GREEN GRIDS INITIATIVE

LUCETIA GROUP

Asia-Pacific High Voltage Transmission Supply Chain Project

8 June 2026

Key Report Findings | Potential Interventions | Next Steps

Who are we & what do we do?

We bring together and empower a global network of proactive, engaged and coordinated organisations to accelerate the development of grids globally.

GGI works collaboratively across a global network to coordinate and enable action on the biggest challenges that face grid development.

NESO National Energy System Operator

Lucetia Group

Climate Compatible Growth

Global Renewables Alliance

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Global HVDC Supply Chain Landscape

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Demand is accelerating

- ASEAN electricity demand is rising rapidly
- Singapore targets 6 GW of clean imports by 2035
- AIMS III identifies 18 priority interconnection projects

Global supply is constrained

- HVDC projects need cables, converters, transformers and specialist vessels
- European OEMs account for ~two-thirds of the global HVDC market
- Manufacturing slots are heavily booked through 2028–2030

ASEAN remains exposed

- No HVDC equipment factories in ASEAN
- New specialist factories take 3–4+ years and major capital to build
- Project-by-project procurement weakens bargaining power

Global demand pressure

Rising clean energy targets and cross-border interconnector pipelines

Scarce manufacturing slots / vessels / permitting capacity

Cables | Converters | Transformers | Specialist vessels | Permitting capacity

ASEAN interconnector delivery risk

Longer lead times, higher costs, and execution delays

Implications for ASEAN

ASEAN interconnector portfolio

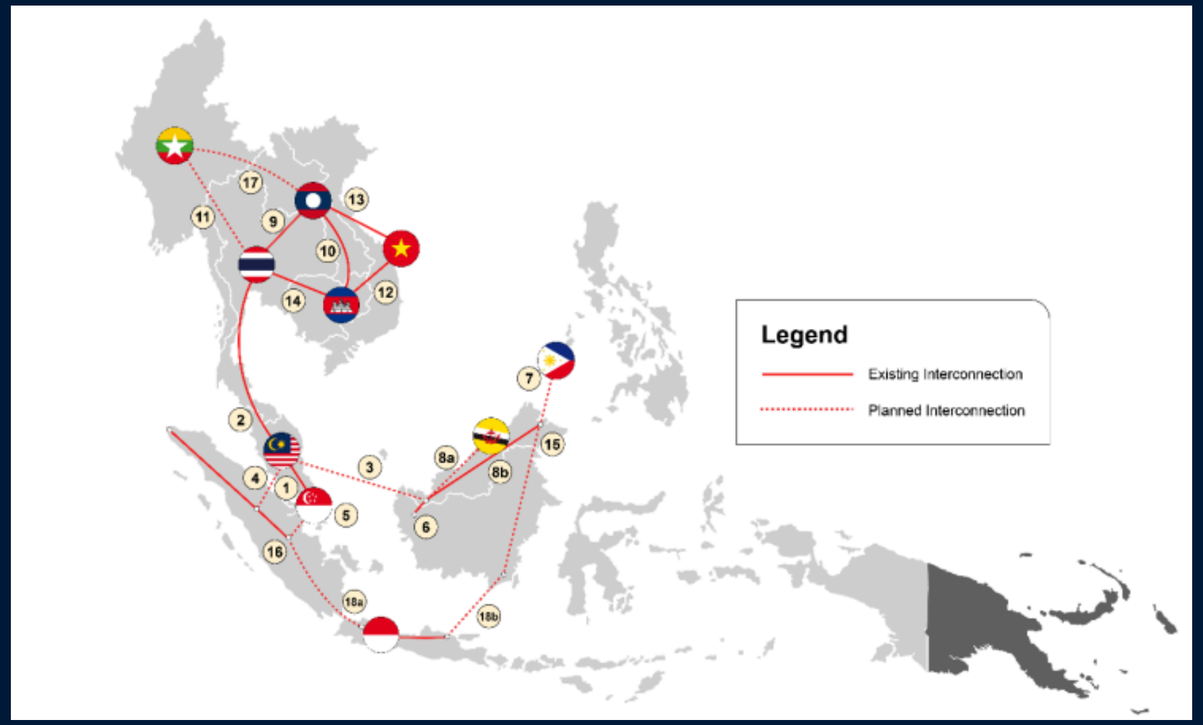
- ASEAN has roughly 10.2 GW of installed cross-border transfer capacity
- Existing capacity is dominated by generation-to-grid arrangements
- Grid-to-grid links account for only around 2.8 GW
- AIMS III projects 17.8-33.5 GW interconnection capacity by 2040

