Accelerating the ASEAN Power Grid: From Ambition to Implementation

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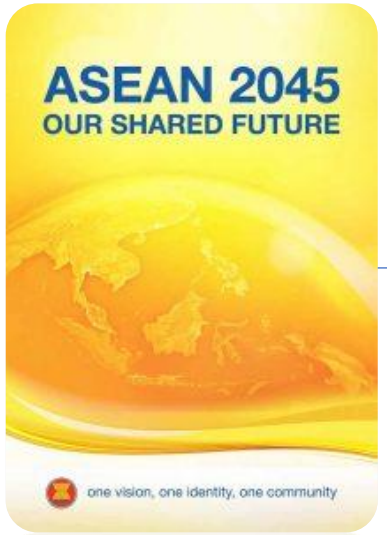
Regional Blueprints
ASEAN Vision 2045 & ASEAN Economic Community (AEC)



- ASEAN Political Security Community
- ASEAN Economic Community
  - ASEAN Plan of Action for Energy Cooperation (APAEC)
    - ASEAN Power Grid (APG)
- ASEAN Socio-Cultural Community Security
- ASEAN Connectivity

Understanding the ASEAN Power Grid (APG)
Roles and Responsibilities of related APG Bodies

- **AMEM and SOME:** ASEAN Ministers on Energy Meeting (AMEM) and Senior Officials on Energy Meeting (SOME) set regional policies for APG development and integration.
- **ASEAN Power Grid Consultative Committee (APGCC) – Lead and Coordinate:** Composed of national energy policy bodies, APGCC oversees APG MOU execution, coordinates APG stakeholders, and monitors progress.
- **ASEAN Energy Regulators Network (AERN) – Regulatory Backbone:** Provides regulatory support to APGCC, ensuring viable, interoperable, and efficient power market integration.
- **Head of ASEAN Power Utilities & Authorities (HAPUA):** planning & operating infrastructures
- **ASEAN Centre for Energy (ACE)**: APG Secretariat
- **ASEAN Secretariat**: Overall secretariat role for the ASEAN Cooperation, specifically on Summit, AMEM, SOME and cross-sectoral coordination

Why Regional Interconnection Matters

ASEAN's diverse resources are stronger together

ASEAN RENEWABLE RESOURCE DISTRIBUTION

Myanmar / Laos
Hydropower

Vietnam
Solar + Wind Offshore

Indonesia / Philippines
Geothermal + Solar

Malaysia / Brunei
Gas + Solar

Thailand / Cambodia
Solar + Biomass

Singapore
Demand Hub / Finance

RELIABILITY

Cross-border balancing reduces outages. N-1 security improves across all member states.

AFFORDABILITY

Dispatch from lowest-cost generators across the region; projected significant cost reductions

RENEWABLE ENERGY INTEGRATION

Larger balancing area absorbs variable solar/wind. Enables significant additional renewable capacity – hydro balancing and geo smoothing

RESILIENCE

Diversified supply routes reduce single-point-of-failure risk from climate events or supply shocks.

ASEAN's Energy Imperative

The Case for a Connected Energy System

Asia Clean Energy Forum 2026
Manila, 8 June 2026

+7%

SEA electricity demand growth forecast in **2026** — driven by increasing electrification and economic activity

4.5%

ASEAN GDP growth forecast 2026 (IMF Regional Economic Outlook, Oct 2025)

2x

Expected electricity demand increase by 2050, driven by urbanisation & industry

$190B

Annual clean energy investment needed by 2035 (IEA APS scenario) – 5x the amount compared to 2023

Sources: IEA Southeast Asia Energy Outlook 2024; IEA Electricity 2026, SEA can harness, Sep 2025, ; IMF Regional Economic Outlook, Asia & Pacific, October 2025

Southeast Asia accounts for 9% of world population, 6% of global GDP, and 5% of global energy demand — yet only 2% of global clean energy spending in 2023. The APG is the critical bridge to close this gap.

ASEAN’s Power Grid Infrastructure

The forces reshaping Southeast Asia's energy future — right now

“The ASEAN Power Grid is not just energy infrastructure — it is strategic economic architecture for the 21st century”

AI & Data Centres

Data centre power demand in SEA projected to surge 4× by 2035, requiring dispatchable, low-carbon supply.

