

“Electricity Regulatory Cooperation Framework for Trans-Regional Grid Interconnections for Enhanced Energy Security and Climate Prosperity”



Current Scenario and Future Prospects for Regional Electricity Regulatory Cooperation for Deepening ASEAN Power Grid and Role of ASEAN Energy Regulators

SAFIR-SAREP Regional Regulatory Dialogue,
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ASEAN Centre for Energy



About ASEAN Centre for Energy (ACE)



Established in January 1999, ASEAN Centre for Energy (ACE) is an **intergovernmental organization within ASEAN** structure that represents the 10 ASEAN Member States' interests in the energy sector.

What We Do



Think Tank

Assist AMS in **research and identifying practical and specific solutions** on policies, legal, and regulatory frameworks, technologies, and innovative solutions.



Energy Data and Knowledge Hub

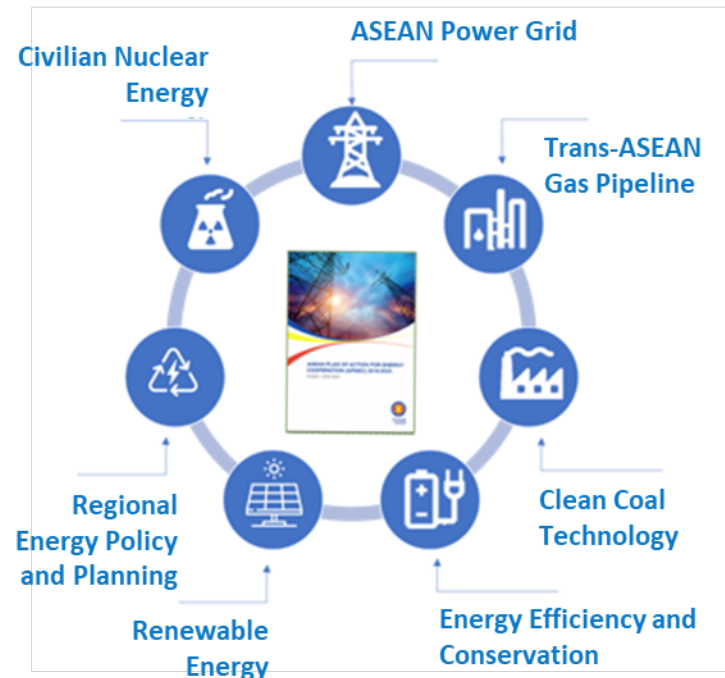
Provide a knowledge repository for ASEAN Member States (AMS) and services through data management, publication, and dissemination.



Catalyst

Unify and strengthen ASEAN energy cooperation by providing a platform for sharing, policy advisory, best practices, capacity building, and secretariat.

ASEAN Plan of Action for Energy Cooperation (APAEC)



What is APAEC?

A series of **guiding policy documents** serving as the platform for deeper cooperation both within ASEAN as well as with DPs and IOs.

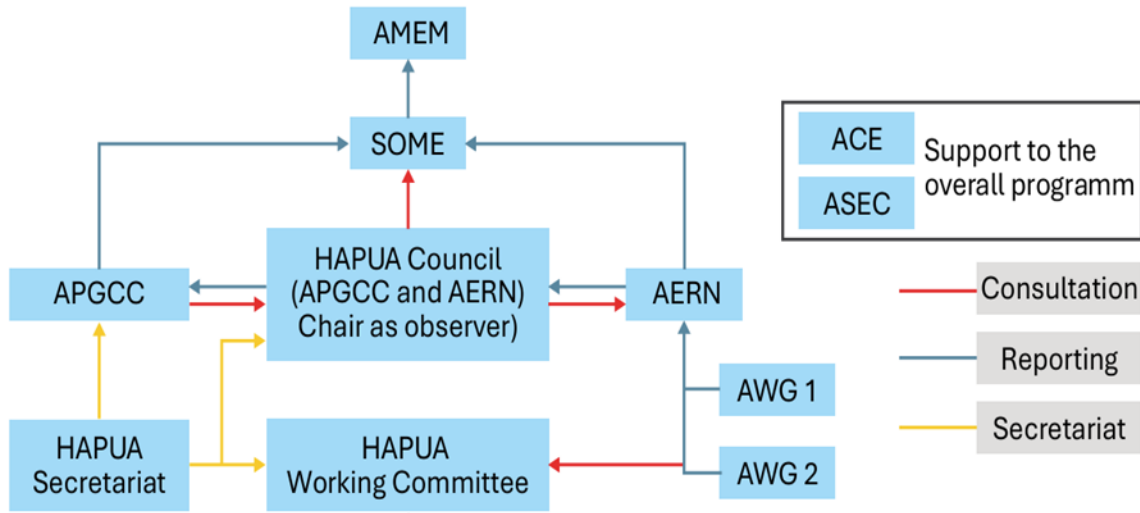
What does APAEC do?

Promoting **multilateral cooperation and integration** in the energy sector.

What is APAEC trying to achieve?

To attain the goals of **ASEAN Economic Community (AEC)** by enhancing security, accessibility, affordability, and sustainability in the energy sector.

