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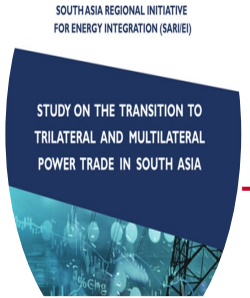
South Asia Regional Energy Partnership (SAREP)

Presentation

on

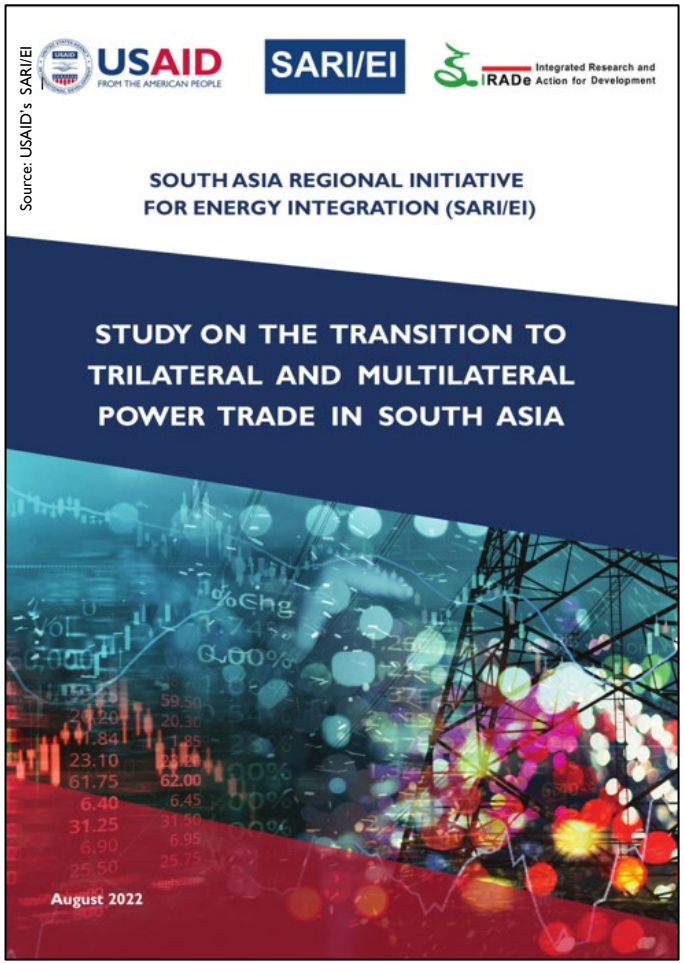
Study on the Transition to Trilateral and Multilateral Power Trade in South Asia



Working session 3: "Strategy for Transitioning gradually to Trilateral/Multilateral Power Trade and Development of Regional Power/Energy Market for Advancing Sustainable Energy"

SAFIR-SAREP Conference on "Deepening Cross Border Electricity Trade and Regional Electricity Market Development for Sustainable Energy in the South Asia Region", 2nd and 3rd March, 2023, Hotel Le Meridien, New Delhi, India

Presented by
Rajiv Ratna Panda
Power Market Specialist, SAREP



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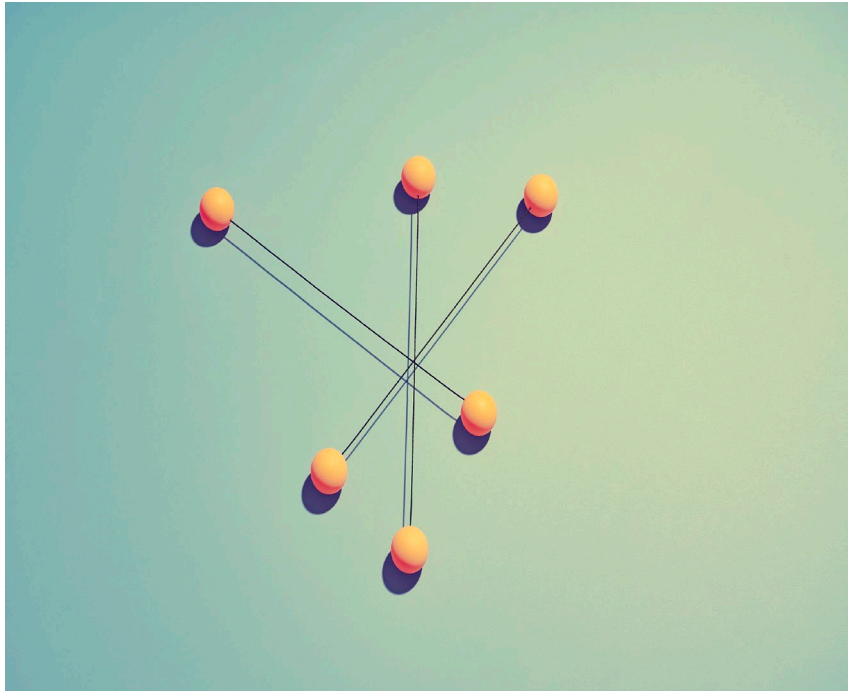
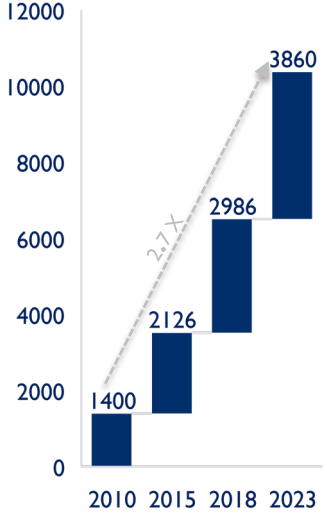
01 Overall Approach to the Study



01 Cross Border Electricity Trade (CBET) in South Asia : Current Scenario

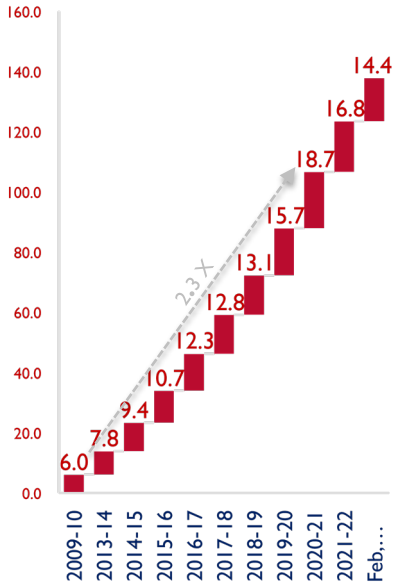
Bhutan-India ~2100 MW
India- Bangladesh ~1160 MW
Nepal-India ~ 600 MW

South Asia
CBET* (~ 3860 MW)