Subsea cables are critical for ASEAN

- 7 of 18 priority APG interconnection projects require submarine cable infrastructure
- 10 APG projects currently under development could add ~15 GW of subsea capacity
- A suitable enabling environment is critical to move them from concept to operation

Cross-border complexity remains high

- Some cable routes may cross multiple maritime jurisdictions, EEZs or transit waters
- Without common rules, projects risk fragmented approvals, delays and higher development costs
- A common Subsea Cable Framework can reduce uncertainty across permitting, surveys, installation etc



Source: ACE (2024)

Key takeaway for ASEAN

The Subsea Cable Framework is a critical policy and regulatory enabler for cross-border electricity trade

Scaling the APG toward wide-scale multilateral trading will also require parallel progress across the commercial, technical and governance pillars.

Stakeholder landscape

*Indicative / non-exhaustive

HOST COUNTRY GOVERNMENT

MULTILATERALS

ADB

ASEAN CENTRE FOR ENERGY ACE

THE WORLD BANK

DEVELOPERS

Keppel

SGEI
SINGAPORE ENERGY INTERCONNECTIONS

suncable

STL

Xlinks

MANUFACTURERS

prysmian

NKT

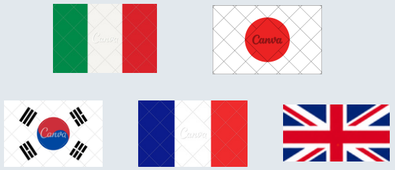
HITACHI

Nexans

XLCC

LS

MANUFACTURER COUNTRY GOVERNMENT



UTILITIES

UNEZA
UTILITIES FOR NET ZERO ALLIANCE

The National HVDC Centre

ADVISORY

ARUP

Baringa

SJ SURBANA JURONG

FINANCE

MACQUARIE

standard chartered

Moelis

KKR

TEMASEK

HSBC

Project Recap

Journey to Today

- Oct 2025 — SIEW 2025 Roundtable: GGI, Lucetia Group, HSBC and Arup convened key stakeholders in Singapore
- Nov 2025 – Mar 2026 — Research phase across governments, developers, OEMs, banks and DFIs.
- April 2026— Second virtual roundtable: share findings, agree an intervention stack.
- June 2026 — Asia-Pacific Electrical Transmission Supply Chain Report published
- Q3 2026 - Phase 2 kick off

Message from the GGI Chair

“The electricity transmission supply chain challenge is one of the defining bottlenecks of the clean energy transition. As Chair of the GGI, it was a privilege to chair the first session in Singapore and to see such a committed group of leaders come together to tackle this issue with exactly the seriousness it deserves. HVDC solutions will be transformational for the ASEAN region and this group is doing vital work, which the UK Government and the Global Clean Power Alliance is proud to stand behind.”

Lee McDonough
Director General, Net Zero, Nuclear and International
Department for Energy Security and Net Zero
Chair, Green Grids Initiative

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Key Findings

The collective action challenge

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Governments

Need cross-border alignment before locking in commitments

There is a need for clarity on import/export licensing (ideally 25-30 year horizons), a single coordination point in each jurisdiction, and a clear Subsea Cable Framework

Developers

Need long-term offtake signals before reserving OEM slots

Large interconnector projects: ~10 years from concept to COD = mismatch between slot reservations and buyer commitments

OEMs

Needs firm, aggregated demand before expanding supply

Idle or underutilised plants burn USD 40–50 M per year in depreciation. Need anchor projects, multi-year frames and staged payments beyond reservation fees.