Industrial Transition

Manufacturing shifts from China drive energy-intensive FDI into Vietnam, Indonesia, Thailand & Malaysia.

Climate Pressure

Net-zero commitments and carbon border adjustments raise urgency for clean power grid integration.

Energy Security

Over-reliance on fossil fuel imports exposes ASEAN to price shocks; regional grids provide strategic resilience.

Economic Growth

ASEAN GDP growth at 4–5% annually — energy must scale in step or become a bottleneck to prosperity.

Sources: Wood Mackenzie ‘Feeding the Cloud’ report, D’Andrea and Partners, EMBER Energy

Economic Benefits of the ASEAN Power Grid

$3T

ERIA / ACE 2025

GDP value-add potential to ASEAN by 2050

1.45M

ERIA

Regional jobs created through APG expansion

3.9%

ERIA

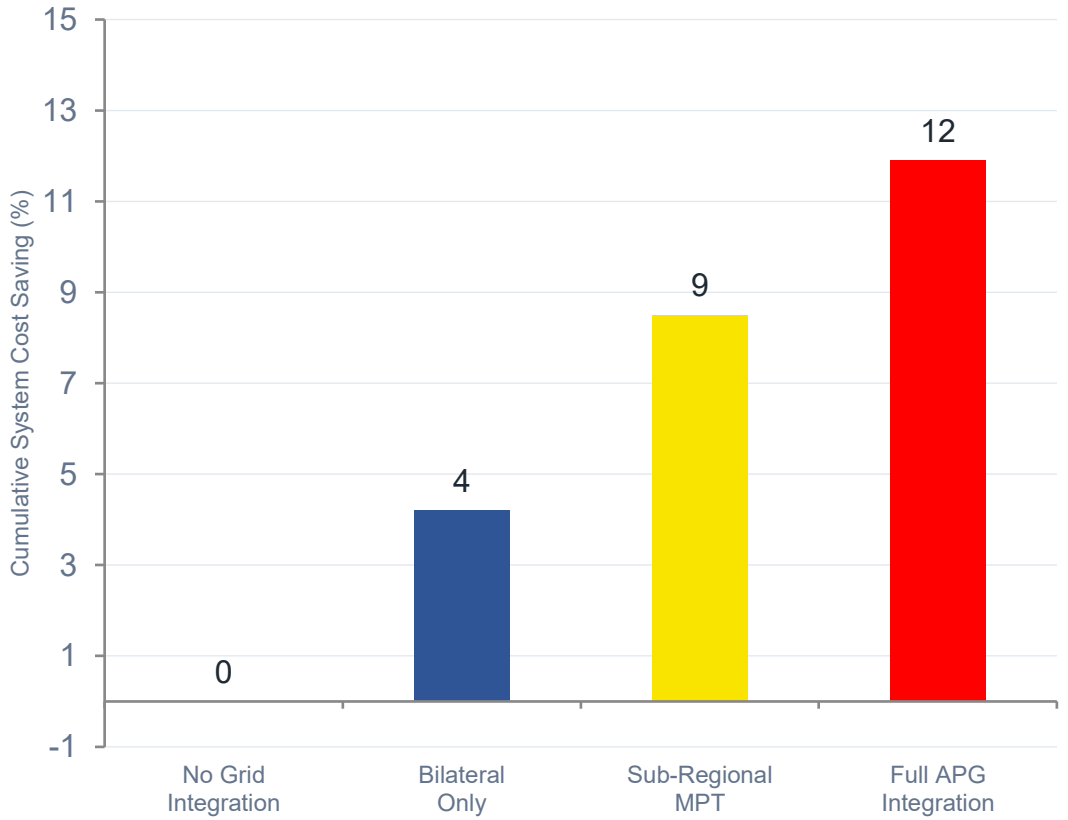
Reduction in consumer electricity costs

Up to +4.6%

Net Zero World Initiative

GDP per country increase from regional interconnection

Projected System Cost Savings — APG Integration



Source: PMC / Sustainability Journal (2025) — integrated capacity expansion modelling for ASEAN 2018–2050

Sources: ERIA (Economic Research Institute for ASEAN and East Asia); Net Zero World Initiative; ACE ASEAN Power Grid Updates 2025;

Advantages of an Integrated Regional Power System

Energy Security & Resilience

Cross-border redundancy reduces dependence on fossil fuel imports. Countries can share power during extreme weather or outages. ASEAN targets 17.6 GW of cross-border capacity by 2040 (from 7.7 GW today).