APG-Related Bodies



MEMORANDUM OF UNDERSTANDING ON THE ASEAN POWER GRID



MEMORANDUM OF UNDERSTANDING ON THE ASEAN POWER GRID

The idea to connect the power grids of the Association of Southeast Asian Nations (ASEAN) member states was first proposed at the Second ASEAN Informal Summit in Kuala Lumpur in December 1997

The Governments of the Association of Southeast Asian Nations, namely: Brunei Darussalam, the Kingdom of Cambodia, the Republic of Indonesia, the Lao People's Democratic Republic, Malaysia, the Union of Myanmar, the Republic of the Philippines, the Republic of Singapore, the Kingdom of Thailand, and the Socialist Republic of Viet Nam (hereinafter referred to collectively as "ASEAN" or "Member Countries", or individually, as "Member Country");

RECALLING the Agreement on ASEAN Energy Cooperation signed in Manila, Philippines, on 24th June 1986, which emphasised cooperation among the Member Countries in developing energy resources to strengthen the economic resilience of the individual Member Countries as well as the economic resilience and solidarity of ASEAN, and developing strategies to promote energy-related trade within the ASEAN region;

RECALLING also that the ASEAN Vision 2020 adopted by the ASEAN Leaders on 15th December 1997 at the Second ASEAN Informal Summit in Kuala Lumpur, Malaysia, called for the establishment of electricity interconnecting arrangements within ASEAN through the ASEAN Power Grid, (hereinafter referred to as the "ASEAN Power Grid");

RECOGNISING the objectives of the Forum of the Heads of ASEAN Power Utilities/Authorities (HAPUA) to, among others, promote the creation of regional power interconnection projects through the exchange of experience and information on planning, construction and operation of interconnected systems, the acquisition of appropriate technology and methodology on all aspects of an

ASEAN Power Grid MOU Timeline

Renewal Process 2024-2025

Ongoing process to renew MOU without expiration "ENHANCE THE APG MOU"

Original Validity End

Original MOU validity set to end in 2024

Extension Decision

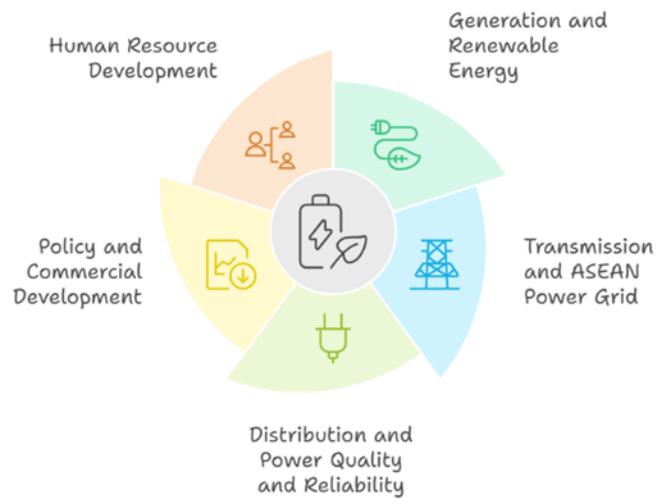
41st AMEM 2023 Decision made to extend MOU until 2025

MOU Effective Date

2009 MOU becomes effective as a legal basis (Completing the Instrument of Full Power)

Signing of MOU

2007 ASEAN members sign the MOU in Singapore



The ASEAN Interconnection Masterplan Study (AIMS) provides relevant stakeholders with a blueprint for the development of the ASEAN Power Grid



AIMS I (2003)

- Proposed a **regional power transmission network** – the ASEAN Power Grid (APG).
- Identified **potential savings** in new investment and operating costs on interconnection.

AIMS II (2010)

- **Updated APG:** changes in economics, electricity demand, and energy requirements.
- **Planning for interconnection,** promoting efficient, economical, and secure systems.

AIMS III (2020, updated 2022)

- **Updating APG plans** from AIMS II.
- **Focussing on RE integration,** supporting 23% RE share target.
- Updated **time horizon** of the planning until up to 2040.

AIMS III consists of three main phases:

AIMS III Phase 1: Capacity Expansion Planning
(2020, updated in 2022)

AIMS III Phase 2: Grid Performance Analysis
(2020, updated in 2022)

AIMS III Phase 3: Multilateral market analysis
(2024, ongoing)

Key works:

- ✓ Identify low-hanging fruit interconnection
- × Power landscape and priorities changes
- × Emerging technologies (BESS, H₂, etc.)

Way forward:

- Periodical update of AIMS
- Interconnection feasibility studies

1. Requirement for MPT development

- Structure of the electricity market necessary to establish MPT
- AMS interconnectivity status
- Multilateral power trade analysis
- Institutional market model design
- Political requirements*

2. Regulatory framework

- Charter for a multilateral AMS Regulatory Body (AMSRB)
- Integrated Resource and Resilience Planning (IRPP)

3. Technical standards

- Set up grid code recommendations
- Strategy to establish ASEAN Multilateral Power Trade



