South Asia Regional Initiative for Energy Integration

Working Session-2 "Transitioning gradually from Bilateral to Trilateral/Multilateral Power Trade and Development of Regional Power/Energy Market for accelerating Sustainable Energy Infrastructure Development and Cross Border Energy Trade"

Theme Presentation

"International experience and best practices on the models of Trilateral/Multilateral Power Trade, based on the SARI/EI study on " Transition of bilateral power trade to trilateral and multilateral power trade in South Asia"

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SAFIR-SARI/EI Conference (Virtual) on "Sustainable Energy Infrastructure Development and Role of Cross Border Energy Trade in South Asia: Challenges, Opportunities and Way Forward" 15th & 16th March 2021, New Delhi, India

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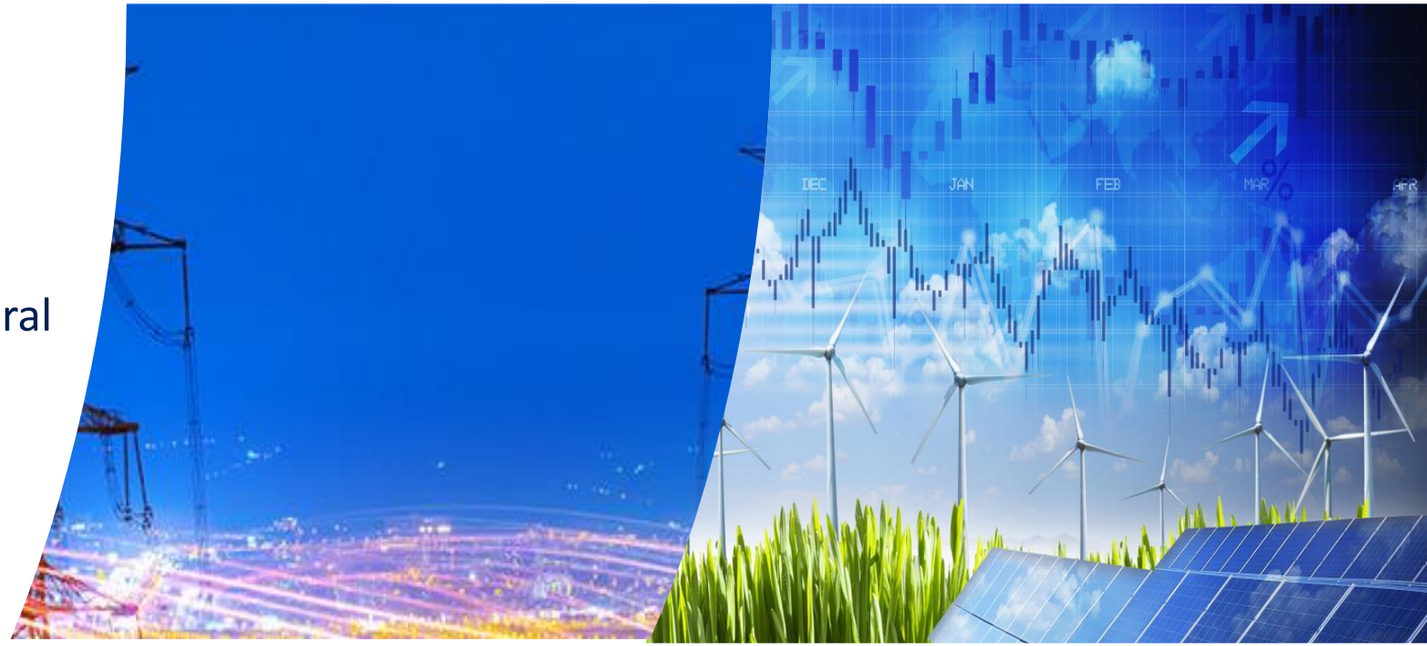
15 IRADe Integrated Research and Action for Development

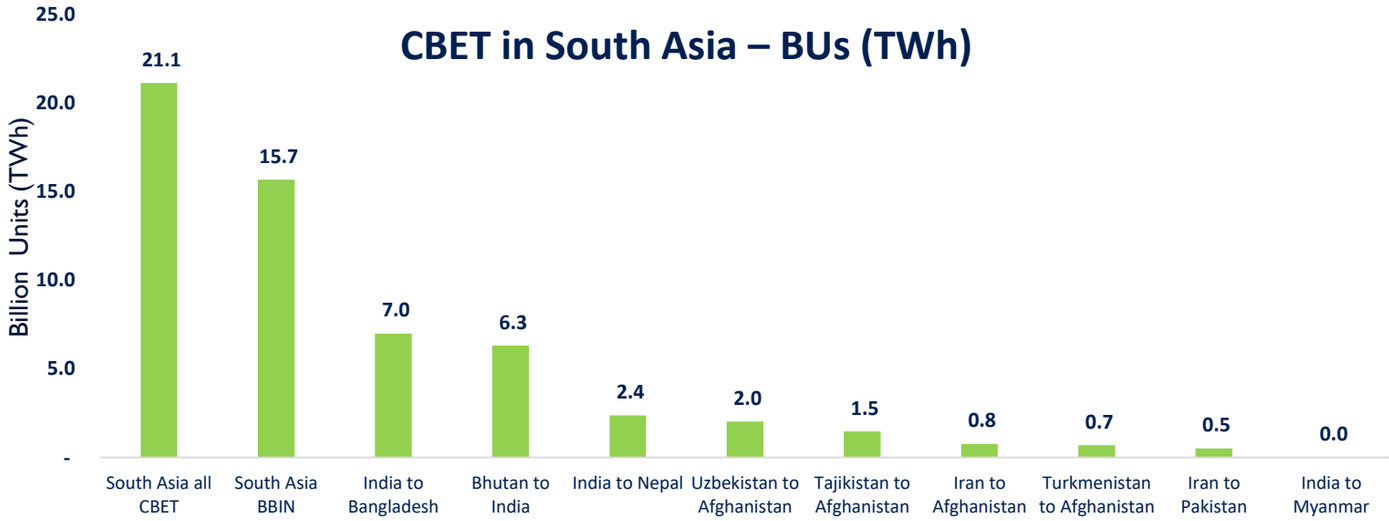
Agenda



1. Current status of Regional Power Trade
2. Power Market in South Asia
3. India's experience with competitive power markets
4. SARI/EI study on " Transition of bilateral power trade to trilateral and multilateral power trade in South Asia"
   - ❖ Review of international experience
   - ❖ Different models of power trade
   - ❖ Institutional structures
   - ❖ Key ingredients to enable trilateral/multilateral power trade
5. Key areas for discussion

