



Accelerating Multilateral Power Trade through Regional Power Market and Interconnection Development

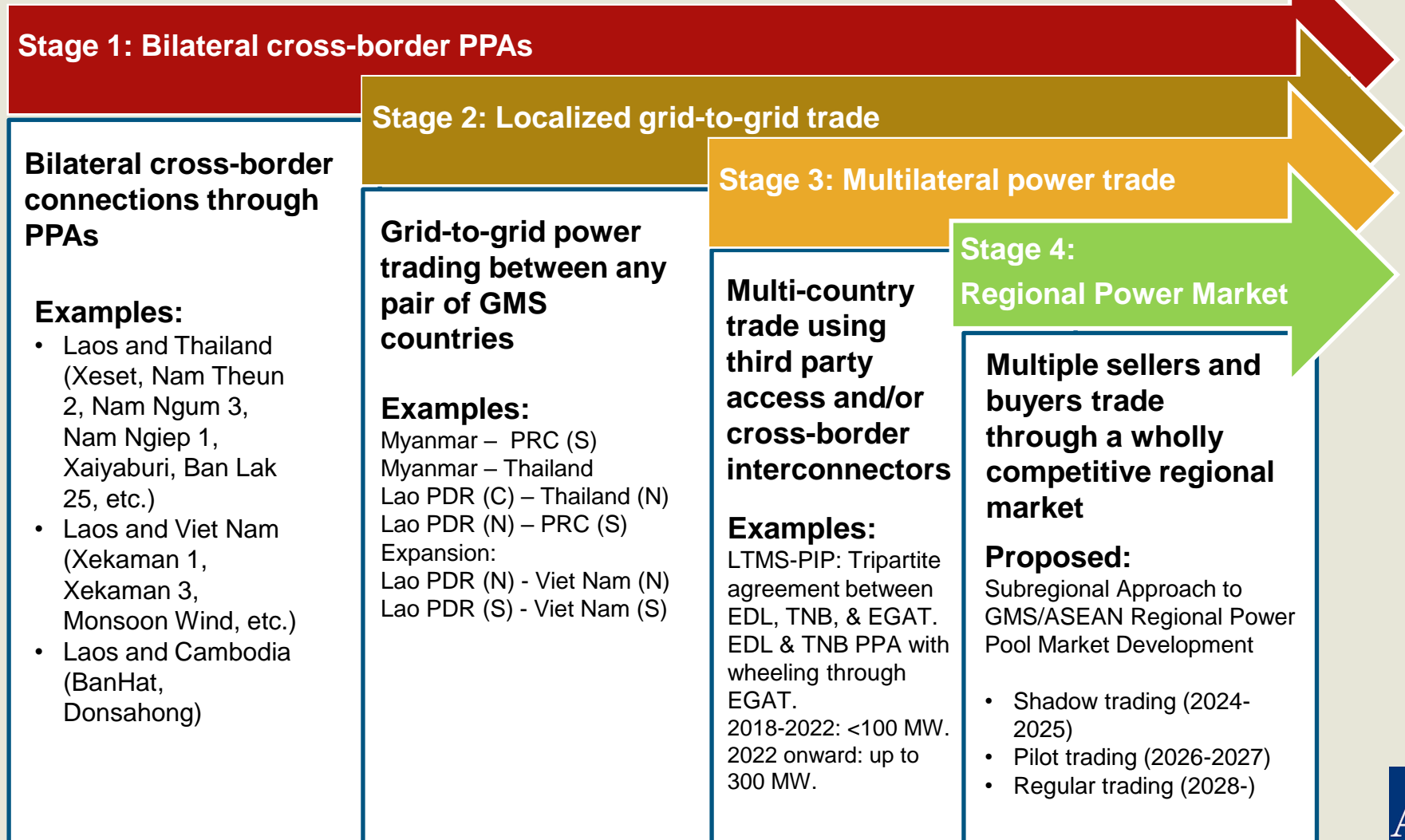


**2nd GMS Energy Transition Task Force
Committee Meeting
December 2023**



GMS power trade towards the aspiration for a regional power market since 2002

- Intergovernmental Agreement (IGA) signed at the GMS Summit (2002)
- Final Report on the Design of Regional Power Trade Operating Agreement (2004)
- Intergovernmental MOU-1 (2005) on the Guidelines for the Implementation of the Regional Power Trade Operating Agreement Stage 1
- Intergovernmental MOU-2 (2008) on the Road Map for Implementing the GMS Cross-Border Trading
- Intergovernmental MOU (2013) on the Establishment of Regional Power Coordination Center (RPCC)



