintained.

The question is not simply whether countries are adding renewables. It is whether demand is being managed and the power system is ready to convert RE additions into fossil-fuel displacement.

Energy efficiency is the first transition fuel

Efficiency is the fastest way to cut emissions, reduce fuel imports and avoid new infrastructure stress.



**EFFICIENCY
FIRST**

Buildings + cooling

passive design, building codes, efficient ACs, public-building retrofits, cooling demand management

Industry + appliances

MEPS, labelling, energy audits, motors, boilers, PAT-style mechanisms, SME finance

Power systems

loss reduction, smart meters, time-of-use tariffs, demand response, efficient public services

Why this belongs in every energy-transition package
Efficiency lowers peaks, cuts imports and reduces the RE/storage/grid investment needed.

Energy crises expose practical bottlenecks

Recent fuel-price, supply-chain, drought and reliability shocks show where transition support must focus.

Issue exposed	Why it matters	Concrete action
Import dependence	Oil, LNG and coal price exposure affects tariffs, subsidies, inflation and utility finances.	Domestic RE, efficiency, targeted social protection and fuel-diversification planning.
Demand spikes	Cooling and industrial loads stress grids, especially during heat and drought periods.	Efficient cooling, demand response, TOU tariffs and peak-load management.
Weak flexibility	Countries fall back on fossil generation when grids, storage and dispatch are not ready.	Storage procurement, ancillary services, grid codes, forecasting and modern control centres.
Regional mismatch	Neighbouring systems often have complementary demand and resource profiles but limited trade.	Interconnection, power-purchase rules, market platforms and harmonized technical standards.

Energy security is not an argument against transition; it is an argument for faster efficiency, domestic clean power, storage, grid resilience and regional trade.

ASEAN/AMS: convert crisis response into transition resilience

A concise action package for RE scale-up, energy storage, interconnection and demand management.

Accelerate RE + storage

Deploy solar, wind and BESS rapidly; include floating solar on reservoirs/hydropower assets to reduce land pressure, complement hydro during droughts and create green jobs.

Enhance inter-country grids

Make the ASEAN Power Grid investable through interconnection pipelines, harmonized grid codes, balancing rules and power-purchase arrangements.

Link energy + battery value chains

Aggregate storage demand across power and mobility markets to reach scale for batteries, standards, reuse and recycling.

Cut peak demand first

Use efficient cooling, appliances, buildings and demand response to reduce stress before expensive new supply is needed.

GEF/UNEP role: de-risk first movers, prepare storage and interconnection pipelines, strengthen efficiency standards and MRV, and build replication models - not standalone hardware subsidies.

South Asia: resilience requires markets, digital systems and finance

The disruption response is broader than generation: it needs power-market reform, data and catalytic finance.

1

Regional power markets

Cross-border power trade, short-term markets and flexible procurement can reduce system costs and improve reliability.

2

Digital energy convergence

Forecasting, smart metering, demand response and data platforms help manage variability and peak loads.

3

Catalytic finance

Blended finance, guarantees, project preparation and utility reform can convert NDC ambition into bankable pipelines.

For smaller or more import-dependent economies, the same logic is even sharper: reduce demand first, use domestic RE where feasible, prepare resilient grids, and use concessional finance to lower risk.

Two country models: different setups, different transition logic

India and the UAE show that energy transition pathways differ by national circumstances.

India: scale-market transition

- Large developing economy with fast power-demand growth
- Non-fossil installed capacity already above 50%; 2035 target of 60%
- Strong auction/policy scale-up, but coal still important for actual generation and reliability
- Next frontier: storage, dispatch, DISCOM health, efficiency and demand flexibility

UAE: diversification transition

- High-income, fossil-exporting, high-cooling economy
- Clean-power diversification through solar, nuclear, storage and efficiency
- 2035 economy-wide emissions-reduction target of 47% vs 2019 baseline
- Next frontier: cooling/water efficiency, demand response, MRV and power-sector decarbonization

Shared lesson

Capacity scale-up is achievable, but deep decarbonization needs operational reform: efficiency, storage, grids, dispatch, finance and implementation institutions.

The three bottlenecks to solve together

Technology, infrastructure and finance are interdependent; solving only one does not deliver the transition.

Technology / operations

forecasting • dispatch • grid codes • storage •
demand response • efficient cooling

Infrastructure

transmission • distribution • smart meters •
substations • interconnection • resilience

Finance / institutions

off-taker risk • tariffs • utility balance sheets • FX
risk • procurement • MRV



Delivery logic

Energy-transition projects need to be designed as system packages - e.g., efficient demand + renewable integration + grid flexibility + financing + MRV - not isolated pilots.

Finance gap: bankability and risk, not only capital

The problem is often weak project preparation, utility risk and unclear revenue models.