Current Status of Regional Power Trade in South Asia

- Bilateral Cross Border Electricity Trade (CBET)
- The annual overall CBET ~ 21 BUs. BBIN-~16 BUs
- Initially all CBET, G-G negotiated tariff
- Comml. CBET in BBIN- 2010-0 MW, 2020-~1266 MW (~33%)
- For future CBET, plans for gradual transition from bilateral trade to trilateral & market trade
- Trade through Power Exchange
- Potential Remains Large
- EUROPE-Leading Regional Power System trade high volume of CBET- 467 TWh



Note-India and Pakistan data are for 2020. Afghanistan import is for 2019. Based on Data Source from : POSOCO, NEPRA, NSIA, CERC-MMR

Planned/under execution Trilateral/Multilateral Power Trade

CASA-1000 trilateral transactions	Pakistan Buyer	Tajikistan Supplier and Transit	Krygystan Supplier	Afghanistan Transit and buyer
500 MW from Upper Karnali HPP (900 MW) Nepal	Bangladesh Buyer	Nepal Supplier	India Transit and buyer	
1125 MW Dorjilung HPP Bhutan	Bangladesh Buyer	Bhutan Supplier	India Transit	

BBIN-Bangladesh, Bhutan, India, Nepal, *- Maximum CBET Peak in MW

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Power Markets in South Asia (SA)

- Except India , all other SA countries are Single Buyer Model
- Has not progressed a lot beyond allowing IPPs and competition in generation (except India)
- Enabling provisions for tripartite trade & trade through Power Exchanges opens up potential opportunities for Trilateral & Multilateral Cross Border Power Trade

Key enabling provisions by India

Guidelines for Import / Export of Electricity 2018	**Section 3.1, 5.3, 8.6**
CERC (Cross Border Trade of Electricity) Regulations, 2019	**Section 3 (2), 6, 12 (6)**
Procedure for approval and facilitating Import/Export (Cross Border) of Electricity by the DA, February 2021	**Section 8, Annex-V , 6.5, 6.6 (iii), Annex-III**

Power Market Reform Status in South Asia (SA)

Country	Removal of single buyer model	Wholesale competition (IPPs)	Open access to transmission lines	Power exchange and power traders
Afghanistan		☑		
Bangladesh		☑		
Bhutan		☑		
India	☑	☑	☑	☑
Maldives		☑		
Nepal		☑		
Pakistan*		☑		
Sri Lanka		☑		

*The CPPA-G is facilitating the power market transition from the current single buyer to competitive market

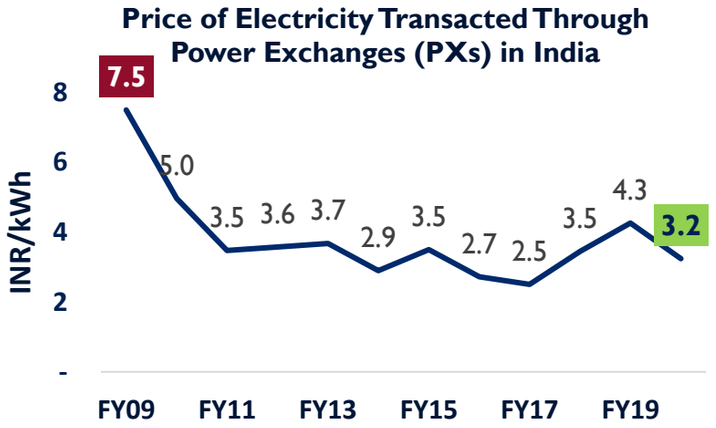
India's Experience with Competitive Power Markets & Prospect for South Asia

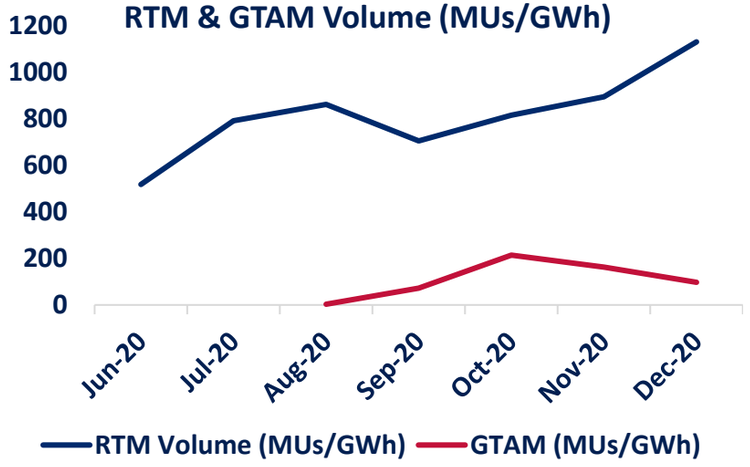
India's Power Market

Transparency | Competitive | Options | Choice

The two power exchanges in India (IEX and PXIL) started their operations in 2008.