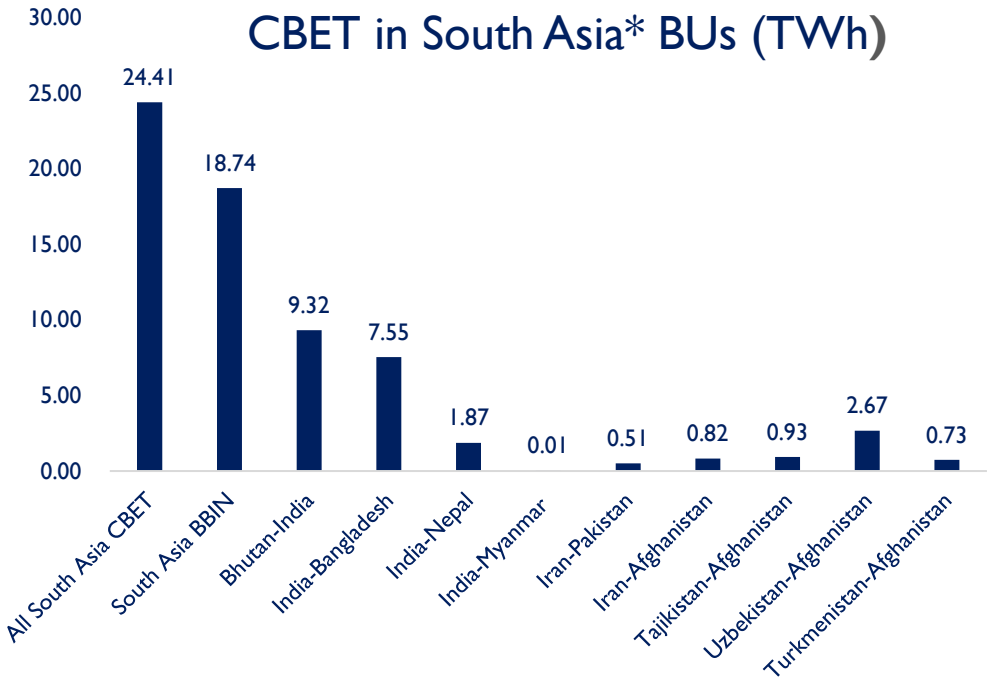
* ~ Maximum Peak Trade Data Source-CERC, POSOCO, NEA, MEA , NSB and Other Sources

South Asia (BBIN)
CBET BUs (TWH)



Data Source-CERC, POSOCO, MEA, NE, NSB etc. BUs-Billion Units

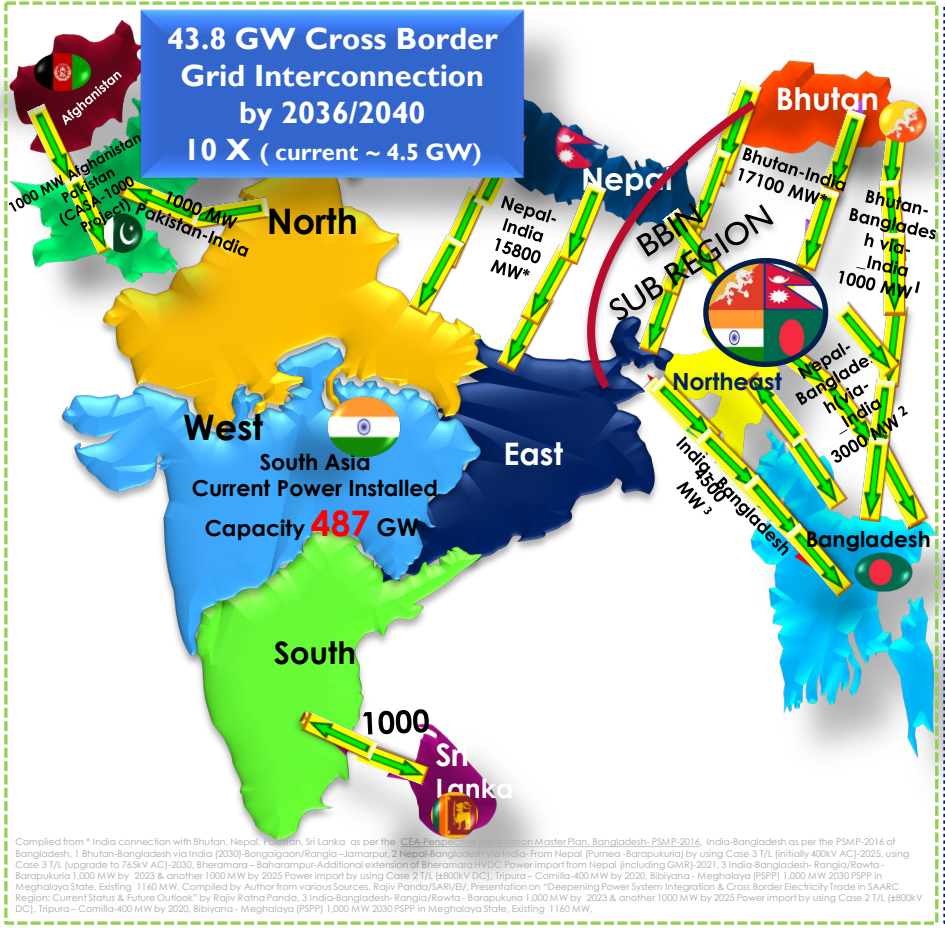
CBET in South Asia* BUs (TWh)



* BBIN & Trade with Neighbouring Region's Countries i.e. Afghanistan's CBET with Central Asian Countries and Iran, Pakistan's CBET with Iran, India's CBET with Myanmar
Data Source- Compile by Author from various Sources -CERC, POSOCO, NEPRA, Afghanistan Statistics , CBET-Cross Border Electricity Trade I BUs-Billion Units

CBET Doubled | Potential Remains Large | EUROPE > 240 TWh of CBET in 2021

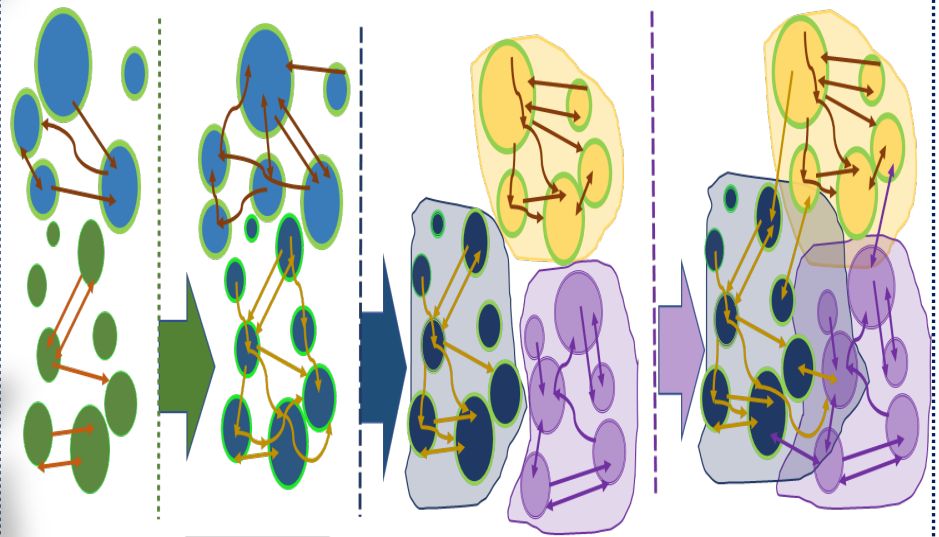
01 Cross Border Electricity Trade (CBET) in South Asia : Future Scenario



Complied from * India connection with Bhutan, Nepal, Pakistan, Sri Lanka as per the CEA-Prespective Transmission Master Plan, Bangladesh- PSMP-2016, India-Bangladesh as per the PSMP-2016 of Bangladesh, 1 Bhutan-Bangladesh via India (2030)-Bongaigaon/Rangia –Jamarpur, 2 Nepal-Bangladesh via India- From Nepal (Purnea -Barapukuria) by using Case 3 T/L (initially 400kV AC)-2025, using Case 3 T/L (upgrade to 765kV AC)-2030, Bheramara – Baharampur-Additional extension of Bheramara HVDC Power import from Nepal (including GMR)-2021, 3 India-Bangladesh- Rangia/Rowta - Barapukuria 1,000 MW by 2023 & another 1000 MW by 2025 Power import by using Case 2 T/L (±800kV DC), Tripura – Comilla-400 MW by 2020, Bibiyana - Meghalaya (PSPP) 1,000 MW 2030 PSPP in Meghalaya State, Existing 1160 MW, Compiled by Author from various Sources. Rajiv Panda/SARI/EI/, Presentation on "Deepening Power System Integration & Cross Border Electricity Trade in SAARC Region: Current Status & Future Outlook" by Rajiv Ratna Panda, 3 India-Bangladesh- Rangia/Rowta - Barapukuria 1,000 MW by 2023 & another 1000 MW by 2025 Power import by using Case 2 T/L (±800kV DC), Tripura – Comilla-400 MW by 2020, Bibiyana - Meghalaya (PSPP) 1,000 MW 2030 PSPP in Meghalaya State, Existing 1160 MW.