Current APG

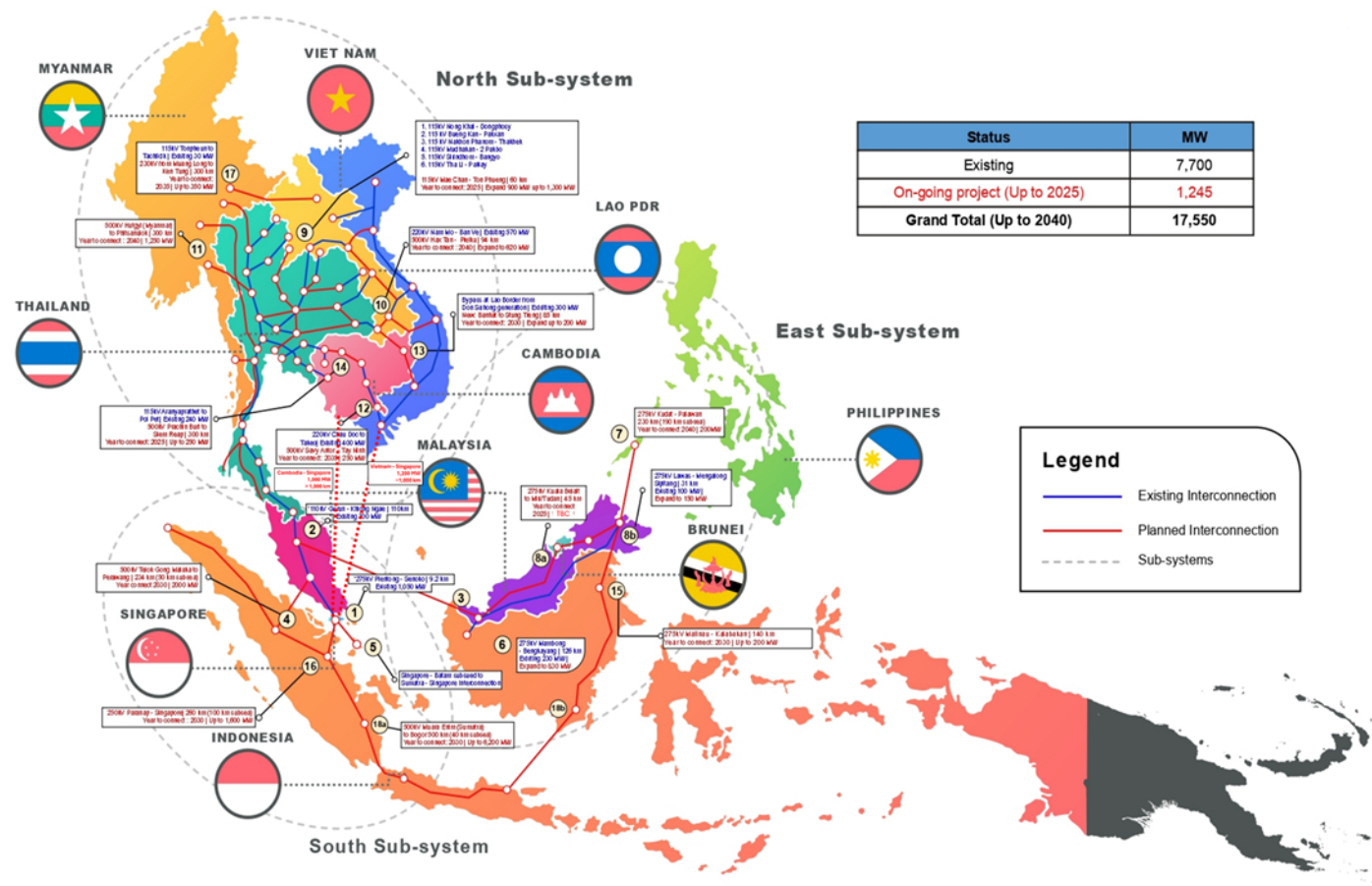


APG is projected to provision 18+ interconnection points – an enabler of an unprecedented 24.5 GW renewable energy integration in SE Asia



Identified interconnection points for APG and the projected capacity in MW

| No | Interconnection | Grid-to-grid, based on national-level planning | | | | AIMS III projections |
|-------------------|---------------------------|--|------------|---------------|---------------|----------------------|
| | | Existing | Up to 2024 | Future | Total | |
| 1 | Pen. Malaysia – Singapore | 525 | 525 | TBC | 1,050 | 1,050 |
| 2 | Thailand – Pen. Malaysia | 380 | - | TBC | 380 | 1,043 |
| 3 | Sarawak – Pen. Malaysia | - | - | 1,600 | 1,600 | 695 |
| 4 | Pen. Malaysia – Sumatra | - | - | 600/TBC | 600 | 2,130 |
| 5 | Batam – Singapore | - | - | 3,400 | 3,400 | - |
| 6 | Sarawak – W. Kalimantan | 230 | - | - | 230 | 777 |
| 7 | Philippines – Sabah | - | - | 500 | 500 | 196 |
| 8a | Sarawak – Brunei | - | TBC | TBC | TBC | TBC |
| 8b | Sarawak – Sabah | - | 30 – 50 | - | 30 – 50 | 177 |
| 9 | Thailand – Lao PDR | 955 | - | TBC | 955 | 700 |
| 10 | Lao PDR – Vietnam | - | - | TBC | TBC | 625 |
| 11 | Thailand – Myanmar | - | - | 365 | 365 | 1,262 |
| 12 | Vietnam – Cambodia | 200 | - | TBC | 200 | 1,353 |
| 13 | Lao PDR – Cambodia | 300 | - | TBC | 300 | 625 |
| 14 | Thailand – Cambodia | 250 | - | 650 | 900 | 1,315 |
| 15 | E. Sabah – N. Kalimantan | - | - | TBC | TBC | 174 |
| 16 | Singapore – Sumatra | - | - | TBC | TBC | 1,133 |
| 17 | Lao PDR – Myanmar | 30 | - | 100 – 600 | 130 – 630 | 624 |
| 18a | Kalimantan – Java | - | - | TBC | TBC | 4,35 |
| 18b | Sumatra – Java | - | - | 2,600 | 2,600 | 10,000 |
| Total (MW) | | 2,870 | 575 | 10,335 | 13,780 | 24,585 |