USD 2.4tn

global energy-transition investment in 2024

USD 807bn

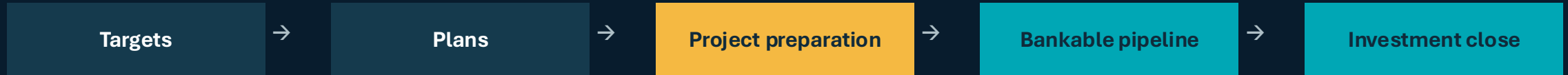
renewable energy investment in 2024

<1%

share of grants in transition investment

USD 4.5tn/yr

needed for renewables, grids/flexibility and efficiency to 2030

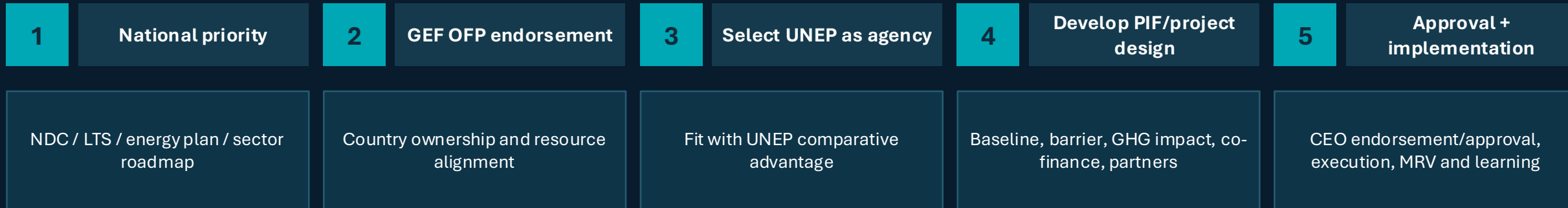


GEF/UNEP value-add

Use grants to prepare pipelines, lower first-mover risk, build standards and MRV, test delivery models and crowd in MDB/private finance.

How countries access UNEP-GEF mitigation support

The route is country-driven, OFP-endorsed and built around GEF additionality.



GEF additionality test

Would the grant change rules, markets, institutions, risk-sharing, MRV or investment pipelines in a way that continues beyond the project?

Good concepts are built with executing partners from the start: energy ministry/regulator, utility, city/sector agency, finance institution, private-sector platform and GEF OFP.

UNEP-GEF energy-transition entry points

Focus the grant on the market-making layer that enables larger investment and replication.

Efficiency + demand reduction

Building/appliance standards, public-sector retrofits, efficient cooling, industrial audits, DSM pilots, MRV.

Grid-ready renewable integration

RE forecasting, storage procurement models, grid codes, dispatch tools, utility readiness and curtailment reduction.

Storage and flexibility markets

BESS standards, tariff/ancillary-service design, demand response, aggregation models and performance tracking.

Regional power trade readiness

Interconnection studies, harmonized rules, power-purchase models, balancing protocols and investment pipelines.

Finance and investment pipelines

Project preparation, de-risking instruments, public-private delivery models, co-finance structuring and bankability support.

Data, MRV and institutional capacity

GHG accounting, NDC tracking, energy data systems, regulator/utility training and replication packages.

Practical design rule: combine one demand-side lever, one supply/grid lever, one finance lever and one MRV/institutional lever wherever possible.

Potential project packages by sub-region

Examples of GEF-able packages that avoid generic pilots and target system incrementality.

South Asia

Efficient cooling + DISCOM/grid readiness + storage procurement + industrial efficiency finance.

Southeast Asia

RE+BESS + floating solar readiness + ASEAN Power Grid rules + cooling demand management.

Central Asia

Regional power trade + winter reliability + grid modernization + coal-to-clean heat efficiency.

Middle East

Solar integration + storage + cooling/water efficiency + demand response + green finance standards.

Avoid weak concepts

Standalone equipment purchase • one-off pilots without replication • generic capacity building • unclear GHG logic • weak co-financing • no policy or market change.

Bottom line

Asia is adding renewables fast - but in many countries power demand is rising so quickly that clean capacity is still more an energy-addition story than a full fossil-substitution story.

Transition accelerators: efficiency first, grid readiness, storage and flexibility, regional connectivity, bankable finance and institutions that can implement.

UNEP-GEF can help close the system-transition gap by supporting policy, standards, data, pilots, MRV, capacity and investment-pipeline preparation.

Key sources: UNEP EGR 2025; ESCAP SDG 7 and SSWA energy-transition paper; IRENA capacity/WETO/finance evidence; WEF ETI 2026; CEEW South Asia disruption brief; ADB ASEAN green economy report; country NDCs; UNEP-GEF materials.

Thank you