Transition of Cross Border Electricity Grid Integration

Bilateral-Trilateral-Multilateral-Regional Electricity Market Development



Source: Conceptualised and developed by the Author

01 Power Market Diversity in South Asia

Power markets in South Asian countries other than India and Pakistan has not progressed a lot beyond allowing IPPs and competition in generation. However, the presence of power exchanges and power traders in India open up potential opportunities to support trilateral and multilateral trade.

Country	Removal of single buyer model	Wholesale competition (IPPs)	Open access to transmission	Separate system operator	Power traders (other than single buyer)	Power exchange/Market
Afghanistan		☑				
Bangladesh		☑		☑		
Bhutan		☑		☑		
India	☑	☑	☑	☑	☑	☑
Maldives		☑				
Nepal		☑			☑	
Pakistan	☑	☑	☑	☑	☑	☑
Sri Lanka		☑				

☑ Advance stage of launching market platform

01 Future Transition to Trilateral and Multilateral Power Trade

$2 billion ,1125 MW Dorjilung Project

Proposed Trilateral Project

Bangladesh will import 500 MW of electricity from 900 MW Upper Karnali Hydro Project in Nepal

(@ 7.72 cents/unit for 25 years##)

(Price Negotiation is Concluded, Discussion on transmission and other aspects is under consideration)

Bangladesh Master Plan# envisaged to import from Bhutan (1 GW) & Nepal (3 GW) through India

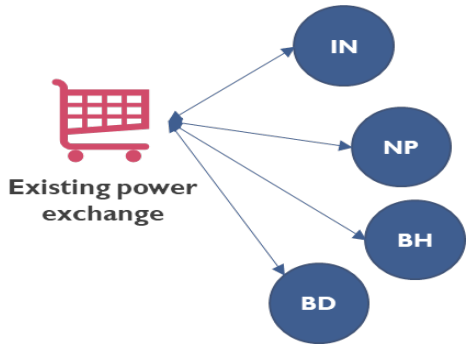
Power System Master plan 2016 (Final)- https://powerdivision.gov.bd/site/page/f68eb32d-cc0b-483e-b047-13eb81da6820/Power-System-Master-Plan-2016

https://kathmandupost.com/money/2020/02/09/bangladesh-issues-letter-of-intent-to-purchase-500-mw-from-upper-karnali-hydro-project

Potential Planned Trilateral Transactions

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

Multilateral transactions (existing or upcoming)

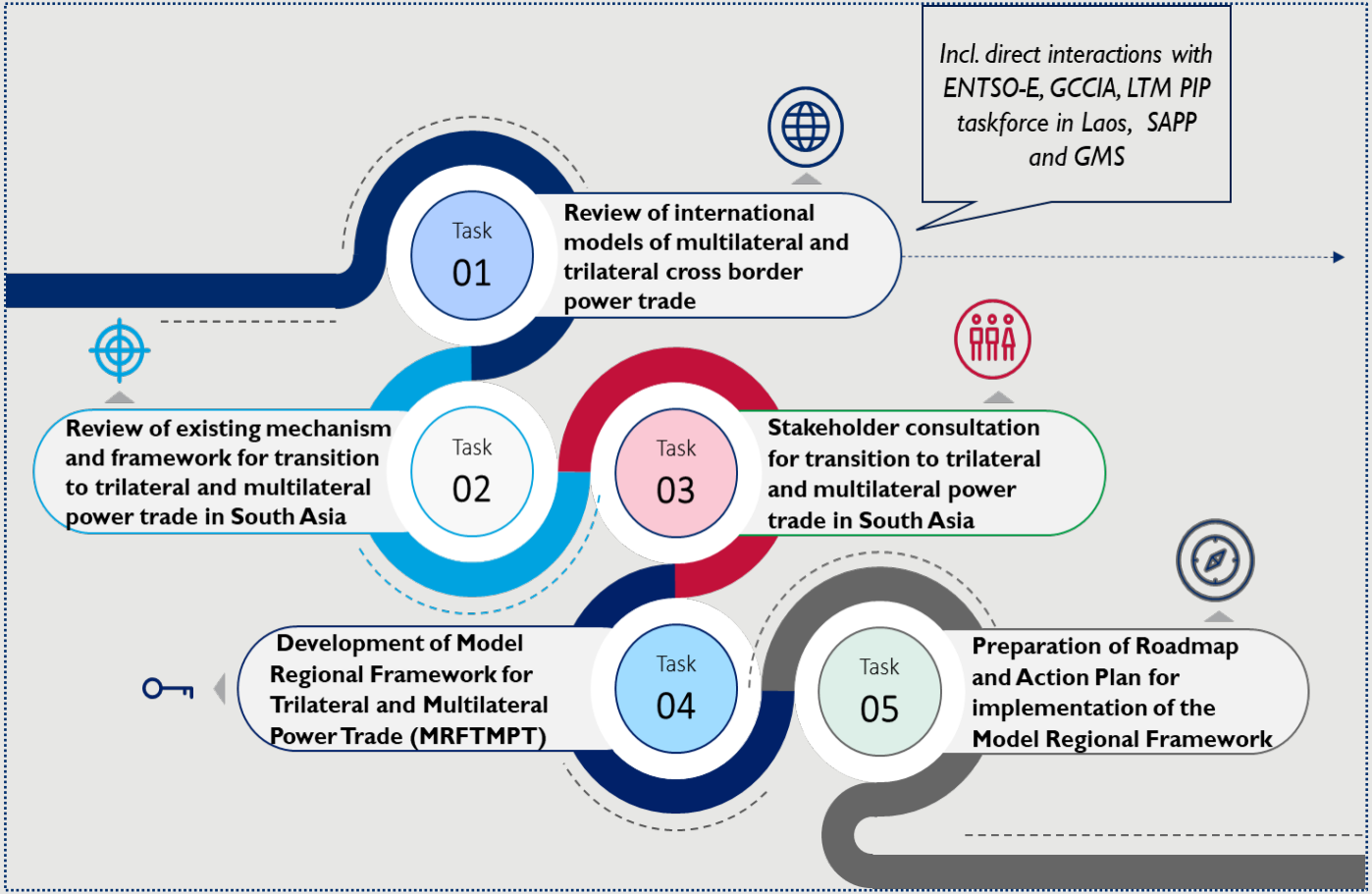


02

Overall Approach to the Study

02 Overall Approach to the Study

Study aimed to learn from **international experience in trilateral and multilateral power trade** and **use such learnings towards the development of a model regional framework to facilitate transition** towards **trilateral and multilateral power trade in South Asia.**