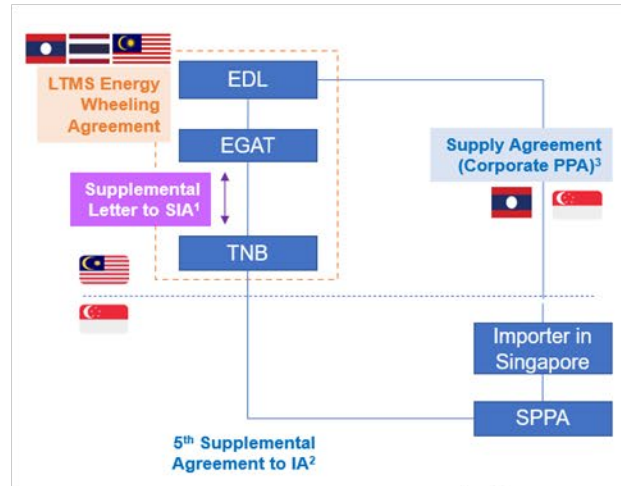
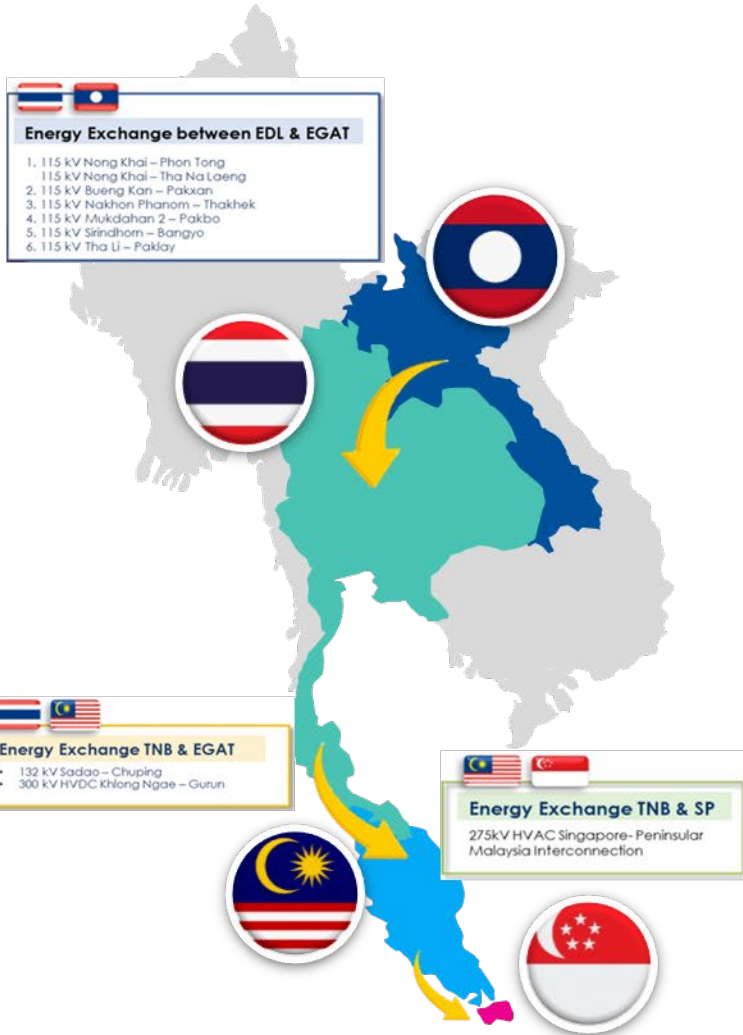
| Status | MW |
|---------------------------------|---------------|
| Existing | 7,700 |
| On-going project (Up to 2025) | 1,245 |
| Grand Total (Up to 2040) | 17,550 |

Source based: Updated Power Development Plan (PDP) scenario under AIMS III, 2022

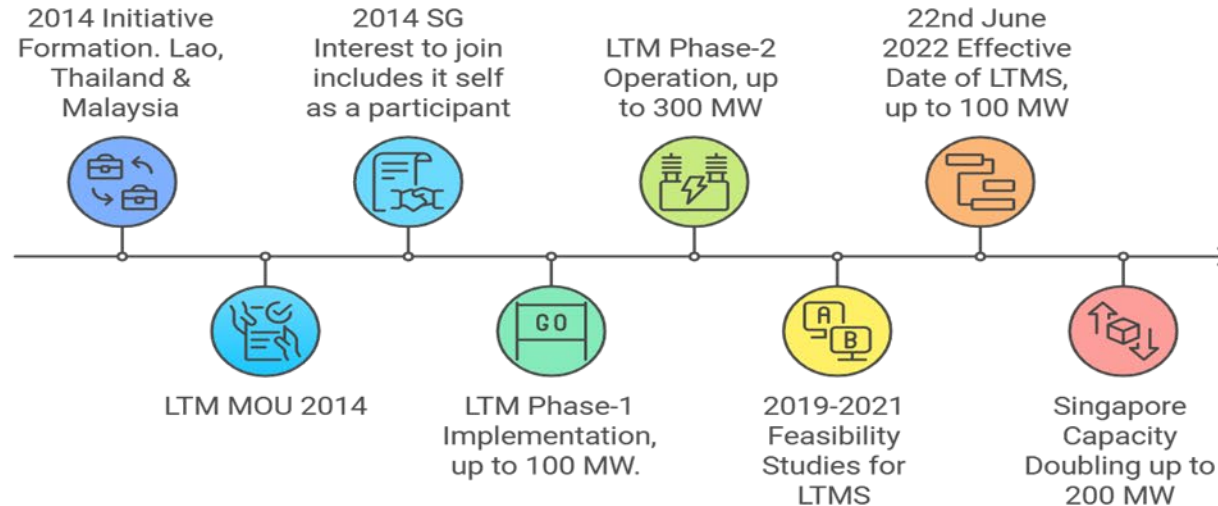
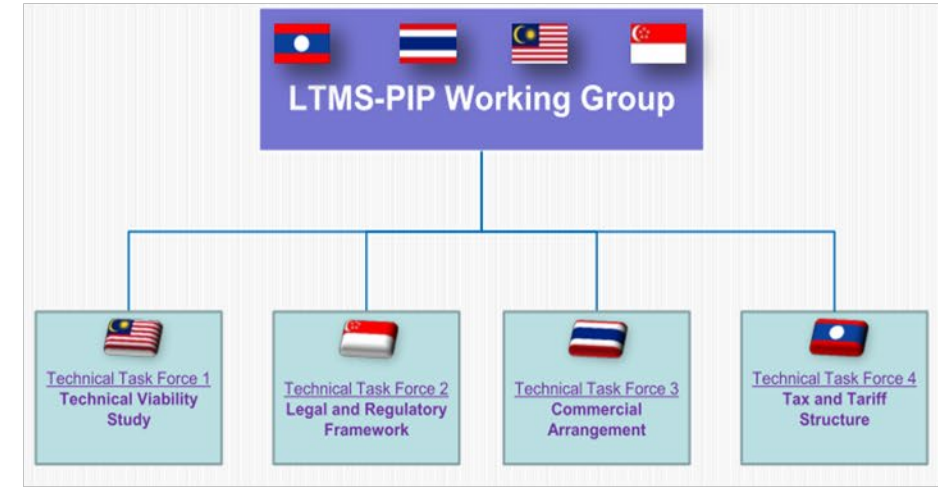
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Project Overview