GMS Achievements – underpinning intergovernmental agreements, MOUs, master plans, and technical studies in support for regional power trade

Key Initiatives

Establish an implementation roadmap of the regional GMS grid codes

Establish an organization for the operationalization of the GMS synchronous zones

Establish the design of the regional high-voltage interconnection transmission network

Establish an organization to administer the fair settlement of power exchange

Provide guidance to establish GMS regional master plan

Assess new interconnection projects and manage existing portfolio

Results

Working Group on Planning and Operation (WGPO):

- GMS technical performance standards finalized
- Policies for regional transmission regulations finalized
- Recommendations on standard regional metering arrangements finalized
- The Regional Grid Code including the preamble, the governance code, connection code, operations codes, market codes, metering code, system operator training code, and strategic planning document, was finalized
- Regional transmission master plan finalized

Working Group on Regulatory Issues (WGRI):

- An assessment of the Regulatory Barriers and Measures to Overcome to Facilitate GMS regional power trade completed
- Third Party Access to the transmission networks in the GMS countries and a Wheeling Charge Methodology was completed
- The report supported power trading between any pair of GMS countries, using transmission facilities of a third country, completed
- National transmission tariff review and application of transboundary transmission charges completed

Objective for regional markets

Allowing for regional cooperation, but maintaining national control of the assets

A stepwise, flexible approach is needed, allowing new players to enter

Flexibility is needed in:

- **Market design** – allowing future evolution of markets
- **Market Rules** – easy access to markets to new players
- **Market Platforms** – managing changes in the market framework
- **Legacy contracts** – respecting these
- **Market opening** – not a big bang where all join at the same time