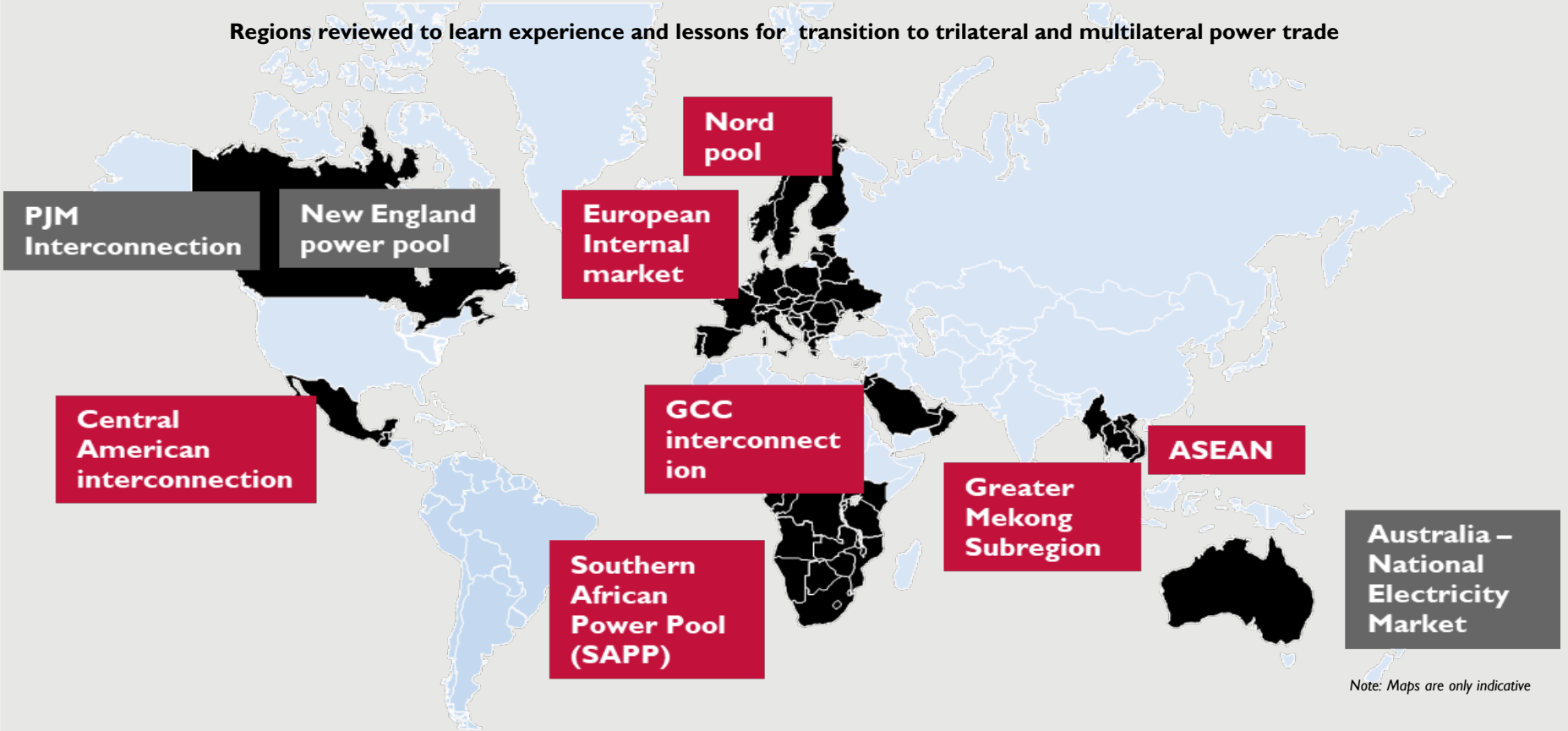
03

Key Learnings from Review of International Experience and Present Scenario in South Asia

03

Review of International Experience on Transition to Trilateral/Multilateral Trade (1/3)

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



Note: Maps are only indicative

03 Institutional Mechanisms (2/3)

	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)	Regional Security Coordination Initiatives (RSCI)	ASEAN Center for Energy

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

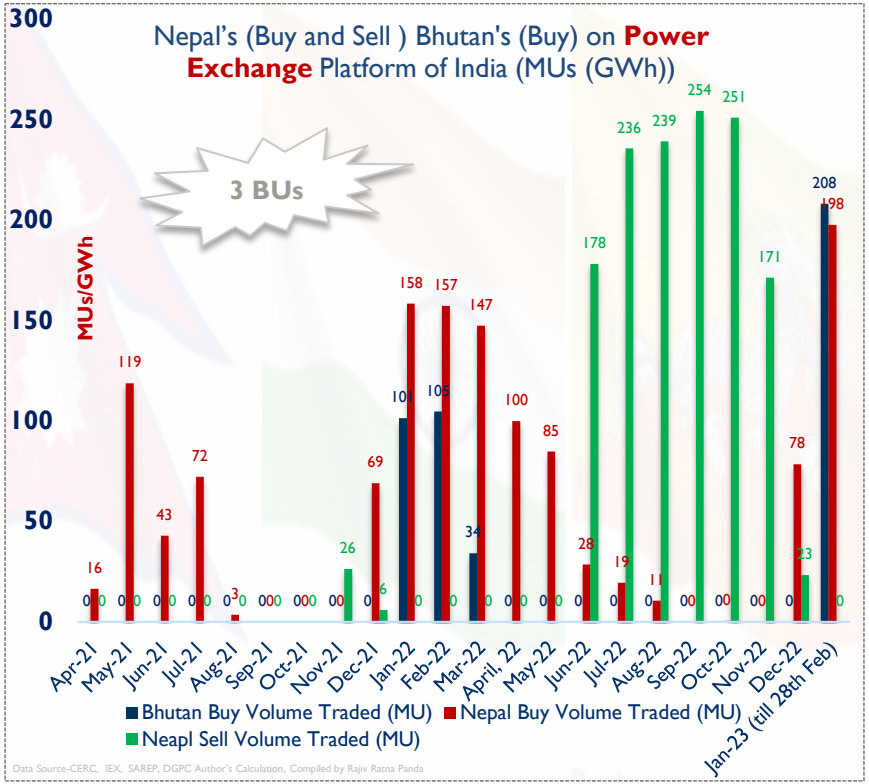
03 Review of International Experience (3/3)

	SAPP	GCC	ASEAN	Central America	European Union
Cross border trade volume (GWh)	**8205** (2021)	**1098** (2021)	**49,000** (2022)	**3109** (2022)	**240,000** (2021)
Exchange trade (%)	18%	3%	Nil	29%	30%*
Bilateral/OTC trade (%)	82%	97%	100%	71%	70%
Type of trade products	Day ahead, intraday, forward physical market - monthly and weekly	Capacity market, spinning reserves and energy market	PPAs	Firm Contracts, Non-Firm Financial Contracts, Opportunity Market	Day ahead, intra-day, forward and balancing products
Wheeling charge mechanism	Transaction based identification of asset usage and charges	A fixed amount set by GCCIA per MWh	Negotiated bilaterally/Trilaterally Energy Purchase and Wheeling Agreement (EPWA)	Variable Transmission Charge (CVT), the Toll and the Supplementary Charge, determined by CRIE	Country wise transmission pricing along with Inter TSO compensation mechanism
Deviation settlement	Linked to frequency and pool generation costs	Settled in kind (<25 MW) or in cash (>25 MW) on weekly basis	As per PPA terms	Linked to average hourly price determined for the market	Managed by TSOs through procurement of balancing energy

Source: Complied from Various Sources, SAPP, GCC, ASEAN, CIRE, EU quarterly electricity market reports, * Overall Europe, (value not only for CBET)

03

Market (Power Exchange) form of CBET (South Asia) & Multilateral CBET (South–East Asia): A Beginning of a New Renaissance



Nepal has earned over Nepalese Rs 11 billion (6.87 billion INR) by selling excess power to India from early June 2022 through December 2022

January 1 and March 16 , 2022, Bhutan imported 240MU of electricity from India through the energy exchange at a cost of Nu 798 M.