- **Competitive market** with competitive prices.
- **Transparency**, **Choice** , **Options**
- Supports Intra-day , Real Time markets, to meet unplanned events
- Supports trading of renewable energy through Green Term Ahead market
- Renewable Energy Certificates (RECS), Energy Savings Certificates (ESCERTs)
- Potential to leapfrog on CBET Front



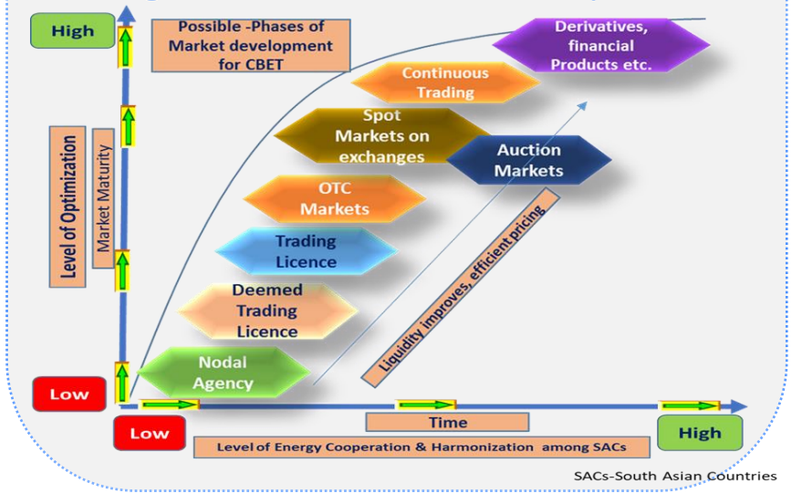


Source: CERC Market Monitoring Report

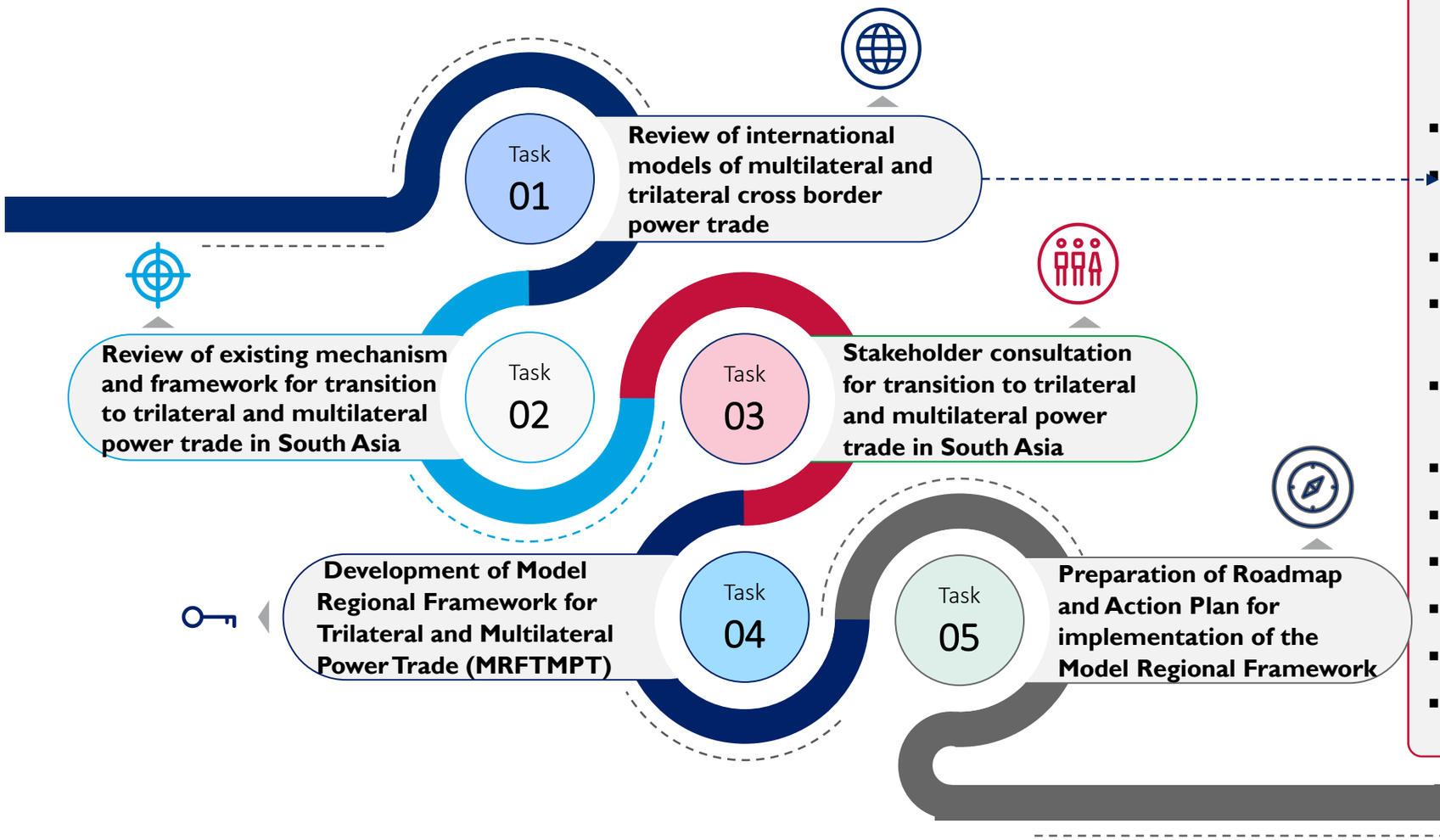
Prospect for South Asia

- Gains from BBIN Multilateral electricity Trade (Capex reduces by USD 17 billion)
- PXs offers a platform for trilateral/multilateral CBET
- SARPEX mock exercise- Demonstrates benefits

Regional Power Market Development



SARI/EI study on " Transition of Bilateral Power Trade to Trilateral & Multilateral Cross Border Power Trade in South Asia"