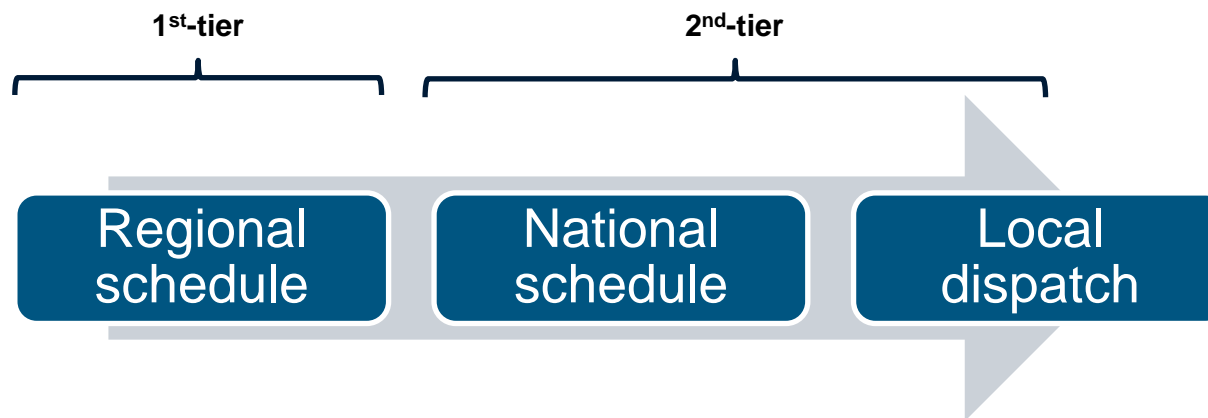
Increased integration

The regional market – two-tier dispatch

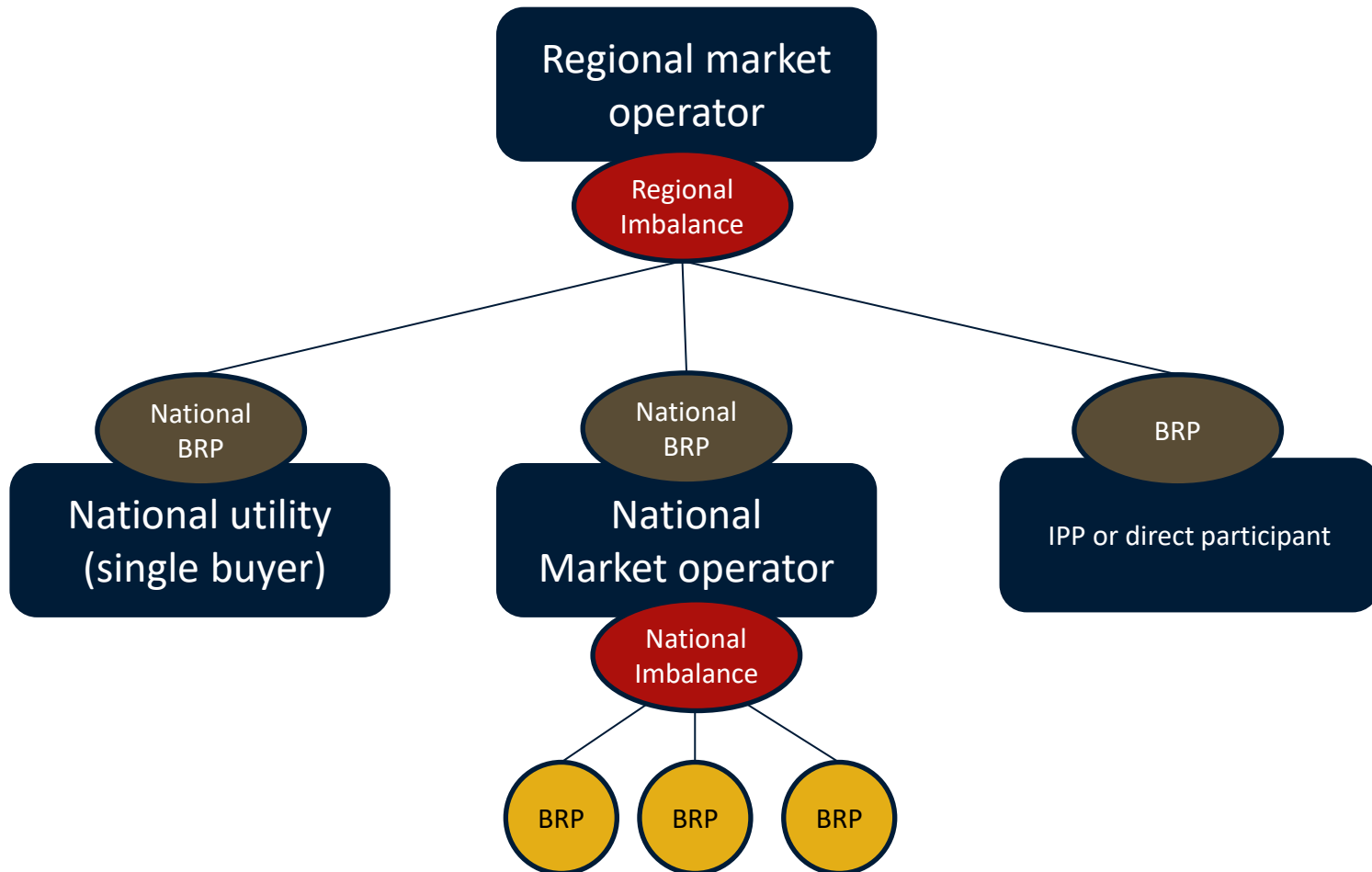
The primary purpose and criteria for the design of a regional power market is **optimal resource allocation and by this increase efficiency, enhance integration of renewable generation and reduce the overall cost of generation, including increasing the security of supply.**