Lao PDR, Thailand, Malaysia, Singapore (LTMS) Multi Lateral Trade Project

Phase-I
100 MW
Trilateral
Lao-Thailand
Malaysia
32.8 GWh
traded between
2018-21

Phase-II
100 MW
Multilateral
Lao-Thailand
Malaysia-
Singapore
23 June 2022

Singapore-fully
liberalised
power market
4 GW import
Plan by Singapore

Energy Purchase
and Wheeling
Agreement
(EPWA)

03 Key Learnings for South Asia from Review of International Examples

Political and Intergovernmental Support	Signing of follow-on protocols to already signed agreements instead of signing of a new regional agreement
Legal, Policy and Regulatory Frameworks for CBET	A common framework / guideline for legal, policy and regulatory matters without affecting the independence and rights of national institutions.
Technical Guidelines, Operating guidelines & Standards etc.	Regional planning documents, and common operational procedures/ guidelines for system operators.
Commercial Framework	Power market platforms as a facilitator of multilateral trade, Wheeling tariffs, energy accounting, deviation settlement etc.
Institutional Frameworks	Presence of permanent regional coordination bodies

04 Model Framework for Trilateral and Multilateral Power Trade in South Asia

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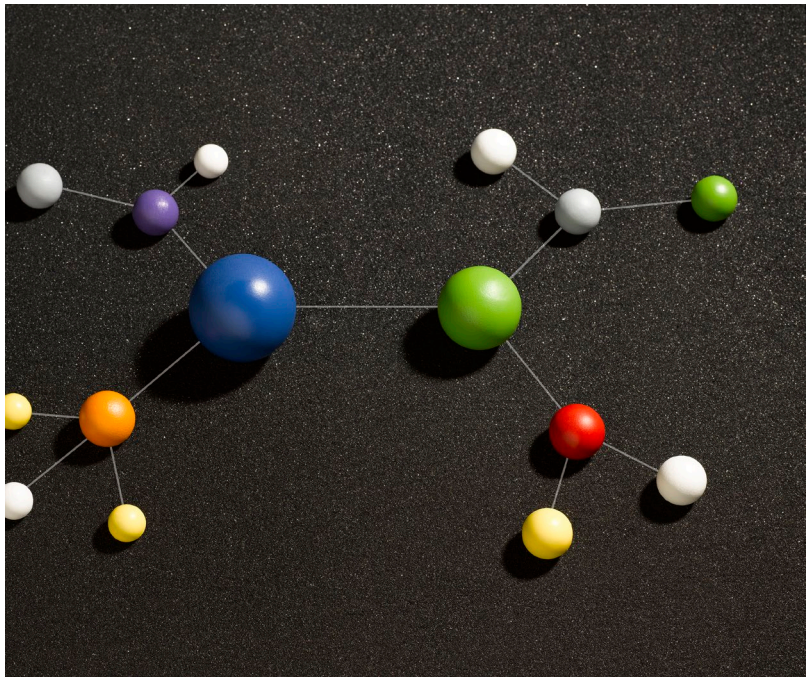
04 Model Framework for Trilateral and Multilateral Power Trade in South Asia



Components of Model Framework

1. Strategic and Political

Regional agreements/treaty/framework for energy cooperation

2. Legal, Policy and Regulatory

Common legal, policy and regulatory provisions that need to be set in place

3. Technical and Operational

Technical guidelines, operational planning and coordination

4. Commercial

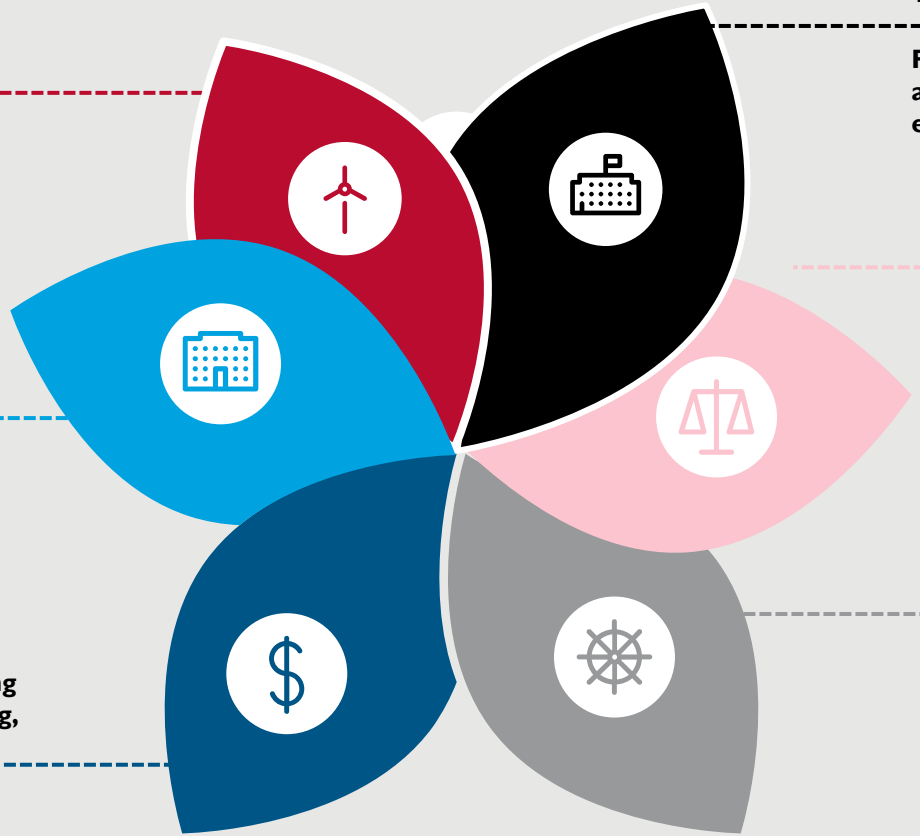
Market platforms, wheeling charges, congestion pricing, deviaiton pricing etc.

5. Institutional

Regional market platforms and dispute resolution

6. Sustainability

Promotion of clean energy in regional energy trade



Component 1: Strategic and Political

- Model regional framework as a template, which can be customized by each of the countries as per the need and depending on the existing frameworks if any
- Provides flexibility to governments on policy matters
- Does not rule out eventual expansion of existing regional agreements / signing of new agreements

SAARC Framework Agreement on Energy Cooperation (Electricity)

- Member States may enable cross-border trade of electricity on voluntary basis subject to laws, rules and regulations of the respective Member States and based on bilateral/trilateral/mutual agreements between the concerned states.
- Member States shall enable Buying and Selling Entities to engage in cross-border electricity trading subject to the laws and regulations of the concerned Member States.
- Member States may enable the transmission planning agencies of the Governments to plan the cross-border grid interconnections through bilateral/trilateral/mutual agreements between the concerned states based on the needs of the trade in the foreseeable future through studies and sharing technical information required for the same.
- Member States may enable the respective transmission agencies to build, own, operate and maintain the associated transmission system of cross-border interconnection falling within respective national boundaries and/or interconnect at mutually agreed locations.

Component 2: Legal, Policy and Regulatory

Define Key Institutional Framework	▪ Countries to designate Approving Authority, Regulatory Authority, System Operator, Transmission Planning Agency, National Transmission Utility, Settlement Nodal Agency.
Define Nature of CBET Approval	▪ Type of approval, duration, one-time or recurring etc.
Eligibility for Approval	▪ Eligibility for entities within and outside country. ▪ Identify market intermediaries who may be allowed to participate.
Process	▪ Process for approval of cross-border electricity trade and cross-border interconnections. ▪ Open access approval procedures.
Transmission Pricing and Cost Recovery	▪ Transmission pricing and cost recovery for cross border transmission lines.
Transit	▪ Approval in transit countries.

Component 3: Technical and Operational

Regional Transmission Plan

- Cross border transmission plans for each country may be discussed and harmonized to arrive at a regional transmission plan.
- Development of such plans may be coordinated by the national transmission utilities.

Regional Operational Procedure

- The existing agreed-upon bilateral operational procedures and guidelines developed under intergovernmental mechanisms may be consolidated to develop the regional operational procedures including common minimum grid codes.
- The development of such plans may be coordinated by the regulators/national system operators.