Collective action deadlock

Each actor is waiting for certainty from another

Finance

Capital is available - but only where risks are clear and allocated

Banks look for transparent permitting and stable import/export license terms, clear trading frameworks and standard technicals specs

Insurance

Need standardised surveys, cable-laying norms and repair protocols

Insurers flagged thin local capacity for complex subsea surveys across varied bathymetry and geotechnical condidions - raising premiums and timelines

Key takeaway

Each actor is rational on its own incentives. Without external stimulus - third-party intervention or shifts in global conditions - the system is unlikely to unblock itself in the short run.

Chicken and Egg Dilemma

BUYERS ASK → “When will additional manufacturing capacity be built?”

MANUFACTURERS RESPOND → “When will projects reach financial commitment?”

Both perspectives are rational, but the system remains stuck

Assessment → The system will remain blocked in the near term without external intervention

Themes from industry

Five key themes emerged during discussion

1 Manufacturing capacity

No HVDC factories in ASEAN and OEM slots booked through 2028.

2 Conservatism in technology adoption

Price sensitivity and risk aversion drives reliance on proven technologies. Tenders often specify 30-year-old AC designs while Europe is standardising on HVDC 525 kV XLPE. Pilot studies, regulatory investment tests, special legislative approvals, and staged qualification (as used in Europe) were highlighted as a way to drive adoption of HVDC 525 kV XLPE.

3 Risk allocation

Banks were explicit: capital is not the binding constraint — rule clarity and early-stage risk allocation are. Developers carry stranded-cost risk on surveys, EIAs and reservation fees without guarantees.

4 Regulatory & permitting uncertainty

Import/export licensing, domestic content rules and subsea permitting remain in flux across the region. Industry asked for 25–30 year license horizons and a single coordination point per jurisdiction.

5 The stakeholder coordination burden

Developers engage multiple agencies and competing stakeholders per project; participants called for an “unbiased, trusted coordinator” across governments, OEMs, TSOs, banks and developers, at national and regional level (ACE, HAPUA).

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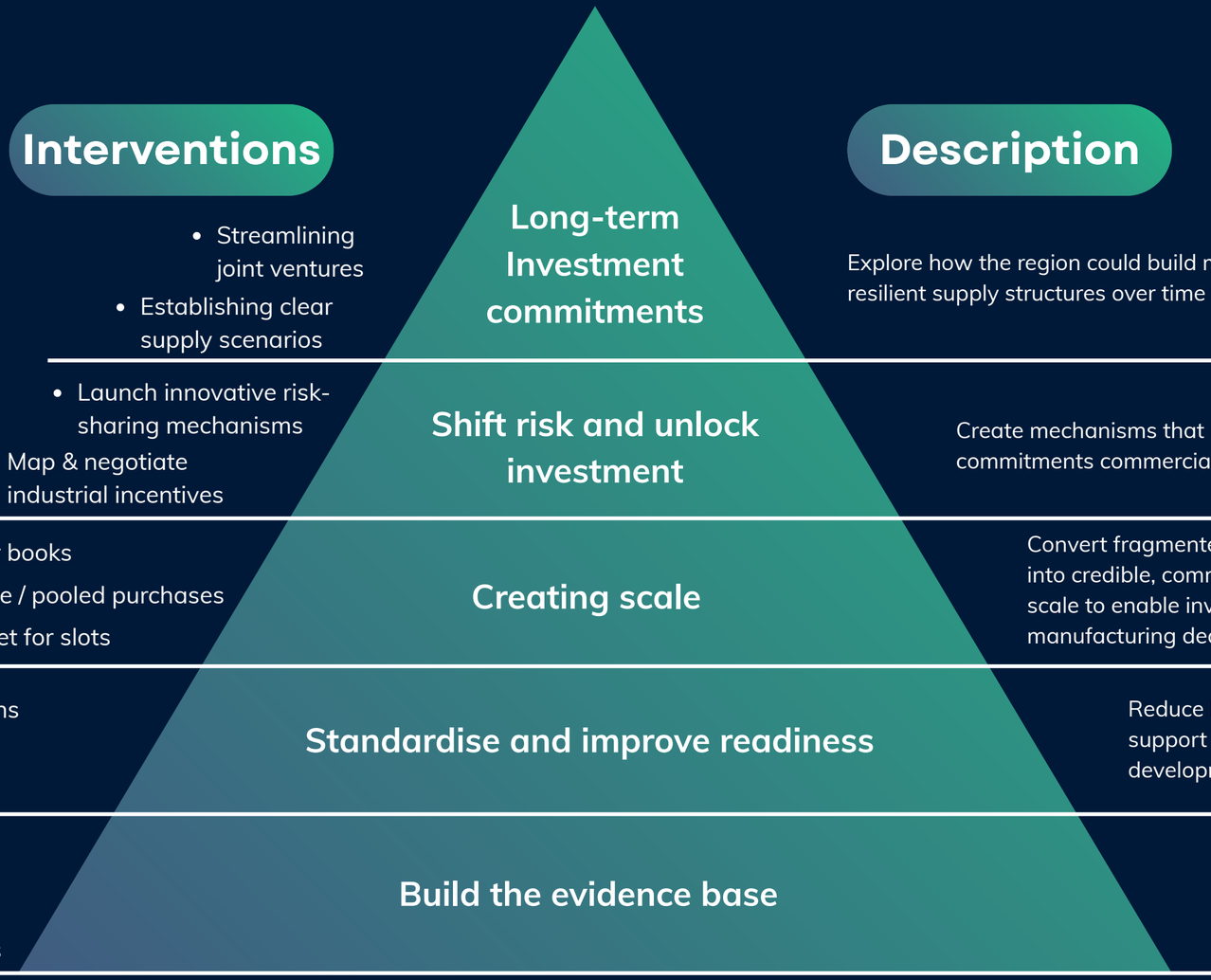
Potential Interventions