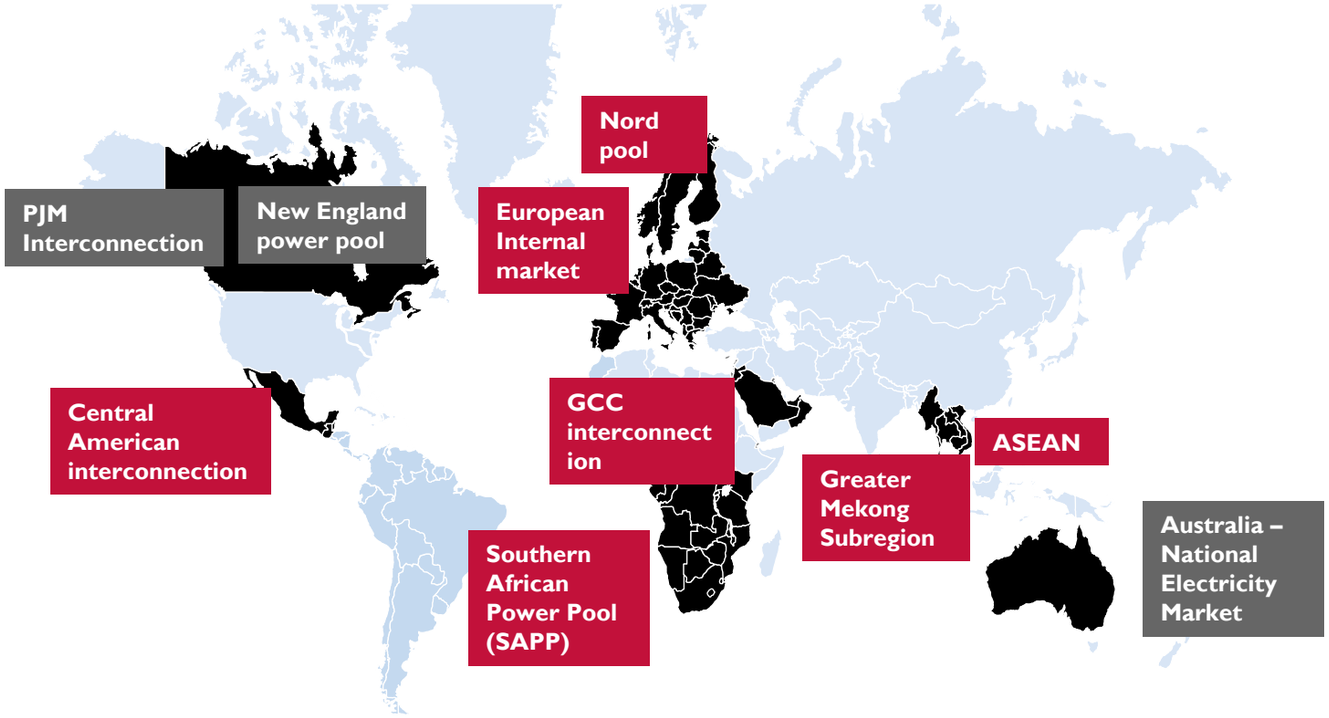
Topics covered in review of international experience, with reference to transition towards trilateral and multilateral power trade

- Key drivers and enabling factors
- Strategic, policy, regulatory, legal and institutional framework
- Technical, commercial and operational framework
- Joint investment and cost recovery mechanisms for cross-border transmission systems
- Transmission pricing, loss accounting, deviation settlement, open access etc.
- How various challenges and barriers were mitigated
- Consensus building mechanisms
- Benefits, including those related to RE integration
- Role of regional institutions
- Different models of CBTMPT
- Key common elements, minimum requirements and key ingredients required for CBTMPT

Review of International Experience on Transition to Trilateral/Multilateral Trade

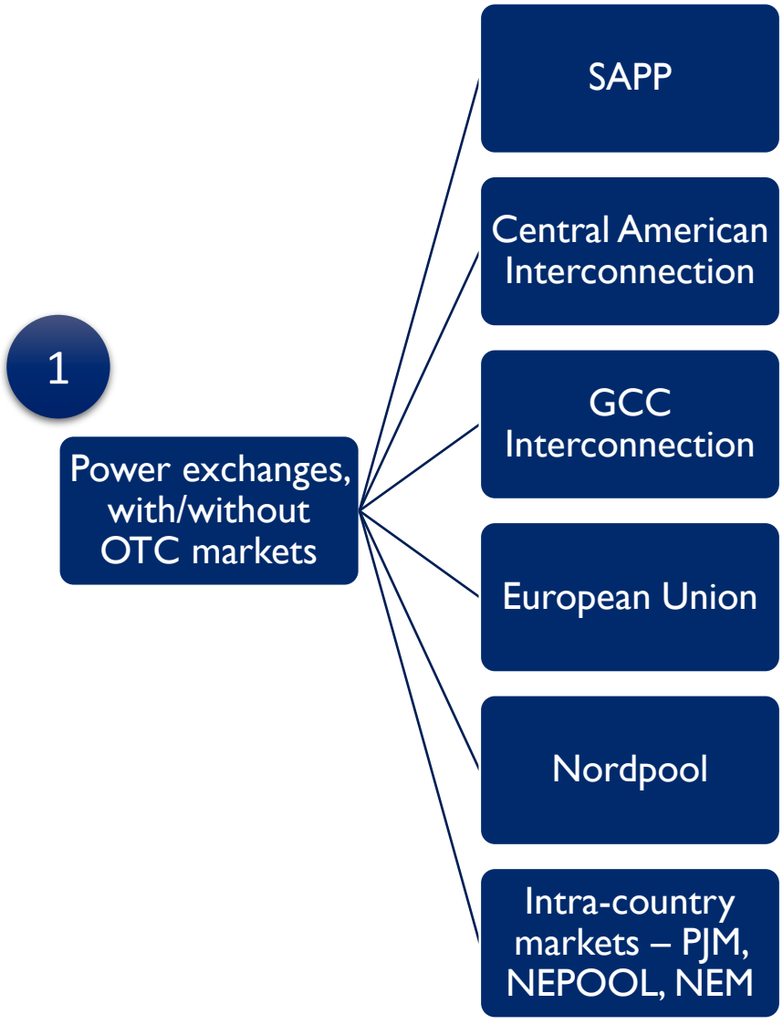
- As part of the study, major power pools and regional power markets were studied, focusing on their handling of trilateral and multilateral power trade.
- Among the international power markets, SAPP, GCC, Europe (incl. Nord Pool), Central America and ASEAN has some form of trilateral / multilateral power trade.
- Some of the intra-country power pools such as PJM interconnection and New England power pool in USA, and the National Electricity Market (NEM) in Australia were also studied, considering the possibility of obtaining key learnings for South Asia.