Renewable Energy Optimisation

APG taps ASEAN's 8,119 GW solar and 342 GW wind potential. Surplus solar can be exported in real-time to demand centres. Lao PDR's hydropower already flows to Singapore via LTMS-PIP.

Decarbonisation Cost Savings

Regional interconnection could cut the cost of SEA decarbonisation by USD 800 billion (ESCAP/UNESCAP). IEA projects annual grid investment needs to exceed USD 30 billion by 2035 in STEPS.

Inclusive Growth & Jobs

New transmission corridors drive rural development. APG creates 1.45 million regional jobs (ERIA). Countries with limited resources can buy clean electricity and surplus exporters earn export revenue.

Lower Electricity Costs

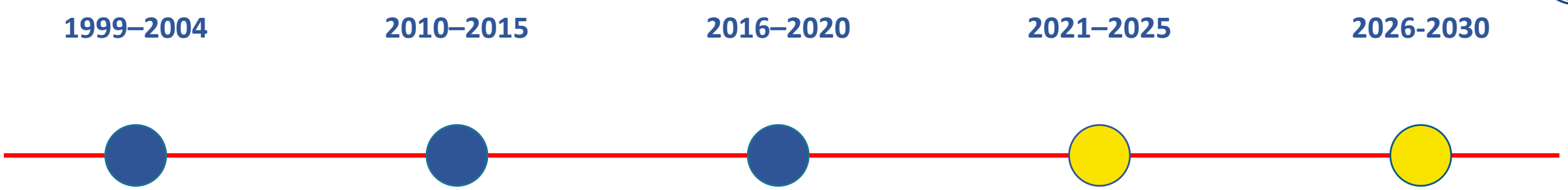
Power trade enables merit-order dispatch across borders. ERIA estimates 3.9% reduction in consumer electricity prices. Smart grid investment of $4–10.7B avoids $2.3B in annual economic losses by 2040.

Infrastructure & Trade Balance

Electricity was Laos' top export product in 2023, contributing USD 2.38 billion - ~ 30% of total exports. Regional grid makes clean energy an investable, exportable commodity for surplus-generating states.

Sources: UNESCAP APG Report 2026; IEA Southeast Asia Energy Outlook 2024; ADB ASEAN Power Grid; ACE Power Grid Updates 2025; ERIA; Ember Smart Grid Analysis 2025; Ember analysis, cited in Energy Tracker Asia, Nov 2025

The APG within the APAEC Framework



APAEC's 7 Programme Areas – APG as Programme Area no. 1

1	2	3	4	5	6	7
ASEAN Power Grid	Oil and Gas Connectivity, Security, and Sustainability	Clean Coal Transformation	Energy Efficiency	Renewable Energy	Regional Energy Policy & Planning	Civilian Nuclear Energy

Sources: ASEAN Plan of Action for Energy Cooperation (APAEC) 2026-2030

Progress and Momentum of the ASEAN Power Grid

From bilateral links to multilateral ambition

1986 APG concept first raised

1997 Included in APAEC

2007 APG MoU signed

2022 LTMS-PIP launched

2024 266 GWh traded

2025 Enhanced MoU & APGF

2026+ Subsea HVDC pipeline

Operational Interconnections

- 9 of 18 APG projects commercially operational
- Peninsular MY–Singapore (1,000 MW of bidirectional electricity + planned New Link – 2,000 MW)
- Thailand–Malaysia (300 MW) – 110 kilometer HVDC powerline
- Laos–Thailand (multiple links) - mainly 230 kV and 500 kV – Hydro to Thailand – backbone to LTMS-PIP – Proof of Concept (POC)
- Vietnam–Cambodia (bilateral)