Laos-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP)



1. HVDC System Interconnection Agreement (SIA) between TNB and EGAT
2. Interconnection Agreement (IA) between TNB and SPPA
3. Supply Agreement between EDL and Importer in Singapore



To support this next phase of the LTMS-PIP, the Energy Market Authority (EMA) has granted an extension of Keppel’s electricity importer license for another two years to 2026. In addition to being able to import electricity from Lao PDR, Keppel will be importing electricity from Malaysia



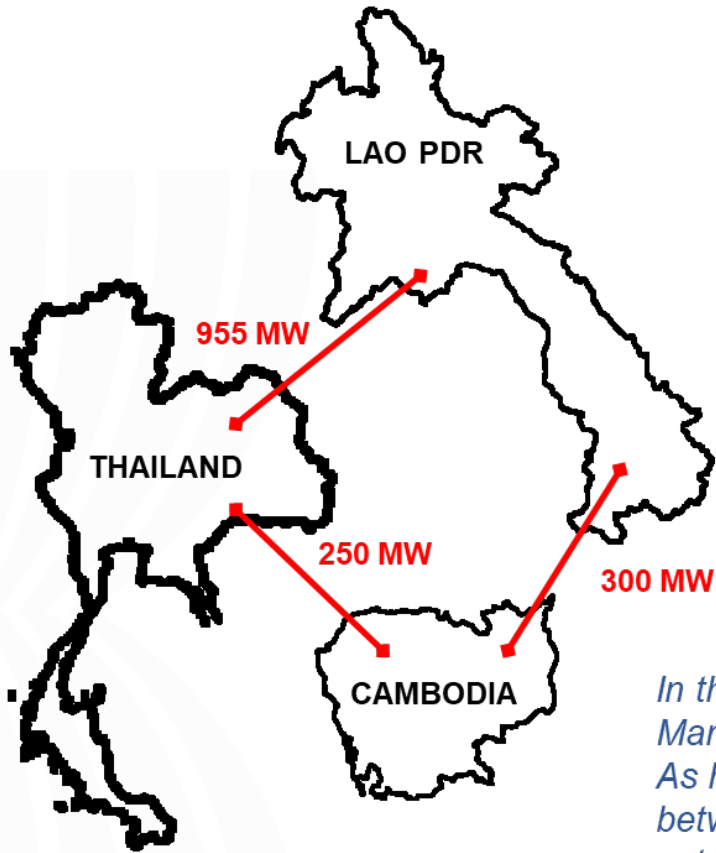
Future Prospect



LTC-PIP Interconnection Projects under the APG



Grid-to-Grid Interconnection Capacity amongst Lao PDR-Thailand-Cambodia



Thailand – Lao PDR

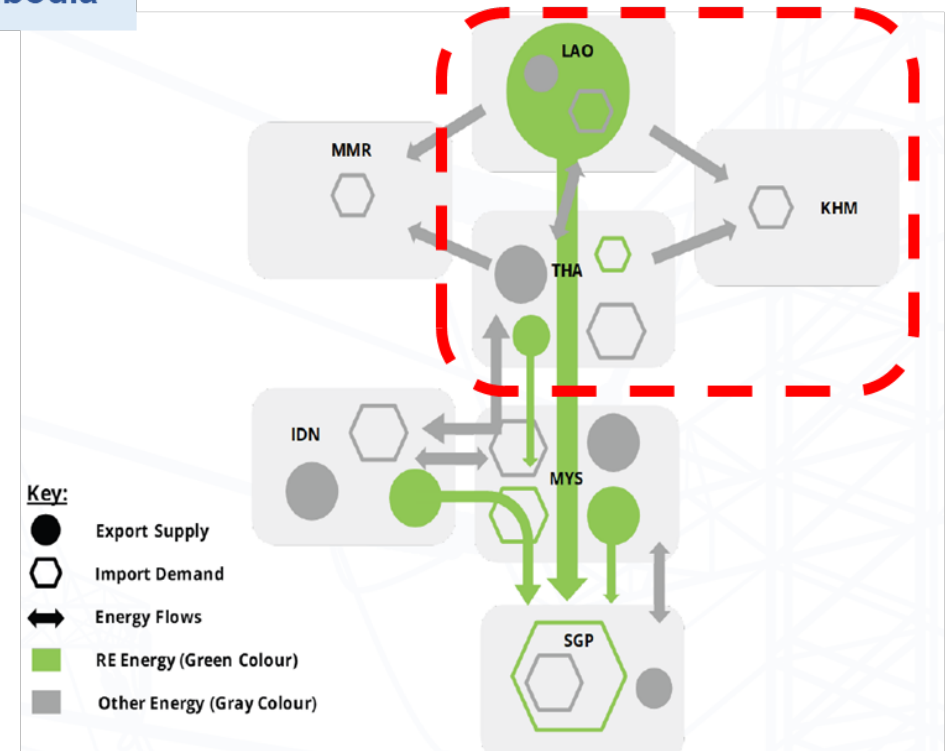
- Nong Khai (TH) – Donphosy (LA)
- Nong Khai (TH) – Thanaleng (LA)
- Bueng Kan (TH) – Pakxan (LA)
- Nakhon Phanom (TH) – Thakhek (LA)