Harmonized Grid Codes

- Overall compliance with the "Common Minimum Grid Code Template".

Component 4: Commercial

Market Platform and Products	▪ Countries to allow entities in other countries also to participate in the power exchange market, through market intermediaries. ▪ Regional power exchange / market coupling to be explored in long term.
Wheeling Fees for Transit	▪ Domestic component – For wheeling within country : To be decided by regulatory. It may be ensured that such charges are not lesser than similar transactions if undertaken entirely within the country. ▪ Regional component – Charge for use of cross border networks: regulator approved or negotiated.
Financing and Cost Recovery of Regional Transmission Lines	▪ To be dealt at intergovernmental level.
Congestion Management	▪ To be managed by respective system operators within each country.
Deviation Pricing	▪ Allow countries to decide on the applicable deviation settlement mechanism for each such peripheries (for example: India-Nepal, India-Bhutan etc.), rather than trying to impose a common mechanism.

Component 5: Institutional

Exchange & Consultations (Informal)

- Coordination and consultations at inter-utility and inter-regulator level
- Preferably by regional platforms/networks/forums such as South Asia Forum of Transmission Utilities (SAFTU), South Asia Forum of System Operators (SAFSO) and South Asia Forum of Electricity Market (SAFEM).

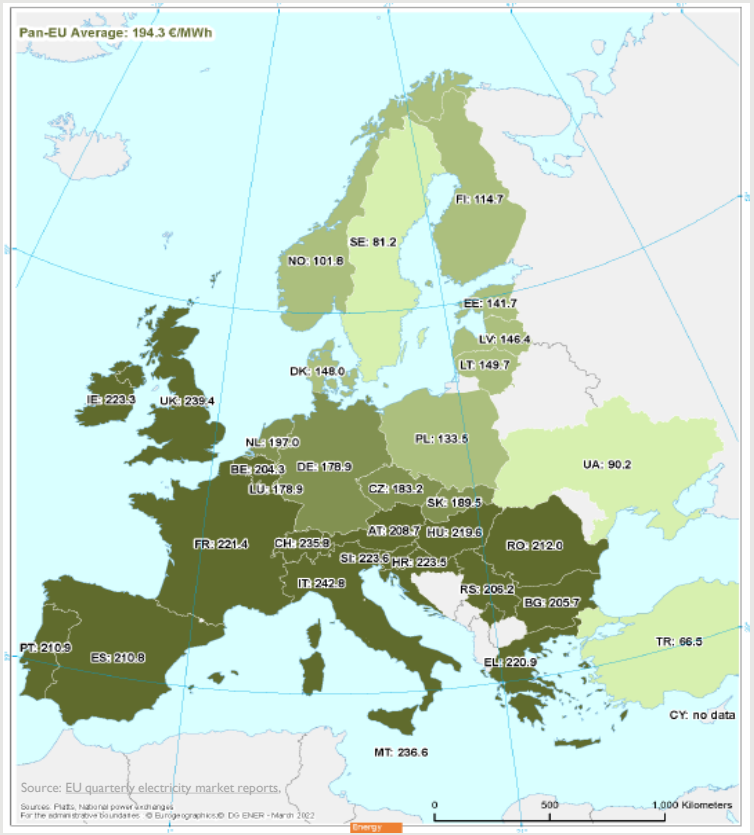
Consultations (Formal)

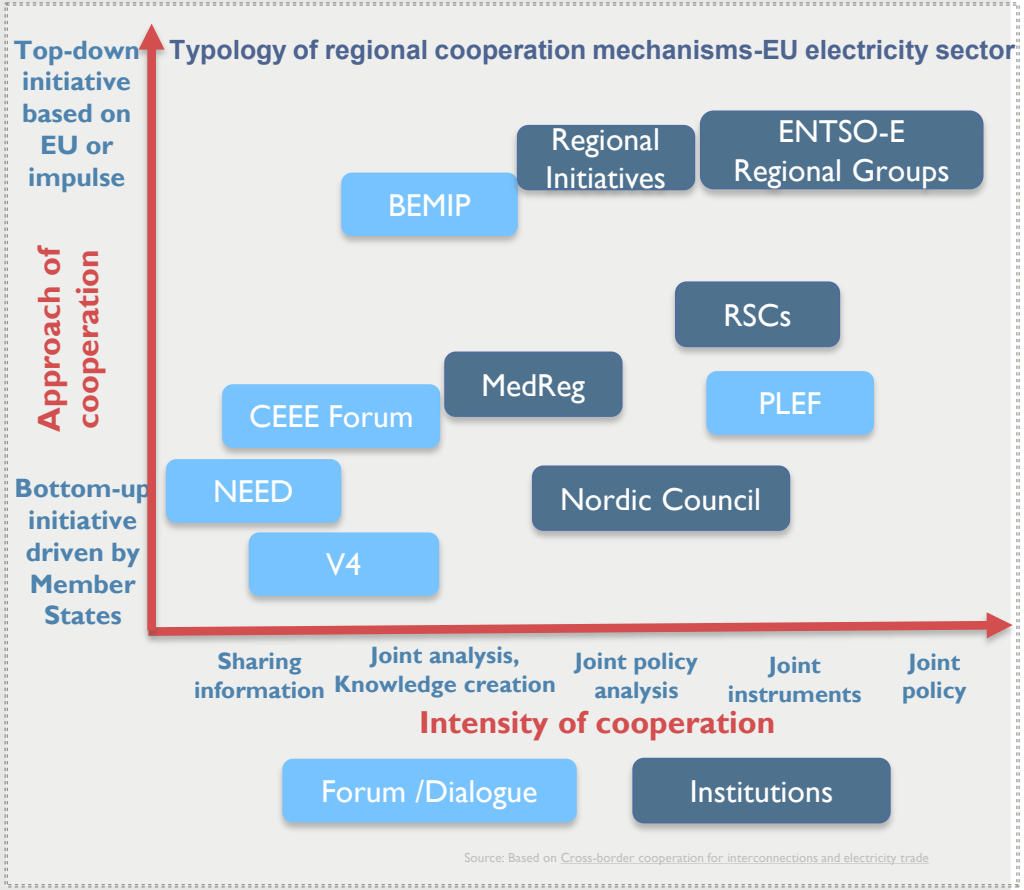
- Intergovernmental coordination mechanisms such as JSC, JWG and JTT

Dispute Resolution

- Agreement related – As provided under respective agreements / arbitration
- Intergovernmental – Discussed at JSC, JWG
- Commercial disputes where no procedure is specified in commercial documents – International arbitration (*Matters totally within country border to be decided by respective regulators)*

Regional Cooperation Approach





Component 6: Sustainability

Promotional Measures for Clean Energy

- Promotional measures to ensure level playing field for clean energy transactions in regional power trade.
- The promotional measures can be decided by the respective countries.
- Promotional measures subject to limitations on account of system security.

Reserve Sharing to Manage RE

- The countries may also consider arriving at a separate reserve sharing agreement, rather than each country building its own dedicated reserves to manage intermittent renewable energy.
- A commercial mechanism for such reserve sharing may also be determined, so that the country offering such reserves get compensated from the countries that utilize such reserves.