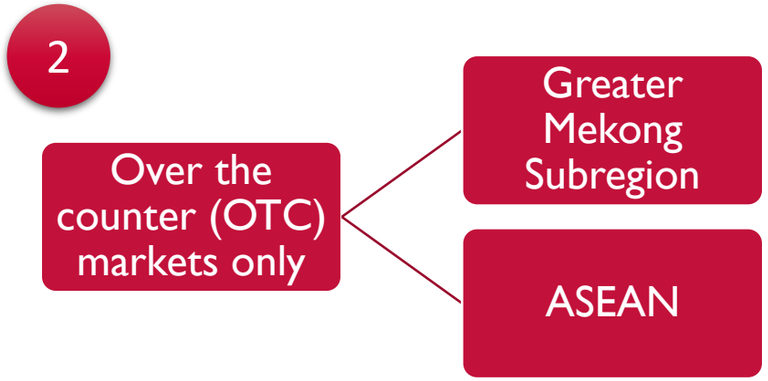
Regions reviewed to learn experience and lessons for transition to trilateral and multilateral power trade

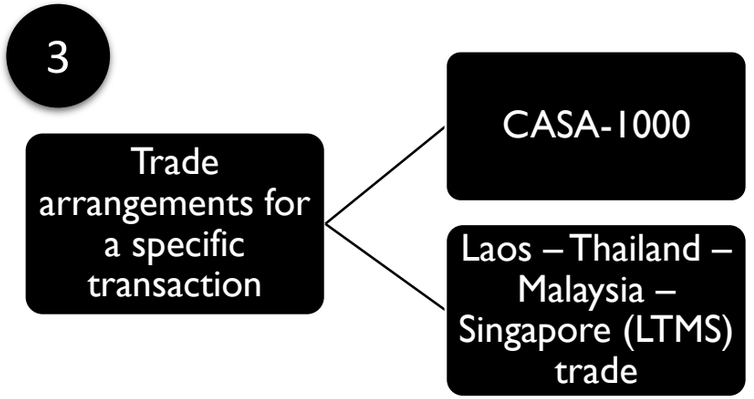


Note: Maps are only indicative

Different Models of Power Trade







There are variations from the perspective of other parameters also:

- **Based on transmission line**: Separate regional line through multiple countries (GCC, Central America) vs the rest.
- **Based on participating entities**: Regions that allow participation of both buyers and sellers from private sector (European Union, Nord Pool, PJM, NEPOOL, NEM) vs regions that allow full fledged participation of only national power utilities (SAPP, Central America, ASEAN, GMS, CASA-1000, LTMS) [There will also be exceptions, such as export oriented IPPs being allowed to trade.]

South African Power Pool (SAPP)

Key drivers and enablers

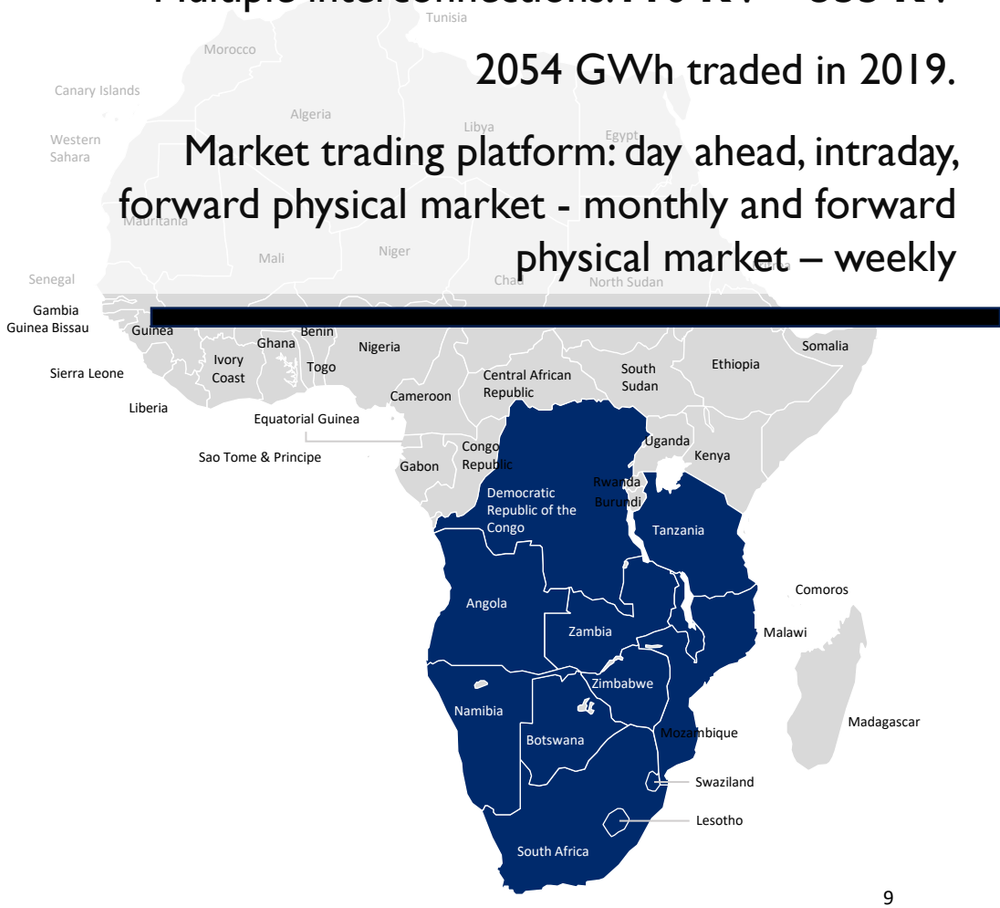
- Strong **IG support**, through Southern African Development Committee (SADC)
- **Resource complementarity** (South African thermal vs hydro in Zimbabwe, Zambia etc.)
- Many i**nterconnections** were developed even prior to SAPP
- Presence of Regional Electricity Regulators Association **(RERA)** and SAPP coordination center
- A well-established **regional regulatory framework**, recommended by RERA