LTMS & Multilateral Trade

- First 4-country electricity trade globally
- Laos hydro → SG via TH + MY grid
- Phase I: 100 MW, 266 GWh (2022–24)
- Phase II expansion under negotiation
- POC for full APG vision

Subsea HVDC Frontiers and Developments

- **Upcoming: Sarawak–Peninsular Malaysia Interconnector** – 700+ km subsea interconnector transmitting renewable hydropower from Sarawak to Peninsular Malaysia.
- **Upcoming: Vietnam–Malaysia–Singapore (VMS) Interconnector** – 700+ km cross-border subsea interconnector delivering renewable power from Vietnam to Malaysia and Singapore, supporting regional power trade.
- **Developments: Indonesia–Singapore Interconnector** – Project progressing following the signing of a Memorandum of Understanding (MoU) between the project developers
- **Developments: Industry Momentum** – Major industry players are advancing transmission technologies, including a 1 GW HVDC interconnection project.

Sources: ASEAN Plan of Action for Energy Cooperation (APAEC) 2016–2025 Phase I & II; ACE ASEAN Power Grid Updates 2025; UNESCAP APG Report 2026; CASE for SEA, Apr 2025; Bangkok Post, Nov 2025

Long-Term Trajectory: APG to 2045 and Beyond

Now (2025)
8 of 18 APG interconnection projects operational. LTMS-PIP live at 100 MW. 7.7 GW cross-border capacity.

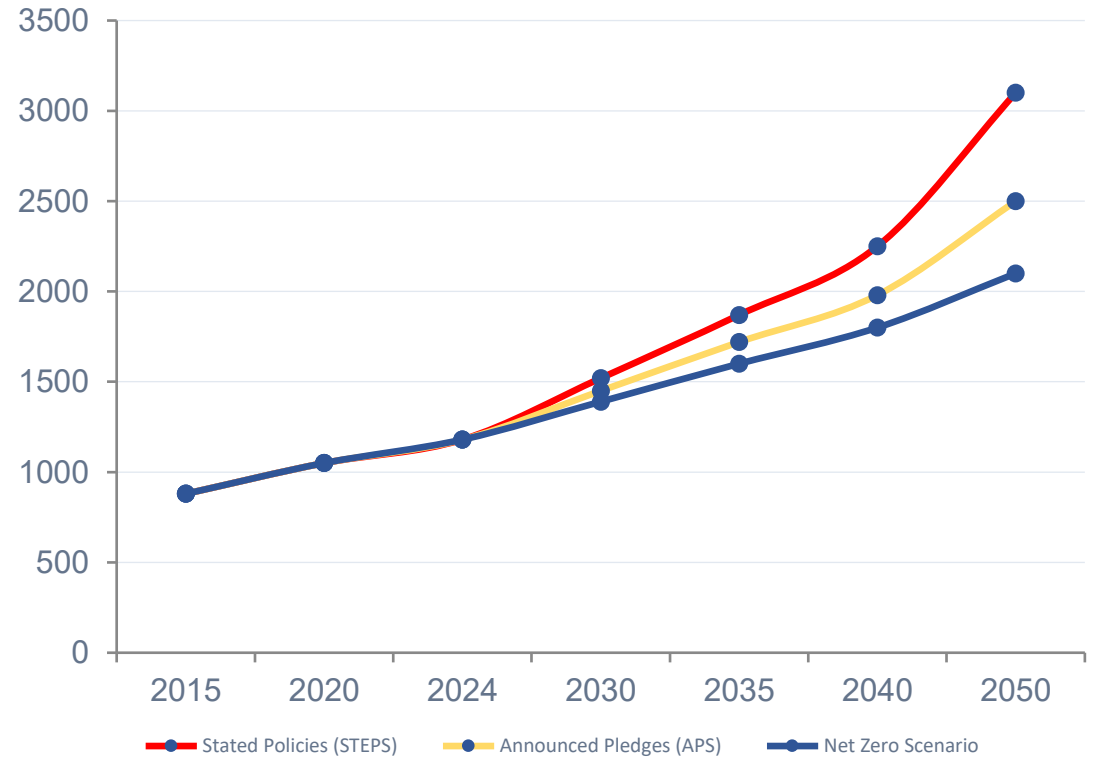
2026–2030
Sub-regional MPT pilots roll out (ESCAP/ACE). BIMP-PIP activation. 200 MW LTMS-PIP target.