- Mudhakan 2 (TH) – Pakbo (LA)
- Sirindhom 2 (TH) – Bangyo (LA)
- Tha Li (TH) – Ken Thao (LA)

Thailand – Cambodia

- Wattana Nakhon (TH) – Aranyaprathet (LA) – Industrial Estate (KH)

Lao PDR – Cambodia

- Ban Hat (LA) – Strung Treng (KH)

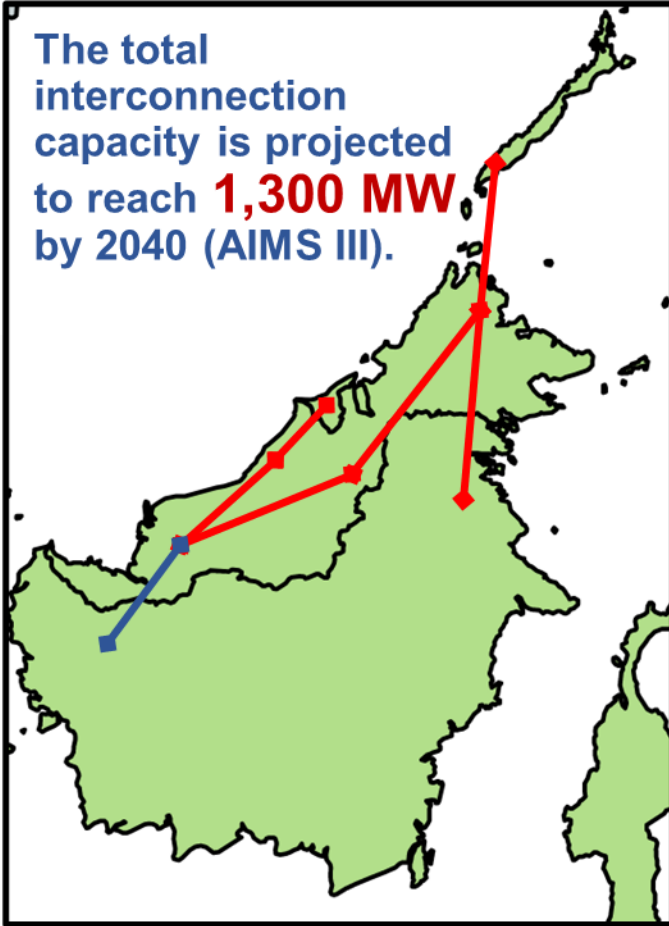


In the APG Advancement Program, the study identified a possible market establishment of a West Subregion Market that includes the original LTMS countries, with Cambodia included in the power trade project. As highlighted by the Roadmap for Multilateral Power Trade in ASEAN, the grid-to-grid interconnection between countries is integral in enabling energy exchange between them. It is a building block for establishing multilateral power trade (MPT).

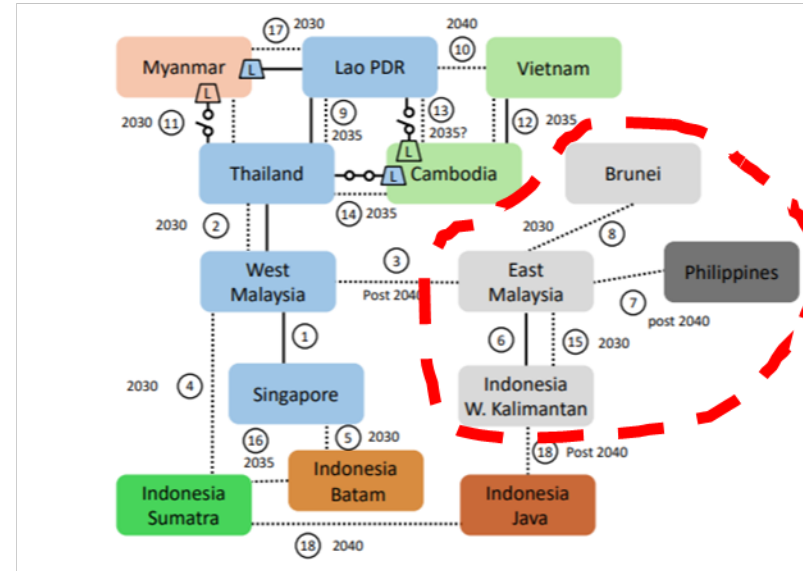
Closer look at the BIMP-PIP interconnection projects in the AIMS III



The total interconnection capacity is projected to reach **1,300 MW** by 2040 (AIMS III).