9 countries

Multiple interconnections: **110 KV – 533 KV**

2054 GWh traded in 2019.

Market trading platform: day ahead, intraday, forward physical market - monthly and forward physical market – weekly



Key technical and commercial framework

- Wheeling path is reserved in advance for each transaction.
- Wheeling charges determined centrally by the SAPP, using transaction based load flow analysis, and cost of assets used for wheeling of power.
- Frequency based deviation settlement mechanism, based on marginal generation cost and average generation cost.

Central American Interconnection

Key drivers and enablers

- Political will of the countries to enter into **MARCO treaty** for Regional Energy Market (MER);
- Availability of interconnection, running through all the member states, managed by a **separate entity (EOR – Transmission Operator)**;
- Institutional framework for regional market, through **CRIE (Regulator)**, **EOR**, and EPR (Transmission line developer);
- Well defined **Regional Energy Market Regulations** of CRIE; and
- Surpluses/deficits of respective countries.

Key technical and commercial framework

- Company for development of transmission line (EPR) formed by Government utilities of participating countries, along with utilities in Colombia, Mexico and Spain.
- Uses the concept of "Transmission Right" which gives the holder of the same, the right to use the network.
- Regional transmission rates determined by regional regulator (CRIE).

6 countries

230 KV, **1790** KM line

Supports trade of up to **300** MW

Bilateral medium/long term trades, and trade through a short-term opportunity market.

Gulf Cooperation Council (GCC) interconnection

Key drivers and enablers

- Availability of GCC **interconnection** running through all the member states, managed by a separate entity (**GCCIA**);
- **Political will** of GCC member states for cooperation in electricity;
- Well established track record for **reserve sharing and emergency support** in the initial years, which thereby enabled further transition to scheduled energy trades; and
- Commencement of operation of trading system (**Power Exchange**) for GCC power market.

6 countries

400 KV, **1200** KM line

Supports trade of **400 – 1200 MW** depending on the country

Day Ahead Continuous and Intra-Day Continuous Market.

Also supports reserve sharing and emergency support.

Key technical and commercial framework

- GCC interconnection – countries sharing the costs in proportion to the present value of reserve capacity savings.
- Transmission prices are approved by the Advisory and Regulatory Committee.
- General Agreement and Power Exchange and Trading Agreement (PETA).
- GCCIA Market Procedures and GCCIA Exchange Market Terms and Conditions.

European Union Common Market for Electricity

Key drivers and enablers

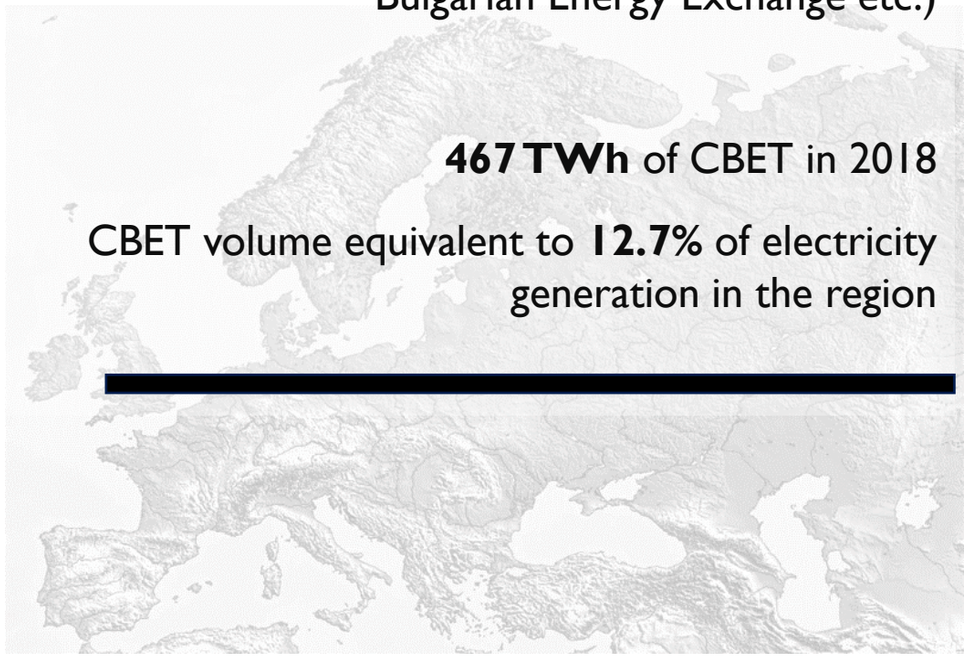
- A long history of regional energy cooperation, supported by EU's vision for regional cooperation;
- The existence of regional bodies such as **ACER** and **ENTSO-E** for coordinated development of regional frameworks and documents such as the network codes;
- Issuance and updating of **'Energy Package' legislations** /directives of the European Commission;
- Development of competitive markets and **power exchanges** within countries and sub-regions of EU.

Key technical and commercial framework

- **European Commission regulations and directives**
- **ENTSO-E network codes**, approved by ACER
- **Projects of Common Interest (PCI)** – Key cross border infrastructure projects, with a right to apply for funding from the Connecting Europe Facility (CEF).