To achieved this the concept is based on,

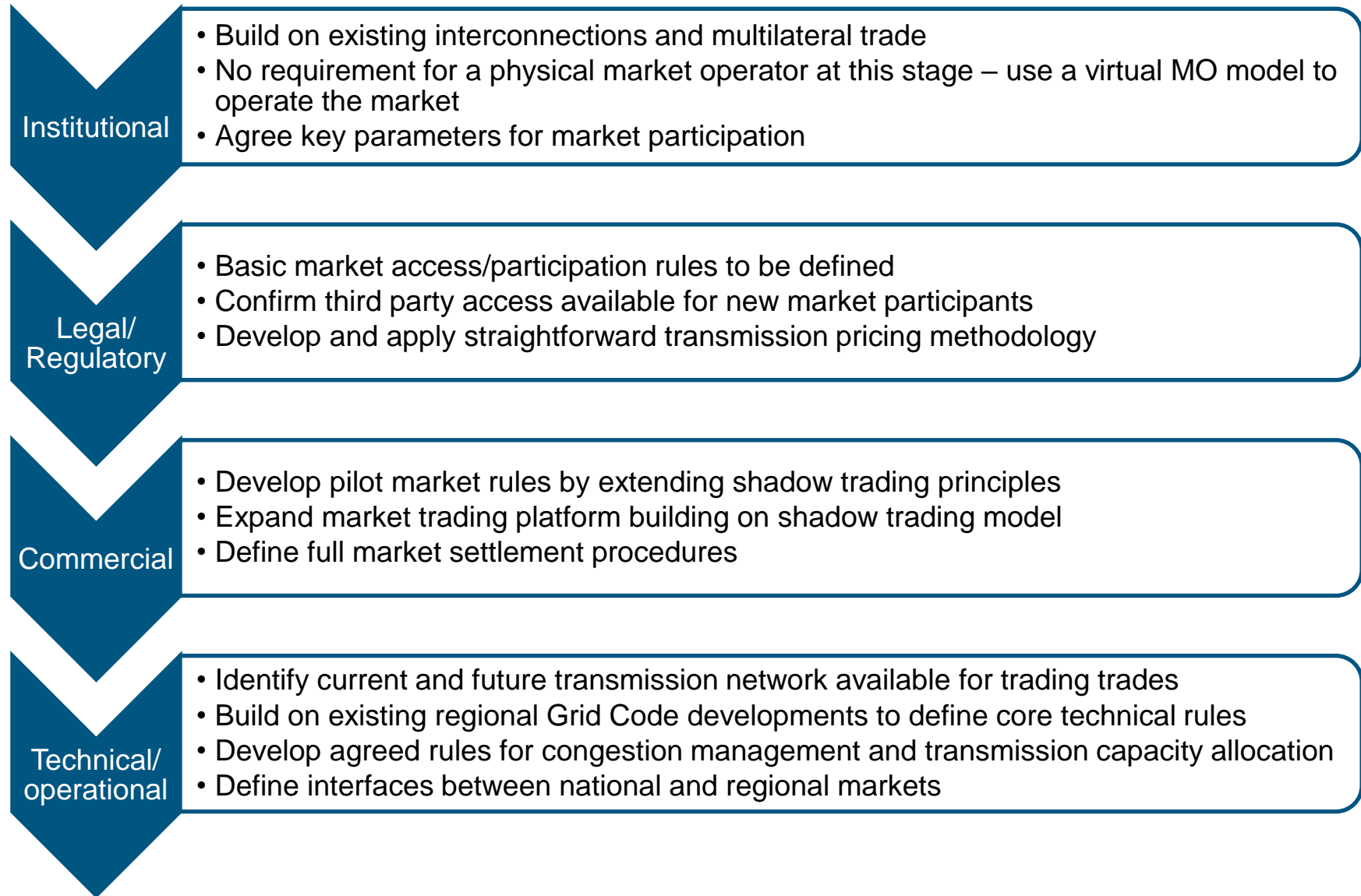
- Creating economic merit orders while taking transmission constraints into account
- Short-term optimizing of the power system and formation of a dispatch schedule from a regional perspective down to the local dispatch
- “Regional market”, connecting countries in a stepwise manner
- The regional trading provides (all or) parts of the interconnector flows between the countries
- The trades in the regional market is considered in the local dispatch together with the national schedule



Balance responsibility – needs to be multi-level and flexible



Initial components of pilot market development



Regional Power Market: High-level overview of the three main phases

- Day ahead market
- Expanded GMS/ASEAN countries

- Day ahead market
- Subregional level (GMS/LTMS/BIMP)

- Dry run
- Open for all GMS/ASEAN countries

Shadow Trading (2024-2025)

Pilot Operation (2026-2027)

Regular Operation (2028-)

Governance

GMS ETTF /ASEAN HAPUA

supported by ADB Technical Assistance

- Intergovernmental MOU
- Inter-utility MOU
- Multilateral utility operation agreement
- Regional market rules

- Intergovernmental MOU
- Inter-utility MOU
- Regional Inter-Utility operation agreement
- Regional market rules

Virtual market operation rules and regulations

- Simplified Wheeling methodology and settlement rules

- Third-party access regulations
- Wheeling methodology
- Financial Settlement rules
- Grid operation rules

- Third-party access regulations
- Wheeling methodology
- Financial Settlement rules
- Grid operation rules

Infrastructure requirements

- Physical transaction not incurred
- Various interconnection scenarios to be tested

- Existing grid-to-grid interconnection
- Dedicated interconnection

- Existing interconnections
- New interconnections (HVDC interconnection, subsea cable interconnection, etc.)

Key enablers for regional power market development

APG MOU

Intergovernmental MOU

Agreeing the principles of regional power market implementation and institutional structures

Inter-utility MOU

Defining the relationships between the utilities operating in the APG

Regional power market rules and regulations

Providing market structure and design, standardized licensing for market participants, pricing mechanism, third party access, technical requirements and standards, grid operation rules, market monitoring and compliance, settlement procedures, risk management, dispute resolution, etc.