Thank You

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Disclaimer

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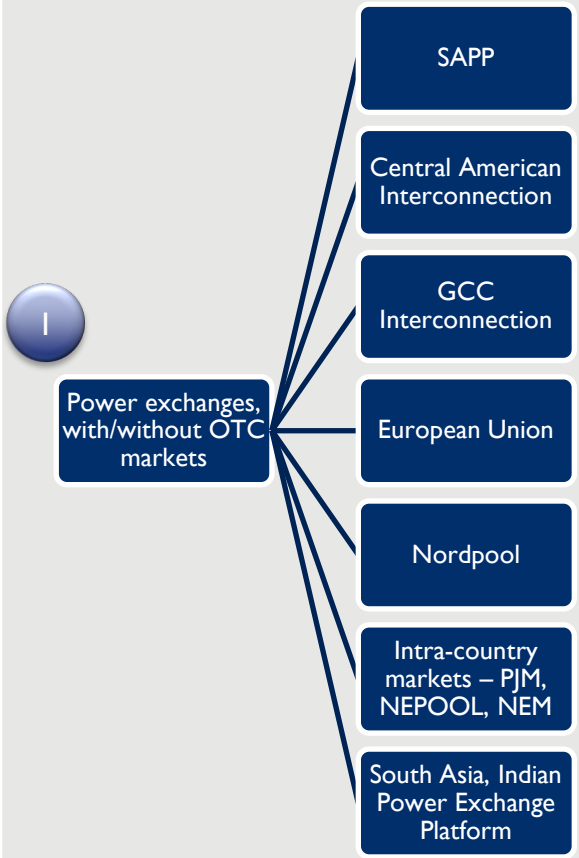
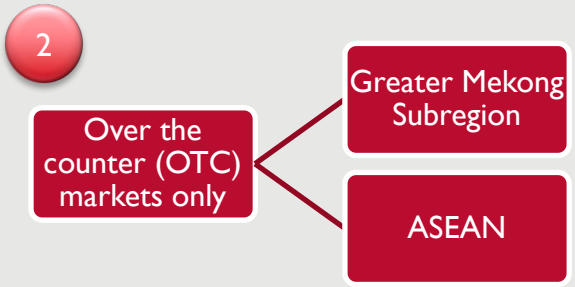
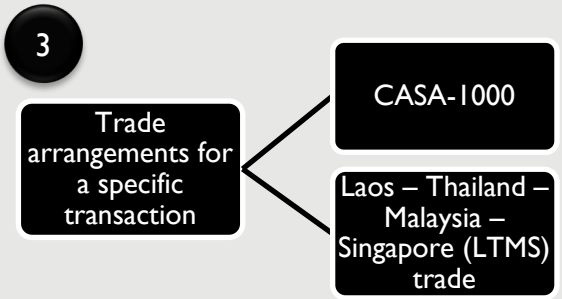
Back up Slides

Different models of power trade







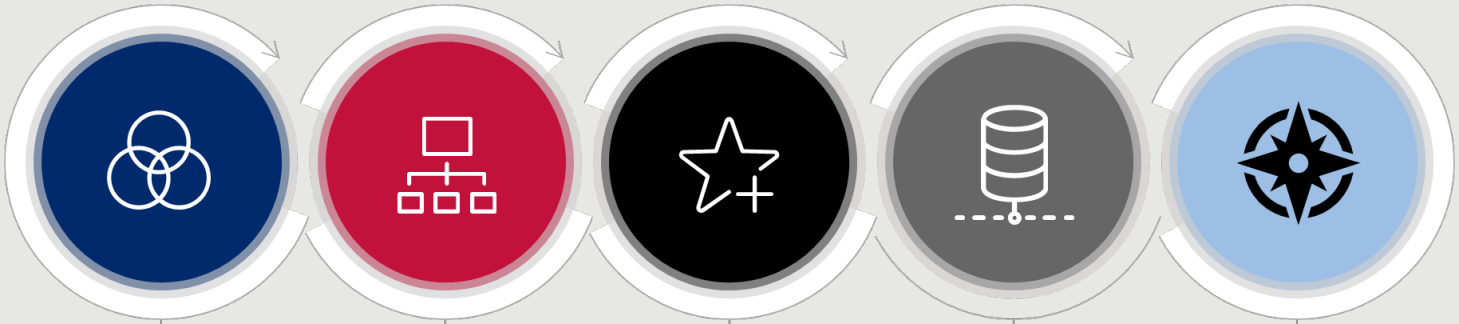
There are variations from the perspective of other parameters also:

- **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 the 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.]

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

Legal, policy and regulatory frameworks for CBET

Technical guidelines, operating guidelines, standards, etc.

Commercial framework – Wheeling tariffs, energy accounting, deviation settlement etc.

Dedicated institutional frameworks for coordination and harmonization

Key learnings from international examples

- In the international power pools/regions, strong political support in the form of an existing regional arrangement (SADC, GCC, ASEAN, GMS) and/or an intergovernmental agreement / MoU is seen as a common factor, creating the enabling conditions, and driving the CBTMPT.

Regional Institutions

	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
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Other key institutions	Southern African Development Community (SADC)	GCC Supreme Council	Empresa Propietaria de la Red (EPR)	Regional Security Coordination Initiatives (RSCI)	ASEAN Center for Energy

- Most of the international power pools/ regions are supported by an Inter-governmental agreement/ MoU and a set of detailed agreements/ procedures/ guidelines/ rules that govern the power trade.
- All the international/regional power pools can be found to have some form of regional-level coordination in planning and operations.
- Regional institutions form a key facilitator and driver of regional power trade.

Key learnings from international examples

- Most of the regions, which did not have a dedicated regional transmission infrastructure (thereby excluding models such as MER and GCCIA) can be seen to **have grown in phases in terms of market products and options.** For example:

  - ***GCCIA initially served as a mechanism to provide reliability and sharing of reserves. Power trade through an exchange platform was initiated in the pilot phase only after multiple years of operation.***

  - ***GMS has a clear roadmap for transitioning from bilateral to multilateral model in phases.***

  - ***ASEAN power market was initially under only bilateral model. Trilateral transactions started with the commencement of LTMS PIP in 2018.***

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

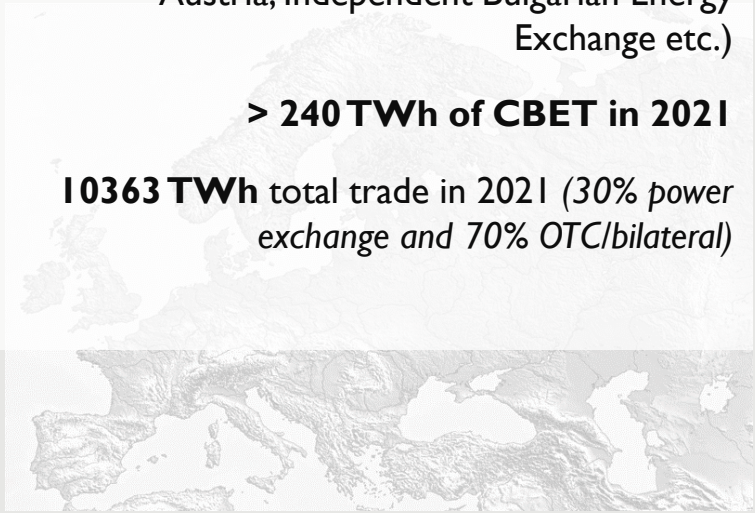
- **European Commission regulations and directives**
- **ENTSO-E network codes**, approved by ACER
- **Projects of Common Interest (PCI)** – Key cross border infrastructure projects, with a right to apply for funding from the Connecting Europe Facility (CEF).

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.)