27 countries

multiple regional markets (Central West Europe, Central Eastern Europe, Baltic market, Iberian market etc.) and power exchanges (European Power Exchange, Energy Exchange Austria, Independent Bulgarian Energy Exchange etc.)



467 TWh of CBET in 2018

CBET volume equivalent to **12.7%** of electricity generation in the region

Laos – Thailand – Malaysia – Singapore (LTMS) in ASEAN

Key drivers and enablers

- The decision to commence trade on existing available transmission capacity.
- Formation of LTMS Power Interconnection Project **(LTMS PIP) Working Group**.
- Signing of **IG MoU** in 2016, during 34th ASEAN Ministers of Energy Meeting.
- Payment based on actual energy delivered. Both buyer and seller can chose to reduce the quantum.

Key technical and commercial framework

- Trade undertaken through margins available in **existing transmission system**.
- **Energy Purchase and Wheeling Agreement (EPWA)** signed between utilities in Laos, Thailand and Malaysia – Medium term agreement, renewed every two years.
- **Wheeling charges** for use of Thailand's network paid by Laos, as per EPWA provisions.
- Extension to Singapore subject to Laos being able to meet the requirements of participation in Singapore's national power market.

Phase 1: 100 MW from Laos to Malaysia already operation since Jan 2018, with expansion to 300 MW planned.

Phase 2: Extension to Singapore planned.

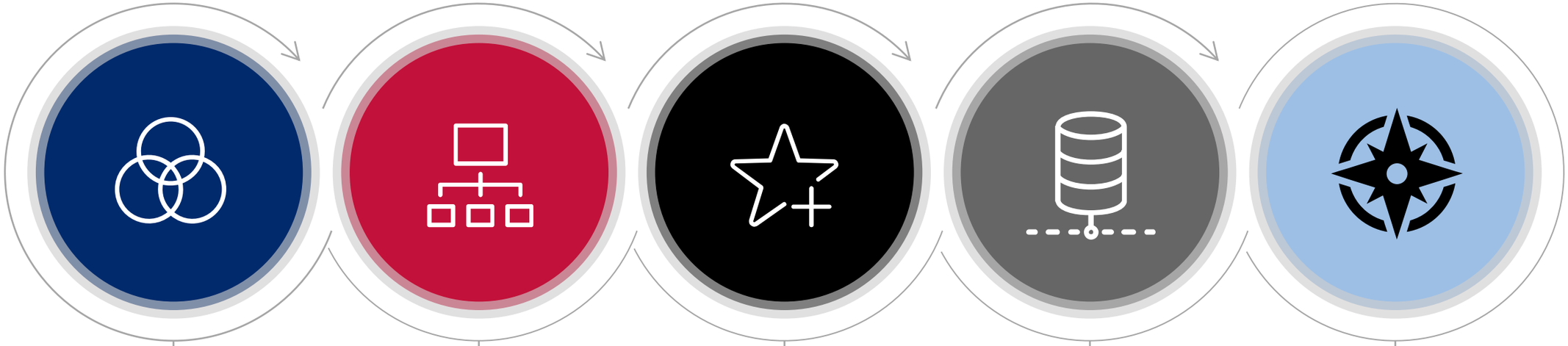
Institutional mechanisms

	SAPP	GCC	Central America	European Union	ASEAN
Inter-governmental coordination	Energy Ministers of SADC	GCC Ministerial Committee	Steering Committee of the Regional Electricity Market (CDMER)	European Commission	ASEAN Ministers on Energy Meeting
Regional regulatory mechanisms	Regional Electricity Regulators Association of Southern Africa (RERA)	Advisory and Regulatory Committee (ARC)	Comisión Regional de Interconexión Eléctrica (CRIE)	Agency for the Cooperation of Energy Regulators (ACER)	HAPUA working group on policy and commercial development
Regional technical mechanisms	SAPP Coordination Centre	GCC Interconnection Authority (GCCIA)	Ente Operador Regional (EOR)	European network of transmission system operators for electricity (ENTSO-E)	Head of ASEAN Power Utilities (HAPUA) and ASEAN Power Grid Consultative Committee (APGCC)
Other key institutions	Southern African Development Community (SADC)	GCC Supreme Council	Empresa Propietaria de la Red (EPR)		ASEAN Center for Energy

Regional institutional mechanisms play a key role in trilateral and multilateral power markets.

Key ingredients to enable trilateral/multilateral power trade

Based on the review of various international examples of trilateral/multilateral power trade, the following enabling ingredients can be identified.



Strong political support, to undertake regional cooperation expressed through implementation of binding treaty, and the follow-on activities

Dedicated institutional frameworks for regulatory coordination and harmonization

Permanent and well-equipped regional institution for operational and commercial coordination

Availability of a market platform such as power exchange to support multilateral power trade

Availability of regional master plans on energy cooperation

Key areas for discussion

- **Since most of the power trade in South Asia is bilateral, this unlocks only a limited trading regime. However, the regional power trade market is expected to transition to a trilateral model, with a third country offering wheeling facilities for the buyer and seller countries, who are otherwise not directly interconnected.**