Inter-utility technical operating agreement

Defining the key planning, data sharing and information exchange, coordination mechanism, connection protocols, operational procedures, technical standards, eventually a Regional Grid Code

A few subregional grid-based shadow trading can be tested to facilitate regional power trade ultimately. **Shadow trading will give visibility of potential benefits**



The generic benefit from the market is that you allow for optimizing the cross-border flow in the short-term timeframe.

You can (and will) still have bilateral/multilateral cross-border agreements that is used for funding the investment but having a short-term market (like Day-ahead) will allow for the flow to be optimized based on the real situation in the grid (where for a given day/hours the optimal trade might be in the opposite direction of the long-term agreement). This will apply to all of these examples:

- ASEAN/GMS Grid
- ASEAN LTMS Grid
- ASEAN Trans Borneo
- ASEAN Singapore-Cambodia / GMS

Table 3.2 ASEAN Interconnection Projects Electricity Import (+) / Export (-) Balance in LCO Scenario

	Net Import/Export (GWh)				% of Domestic Generation			
	2025	2030	2040	2050	2025	2030	2040	2050
Brunei Darussalam	-526	-3,504	-3,504	875	8.34	36.89	34.12	12.27
Cambodia	-2,468	-71	-2,055	-14,197	21.71	0.61	11.46	45.01
Indonesia	-1,519	-624	1,115	7,271	0.45	0.16	0.22	1.15
Lao PDR	-4,575	-8,349	-8,901	-58,326	10.09	16.33	16.29	54.26
Malaysia	-1,765	-686	-12,215	-27,851	0.95	0.35	5.62	11.07
Myanmar	-6,326	-8,603	-7,850	-7,634	22.01	23.44	19.83	17.86
Philippines	0	-294	2,433	4,380	0.00	0.20	1.34	1.93
Singapore	3,199	4,225	8,067	9,198	6.09	7.68	13.74	15.69
Thailand	58,850	52,357	58,512	48,953	46.38	32.51	27.40	15.96
Vietnam	-44,869	-34,451	-35,602	37,330	14.71	10.64	8.95	8.37

GMS/ASEAN Regional Power Market - **Creating a Marketplace for Multilateral Power Trade, which will enable regional interconnector and more RE development**

Regional Power Market Development

- **A Day-ahead Market** for enabling power purchases to be optimized for the **short-term**, complementing long-term bilateral and multilateral trades with more flexible trades and allowing for the management of congestion and transmission capacity
- No requirement for a physical market operator – use **a virtual market operator** model to operate the market
- **A decentralized market based on self-dispatch** – allowing the participating countries to set up their trading as per their own national requirements including flexibility to add new market participants (countries, utilities, IPPs, etc.)
- **A settlement solution** allowing the participants to see the financial outcome of the trading
- **A methodology for third-party access and wheeling pricing**

Regional Interconnector Development

- Assessment of GMS/ASEAN cross-border **interconnection infrastructure capacity and utilization**
- Feasibility test during the shadow trading **among different interconnection scenarios**
- **Cross-border transmission operation rules and standards**, towards the harmonization of regional grid code
- **Regional interconnector development** roadmap including different financing models and investment modalities for private sector participation
- Developers of interconnectors remunerated via published **wheeling tariff or using standard PPP models** (Tariff Based Competitive Bidding, BOOT, Design-Finance-Build-Operate-Maintain)