The listed projects, estimated capacity, and COD are based on the ASEAN RE Target Scenario of AIMS III Phase 1 and 2 (2020).



Eastern Sub-region of the APG = BIMP-PIP

Planned Projects

Sarawak – Brunei Darussalam (MY-BD)

- Estimated capacity: TBC (by 2028)
- OHL HVAC

Sarawak – Sabah (Internal MY)

- Estimated Capacity: 177 MW (by 2040)
- OHL HVAC

North Kalimantan – Sabah (ID-MY)

- Estimated Capacity: 174 (by 2040)
- OHL HVAC

Sabah – Palawan (MY-PH)

- Estimated Capacity: 196 MW (by 2040)
- Subsea HVDC

Existing Projects

West Kalimantan – Sarawak (ID-MY)

- Estimated capacity: 230 MW
- Voltage: 275 kV (HVAC)

BIMP Power Integration Project Timeline

41st AMEM 2023, Joint Statement Announcement under ASEAN Framework

Project Endorsement by BIMP-EAGA Power and Energy Infrastructure Cluster (PEIC)

Task Force Formation Late 2023-2024 will establish in 2025

Project Studies Development with DP/IO in 2025



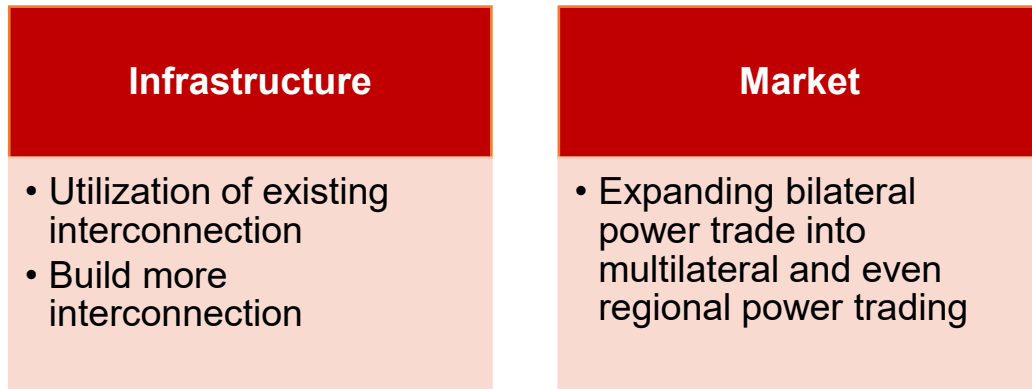


Challenges, Barriers & Opportunities on APG

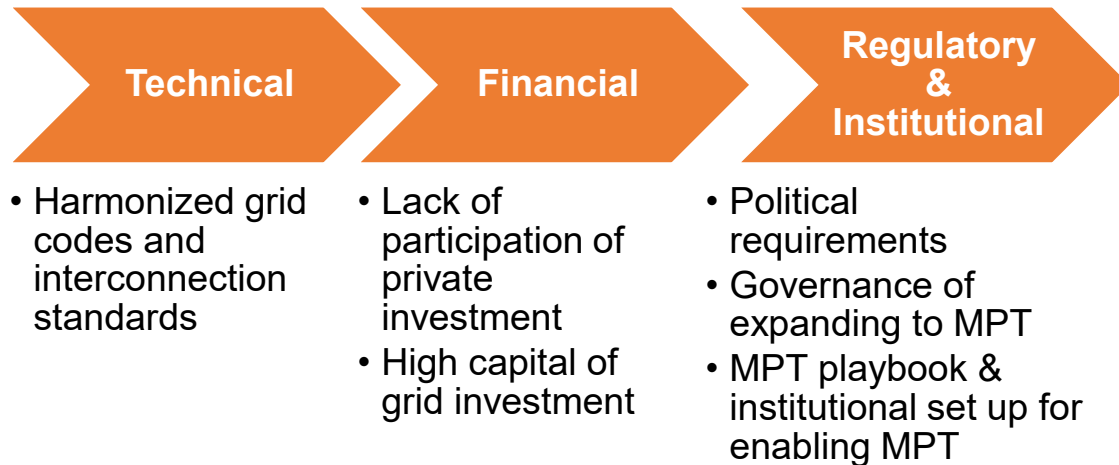


Challenges, Barriers & Opportunities on APG

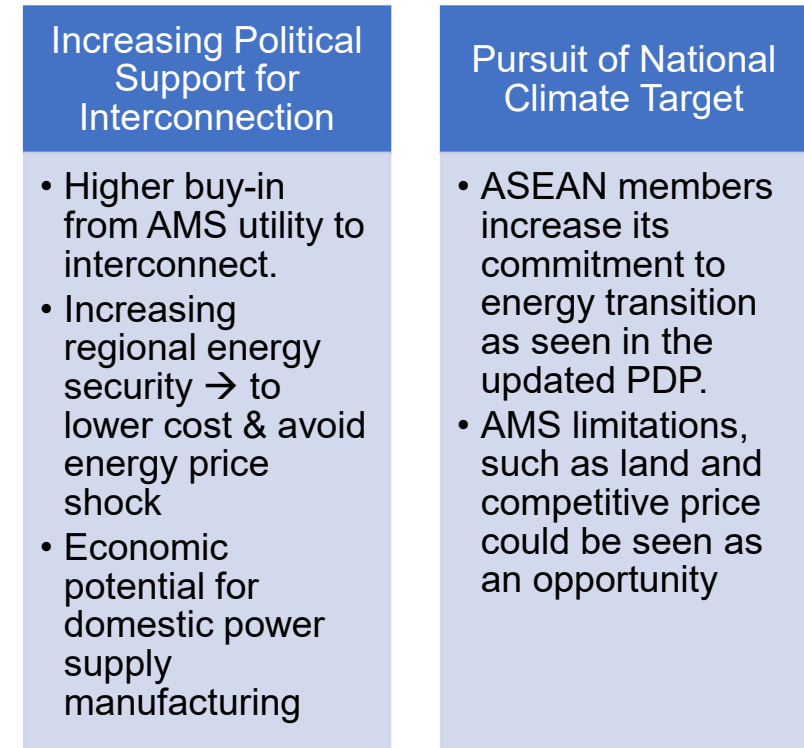
Challenge



Barriers



Opportunities





Way Forward



What to expect in APG Post-2025?



There are 4 main focus area for cooperation under APG program area envisioned in the APAEC Post-2025.

Outcome Based Strategy

OBS 1

Strengthen **AGP bodies' coordination** to advance APG implementation and operation

Action Plan

Operationalise APG Enhanced MoU and TOR for APG Bodies

Strengthen coordination among APG bodies

Strengthen the capacity of APG bodies and APG Secretariat

OBS 2

Enhance **regional planning** for the APG cross-border interconnections and infrastructure

Establish a mechanism and framework for the regular update of ASEAN Interconnection Masterplan Study (AIMS)

Assess the feasibility of proposed cross-border interconnections under AIMS

Explore cross-border interconnectors and transmission technologies, including subsea interconnections

OBS 3

Expand **cross-border power trading** by optimizing APG infrastructure and enhancing regional market integration

Track the progress of APG development, including interconnections, infrastructure, and electricity trade