Potential Interventions



Implication: Not all layers need to be progressed simultaneously.
Key Question: which minimum combination of interventions can unlock near-term project delivery?

Launch innovative risk-sharing mechanisms

OBJECTIVE

- Enable earlier project and manufacturing commitments by redistributing and reducing key risks
- Unlock financing and investment by making risks clear, manageable, and appropriately allocated

What already exists

- MDBs and DFIs provide concessional finance and risk mitigation instruments
- Some use of guarantees and blended finance in energy infrastructure

What is missing

- Mechanisms to cover early-stage risks (e.g. surveys, slot reservation, cancellation)
- Clear allocation of risk across developers, OEMs, and financiers
- Pathways to apply concessional / green finance to supply chain investments

What would be required

- Define a regional risk-sharing toolkit (guarantees, insurance, blended finance)
- Engage MDBs, DFIs, and public finance institutions to structure instruments

Promoting technology adoption via pilots and sandboxes

OBJECTIVE

- Accelerate adoption of HVDC 525 kV interconnectors
- Reduce uncertainty by testing delivery models, standards, and technologies in real-world conditions

What already exists

- LTMS-PIP: multilateral electricity trading pilot
- Europe demonstrating feasibility of 525 kV for cross-border interconnection

What is missing

- HVDC 525 kV pilots and sandboxes in ASEAN
- Coordinated approach to piloting technologies in the region
- Clear pathways for moving from pilot → scaled deployment
- Regulatory flexibility to enable testing of new approaches

What would be required

- Identify candidate projects or corridors suitable for pilot implementation
- Establish regulatory frameworks or sandboxes to enable testing
- Engage OEMs, developers, and governments to define pilot scope and objectives
- Capture and share learnings to support broader adoption

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Action Plan & Next Steps

Next Steps Building a Task Force - Seeking EOIs

- We are seeking active commitment to help shape and deliver the taskforce over the next 6–12 months
- Early leadership support and clear ownership will be critical to maintain pace and unlock wider participation
- We are working to align public-sector commitments with private-sector participation to accelerate delivery and de-risk investment

Point of Contact

Nominate the lead POC in your organisation

Leadership Sponsorship

Secure senior leadership sponsorship for participation and decision-making

Role & Organisation's Commitment

Confirm your organisation's role and potential contribution to the project. We want to know what's the largest committment you could make if this process goes well.

Workstream Leadership

Identify opportunities to lead or support specific workstreams and strategic partnerships

Thank You

The Asia-Pacific Electrical Transmission Supply Chain Report is available on the GGI website.

[Link to be included]