Renewable Energy Development

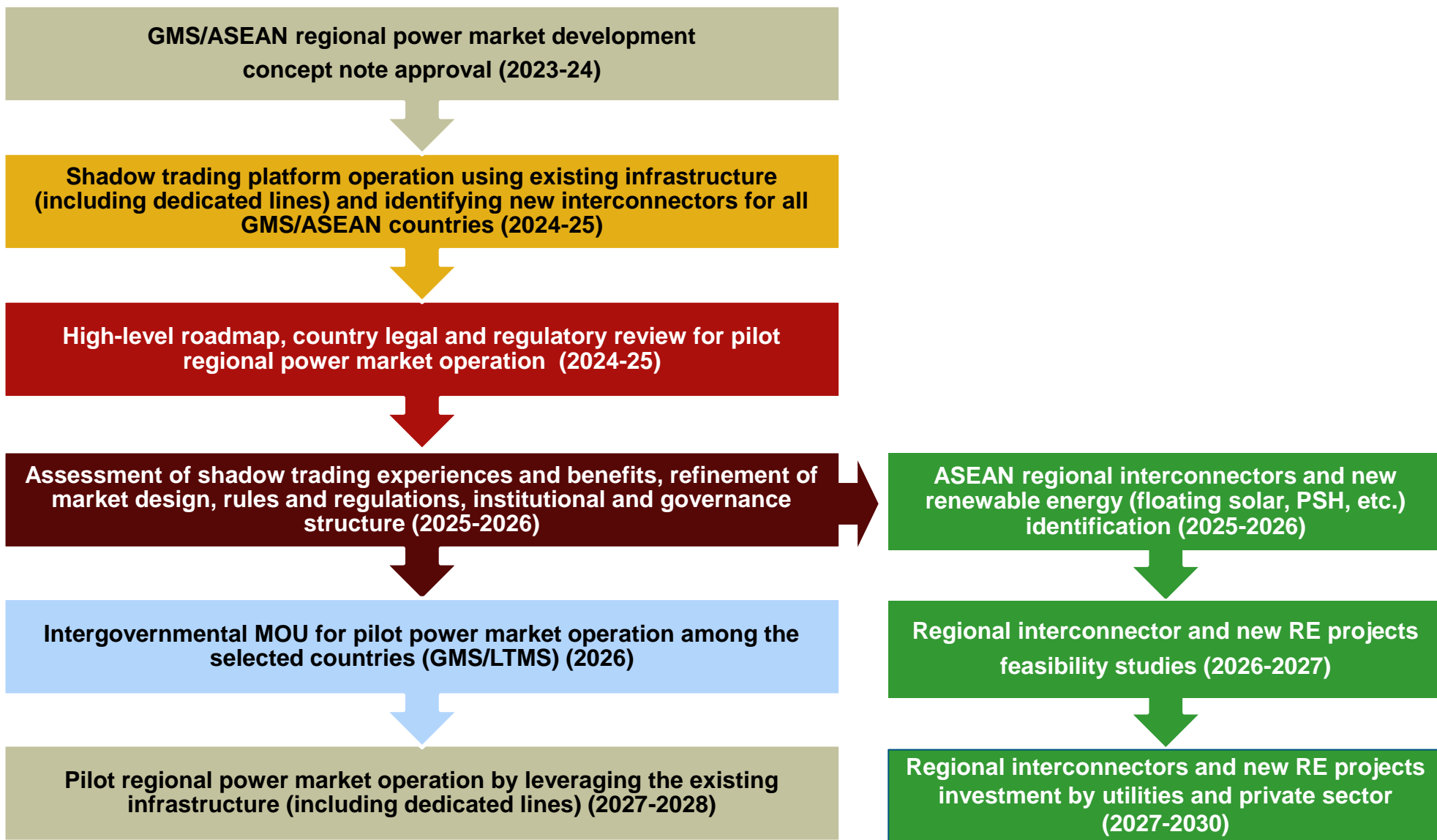
- Regional marketplace will create the opportunities **for more renewable energy development** in the region by private sector
- Potential projects includes floating solar project combined with the existing hydropower plants, pumped storage hydropower projects, etc.
- Private sector participation and financing models will be examined.

Pilot Regional Power Market Development Concept Preparation (2023)

Key stakeholder consultation and engagement process

Activities	Time
Concept preparation by ADB based on the RPTCC studies and decisions	Q1 2023
Concept discussion with ASEAN Secretariat under ASEAN-ADB Energy Dialogue	Q1 2023
Concept presentation and discussion at ASEAN AREN Meeting	May 2023
Concept presentation and discussion at GMS ETTF Committee Meeting	June 2023
Concept paper submission to the ASEAN Secretariat	June 2023
Concept paper presentation and discussion at the ASEAN SOME Meeting	June 2023
Concept paper comments received from the ASEAN Secretariat	July 2023
Concept paper discussed with the ACE and other Development Partners	Q2-Q3 2023
Draft final concept paper shared with the GMS countries, HAPUA, ACE, LTMS	September 2023
Bilateral consultation meeting with Cambodia (MME, EAC, EdC)	21 September 2023
Bilateral consultation meeting with Laos (MEM, EdL)	26 September 2023
Bilateral consultation meeting with Thailand	5 October 2023
Bilateral consultation meeting with Viet Nam	6 November 2023
Laos national consultation workshop and GMS/ASEAN regional training in Laos	8-10 November 2023

Regional Power Market and Interconnection Development: Proposed Key Milestones



Thank you!

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