2030–2040
RE share in TPES to reach 52% by 2040 (APAEC target). Cross-border capacity scaled to 17.6 GW. Annual SEA electricity growth: ~ 4% p.a. Grid investment: USD 30B+ by 2035 (IEA STEPS)

2045
Vision: Fully integrated APG operations across all 10 ASEAN nations. 680 million people with reliable, affordable clean power (ADB).

2050
Net-zero power sector achievable. Up to $3T GDP value-add unlocked. 1.45M jobs created.

SEA Electricity Demand Trajectory (TWh)



Illustrative projections based on IEA Southeast Asia Energy Outlook 2024 scenarios (STEPS / APS / NZE)

Sources: IEA Southeast Asia Energy Outlook 2024; ACE 8th ASEAN Energy Outlook 2025; ADB ASEAN Power Grid; APAEC 2016–2025 Phase II; ESCAP Regional Roadmap 2026

Key Challenges in Advancing Cross-Border Connectivity

Structural, regulatory and implementation barriers to closing the APG ambition-execution gap

REGULATORY

Fragmented Frameworks

10 national energy laws, 10 tariff regimes, 10 dispatch protocols — no harmonised regional market rules.

Cross-Border Permitting

No common permit pathway for interconnection – projects face sequential national approval processes.

COMMERCIAL

Off-taker Credit Risk

State-owned utilities in weaker credit markets struggle to attract private lenders without guarantees.

Revenue Certainty Gap

Long-tenor, cross-border PPAs lack regional legal enforceability – investors discount cash flows heavily.

IMPLEMENTATION

Coordination Bottlenecks

Multi-country projects require simultaneous decisions across utilities, regulators and governments.

Technical Interoperability

Differing frequency standards, grid codes and metering protocols need harmonisation at each border.

NON-FINANCIAL RISK

Political & Geopolitical

Sovereignty sensitivities over grid interdependence – administration changes can stall approvals.

Environmental & Social Safeguards

Cross-border projects trigger overlapping safeguard regimes – community displacement and biodiversity impacts.

Potential Solutions to the Key Challenges

Structural, regulatory and implementation barriers to closing the APG ambition-execution gap

REGULATORY

Fragmented Frameworks and Cross-Border Permitting

Harmonize fragmented national laws, tariffs, and grid codes through a **unified regional framework,** while establishing a **single-window permitting process** and a dedicated APG Secretariat to streamline cross-border approvals.

COMMERCIAL

Off-taker Credit Risk and Revenue Certainty Gap

Mitigate off-taker credit risk and revenue uncertainty using **blended finance tools**, multilateral **guarantees**, standardized enforceable long-term PPAs, and **political risk insurance** to attract private investment.

IMPLEMENTATION

Coordination Bottlenecks and Technical Interoperability

Overcome coordination bottlenecks and technical interoperability issues by **strengthening joint planning** under **HAPUA**, harmonizing grid codes and metering standards, and scaling up successful multilateral pilots like LTMS-PIP.