Advance regulatory, policy, commercial and technical frameworks to support cross-border electricity trading and regional market integration

Explore financing mechanisms and opportunities for the development of APG interconnections and infrastructure

Advance grid modernisation and digitalization to ensure power reliability, quality and accelerate decarbonisation

OBS 4

Drive a **low-carbon APG** as a regional cooperation strategy to decarbonize the ASEAN energy system and support net-zero emissions goals

Update on share of RE and carbon-free power in the total capacity of cross-border traded power

Explore the integration of emerging technologies to accelerate grid decarbonisation

Explore enabling policy and regulatory frameworks to accelerate cross-border clean and renewable electricity trading

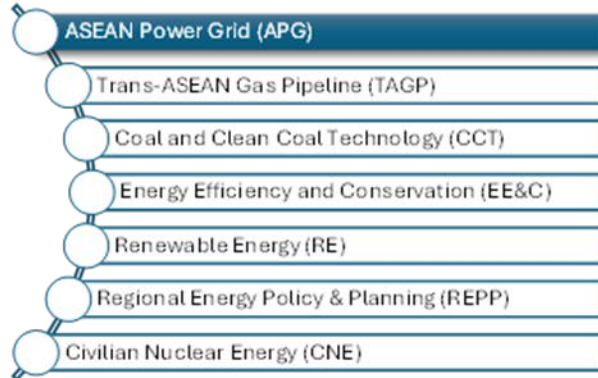
**indicative as APAEC Post 2025 is under development and subject to approval and endorsement for AMEM 2025*

APAEC 2016-2025 Phase II: 2021-2025

Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All

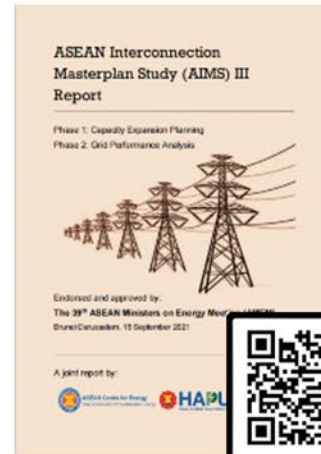


SCAN ME



The ASEAN Interconnection Masterplan Study (AIMS) III

The ASEAN Interconnection Masterplan Study III (AIMS III) is a flagship study by HAPUA and ACE under the direction of the ASEAN Ministers on Energy Meeting (AMEM) to explore the viability of multilateral electricity trading in the ASEAN region. The purpose of this study is to **enhance grid resilience and modernisation to provide an affordable and resilient electricity supply and accommodate higher shares of renewable energy (RE) to the grid**. Through the study, 62 potential VRE sites and 18 priority interconnection projects under the APG were identified and used as a strategic reference in maximising the potential utilisation of APG.



SCAN ME

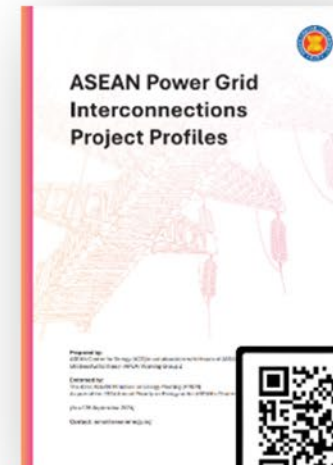
The 8th ASEAN Energy Outlook (AEO8) complements the APAEC and supports the creation of pathways for achieving regional targets. Guided by Programme Area No. 6: REPP; Action Plan 1.2: Publish regular regional energy outlooks and strategic reports on the thematic issue.



SCAN ME



APG Interconnections Project Profiles



SCAN ME

Data Sharing Framework and Guidelines to Accelerate MPT in ASEAN



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Thank You