- **Considering this, the following key questions emerge:**

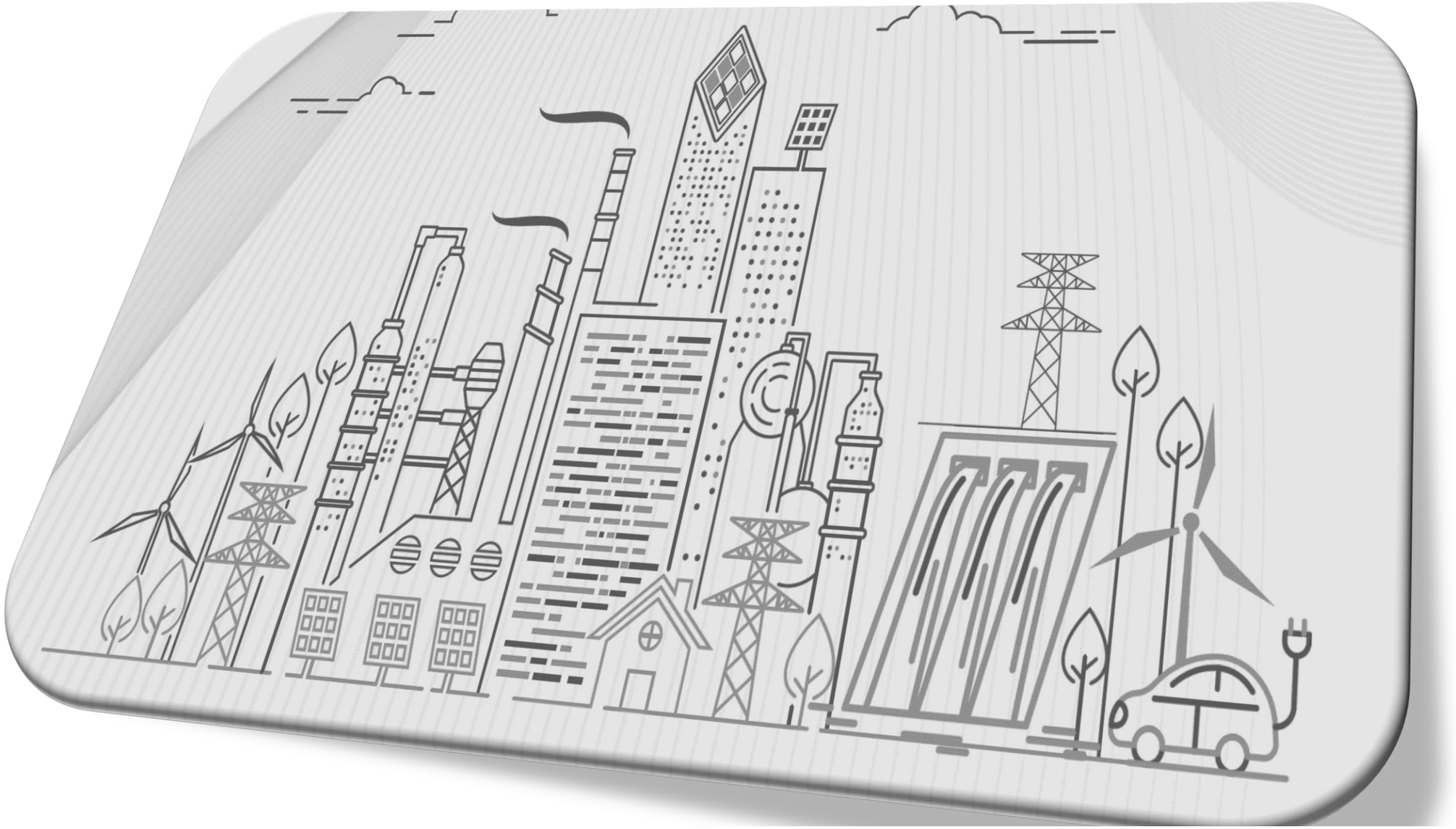
  - What type of inter-governmental agreements will need to be set in place to support the trilateral / multilateral power trade? Or will the implementation of existing IG agreements will be adequate?

  - Will South Asia require regional forums / new entities to support the development of trilateral/ multilateral power trade?

  - What model can South Asia follow for transmission investments and their cost recovery (tariff) mechanisms for trilateral and multilateral power trade?

  - Will the availability of access to a market platform such as power exchange support multilateral power trade?

Thank You



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For more information, please visit the SARI/EI project website: https://sari-energy.org/

Key enabling provisions for power exchanges and CBET

Guidelines for Import / Export of Electricity 2018

3.1

.....Provided that in case of tripartite agreements, the cross border trade of electricity across India shall be allowed under the overall framework of bilateral agreements signed between Government of India and the Government of respective neighbouring country(ies) of the participating Entity(ies).

5.3 *Any Indian power trader may, after obtaining approval from the Designated Authority, trade in Indian Power Exchanges on behalf of any Entity of neighbouring country, for specified quantum as provided in the Approval and complying with CERC Regulations.*

8.6 *Where tripartite agreement is signed for transaction across India, the participating entities shall sign transmission agreement with Central Transmission Utility of India for obtaining the transmission corridor access. Further the transmission system in India for transmission of electricity across the territory of India under cross border trade of electricity shall be built after concurrence from Government of India and necessary Regulatory approvals.*

CERC (Cross Border Trade of Electricity) Regulations, 2019

3. (2)

Provided that in case of tripartite agreements, the cross border trade of electricity across India shall be allowed under the overall framework of bilateral agreements signed between Government of India and the Governments of the respective neighbouring countries of the Participating Entities.

8.6 *Where tripartite agreement is signed for transaction across India, the participating entities shall sign transmission agreement with Central Transmission Utility of India for obtaining the transmission corridor access. Further the transmission system in India for transmission of electricity across the territory of India under cross border trade of electricity shall be built after concurrence from Government of India and necessary Regulatory approvals.*

5.3 *Any electricity trading licensee of India may, after obtaining approval from the Designated Authority, trade in the Indian Power Exchanges on behalf of any Participating Entity of neighboring country, for the specified quantum as provided in the Approval subject to compliance with the applicable Regulations of the Commission.*

Procedure for approval and facilitating Import/Export (Cross Border) of Electricity by the Designated Authority. February 2021

8.Transaction of electricity through Indian Grid under tripartite agreement

Annex-V (For approval of transaction of electricity through Indian Grid under tripartite agreement)

6.5 Eligibility of Applicant for Trading in Indian Power Exchange(s)

6.6 (Process for grant of approval for Trading in Indian Power Exchange(s)

Annex-III (For approval of participation in power exchange)