NON-FINANCIAL RISK

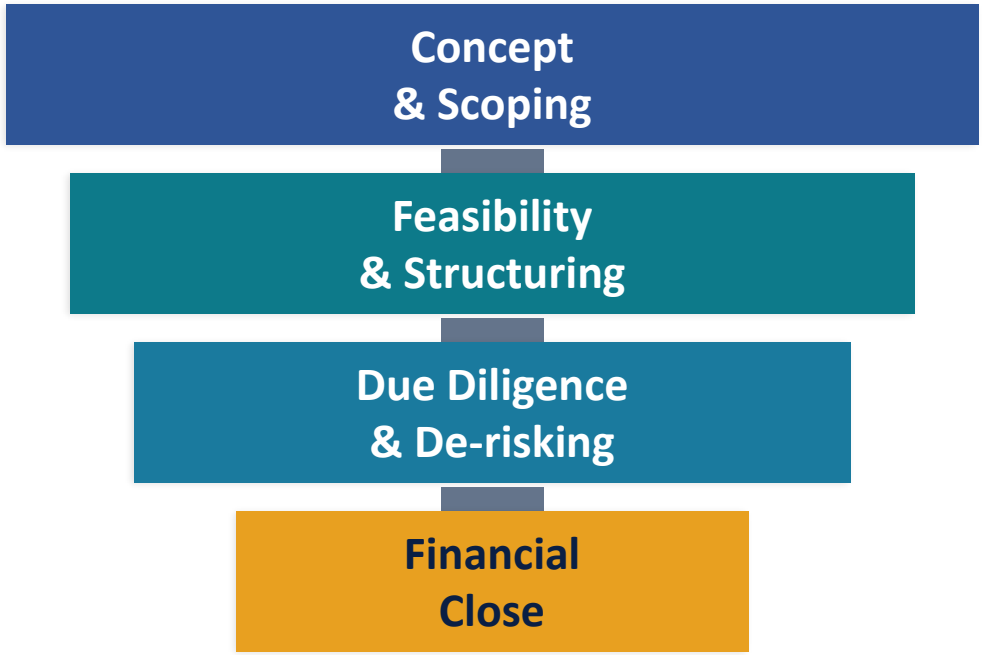
Political & Geopolitical and Environmental & Social Safeguards

Address political, geopolitical, and environmental risks through **flexible sovereignty-respecting governance**, common regional **ESG** standards, early stakeholder engagement, and community benefit-sharing mechanisms.

Making APG Projects Bankable and Investable

APGF, PACE and project preparation: from concept to financial close

PROJECT PREPARATION PIPELINE



" Bankability depends on institutional confidence and implementation readiness — not just financial engineering "

APGF — APG Financing Initiative

Platform to mobilize and coordinate end-to-end financing and technical support for APG projects. It streamlines support from project identification to financing by aligning technical and financial partners across all project stages

PACE — Partnership for ASEAN Connectivity on Energy

A forum for structured discussion on APG project issues and opportunities focused on bankability and financing, involving partner organizations such as DFIs, commercial financiers, climate funds and philanthropies

MDB Coordination

ADB and World Bank coordination and financing frameworks minimise duplication and align due diligence standards across borders.

Private Sector Confidence

Institutional confidence stems from sovereign backing, clear dispute resolution, and credit-enhanced offtake structures.

The Financing Imperative: Bridging ASEAN's APG Investment Gap (To be discussed)

Public capital alone cannot close the gap — blended finance and private mobilisation are essential

$100B+
(ADB estimate) Total APG Transmission & Interconnection Investment Needs (to 2045)

$5-10B
Annual Investment Needed for APG

$10B
ADB APG Commitment

$2.5B
World Bank (WB) Commitment – US$2.5 billion pledged for APG

ASEAN CLEAN ENERGY CAPITAL STACK — WHO FILLS THE GAP?

- **MDBs / DFIs** — Lead project preparation and de-risking
- **Climate Funds (GCF, CIF)** — Concessional layers for early-stage projects
- **APGF / AIF (Blended)** — Dedicated blended finance vehicle for APG
- **Private Sector (Target)** — Majority of capital for construction and operations
- **Public Budgets** — Sovereign guarantees and equity

Blended Finance Structures

Concessional layers, viability gap funding, political risk insurance and FX hedging are critical de-risking tools.

Sources: ASIAN Development Bank (ADB)

Call to Action:

Accelerating ASEAN's Connected Energy Future

01

HARMONISE

Accelerate APAEC Phase III targets; finalise Enhanced APG MoU; align grid codes and cross-border permitting.

02

FINANCE

Operationalise APGF & AIF; unlock ADB's $30B commitment; deploy blended structures to crowd-in private capital.

03

BUILD

Fast-track priority interconnections; invest in subsea HVDC, pumped storage and regional balancing infrastructure.

04

GOVERN

Establish a regional energy market framework; strengthen APGCC, AERN and TSO coordination for real-time grid operation.

Setting the scene for today's three panels: State of Play · Financing · Pumped Storage Hydropower

THANK YOU

ONE VISION, ONE IDENTITY, ONE COMMUNITY

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