> 240 TWh of CBET in 2021

10363 TWh total trade in 2021 *(30% power exchange and 70% OTC/bilateral)*



European Union Common Market for Electricity

Seven Regional Markets within EU:

- Central Western Europe (Austria, Belgium, France, Germany, Luxembourg, the Nether-lands, Switzerland)
- British Isles (GB, Ireland)
- Northern Europe (Denmark, Estonia, Finland, Latvia, Lithuania, Sweden, Norway)
- Apennine Peninsula (Italy, Malta)
- Iberian Peninsula (Spain and Portugal)
- Central Eastern Europe (Czechia, Hungary, Poland, Romania, Slovakia, Slovenia)
- South Eastern Europe (Bulgaria, Croatia, Greece and Serbia)

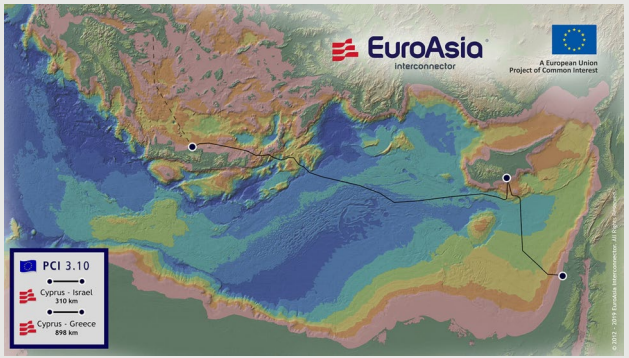
CBET also with countries outside the union, such as Ukraine, Belarus, Russia, and Morocco.

European Union Common Market for Electricity

Proposed expansion

- The EuroAsia Interconnector will start near Hadera in Israel and take the sub-sea route to Cyprus where it will connect at the Kofinou station. From there it will head west and take a sub-sea route to Korakia point in Crete, Greece.

- The EuroAsia interconnector is a Project of Common Interest (PCI) under the 5th Union List comprising a 1,200 km undersea cable from Israel to Crete via Cyprus. As a second phase, once the link to Crete is completed, an electricity link between Cyprus and Israel will be constructed.



- The first phase of the project, with total estimated construction costs of €1.57 billion, received a €657 million EU grant under the Connecting Europe Facility (CEF).

South African Power Pool

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

Key technical and commercial framework

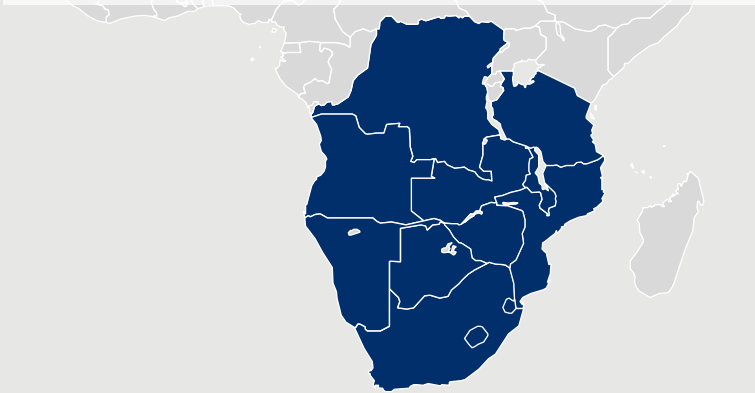
- Wheeling path is reserved in advance for each transaction.
- Wheeling charges determined centrally by the SAPP, using transaction based load flow analysis, and cost of assets used for wheeling of power.
- Frequency based deviation settlement mechanism, based on marginal generation cost and average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

9 countries

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

8205 GWh traded in 2021 *(18% competitive and remaining bilateral)*.

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



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.

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.

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.

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.

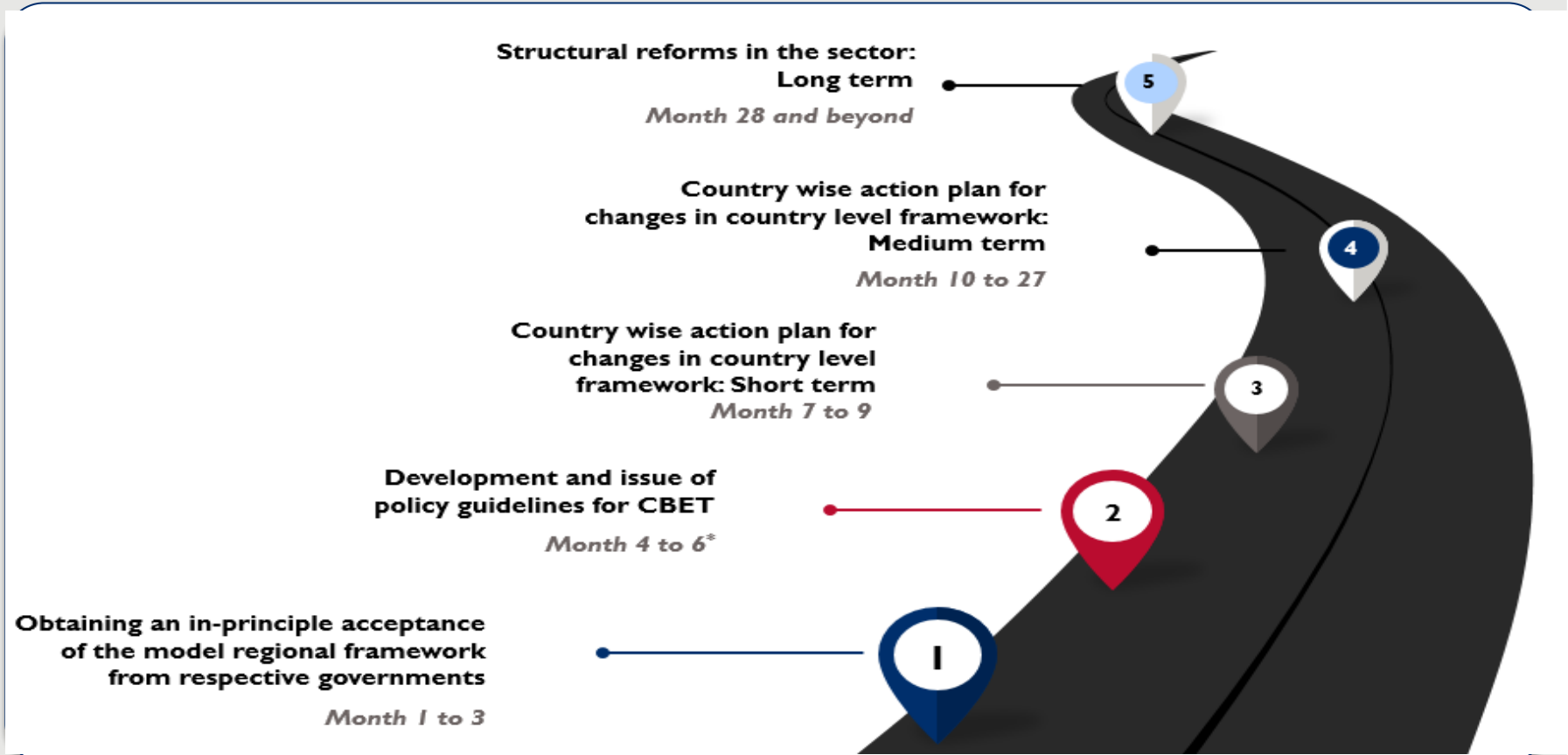
Key technical and commercial framework

- 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.

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 (currently 100 MW import commenced with existing line).

Implementation Plan (1/2)



Implementation Plan (2/2)

1. Preferable for the national transmission utilities and regulators to **seek an in-principle concurrence on the regional framework, from the respective governments**.

2. Once there is an in-principle acceptance of the framework, policy guidelines for CBET for the countries would be required to be developed and issued. Successful completion of these two activities would pave the way for implementation of country wise action plans, which have been divided into short term and medium term.

3. Based on the guideline document, some of the key regulatory, operational and commercial modifications required in the respective frameworks to support trilateral and multilateral trade, will have to be undertaken initially. These will mostly relate to amendments in existing documents, rather than the creation of a new document.

4. Post this, during the next 18 months (i.e., medium term) various relevant regulations and mechanisms (for example, transmission pricing) would be developed and issued to create the required regulatory framework for enabling and supporting CBET.

5. Thereafter, long term sectoral reforms can be focussed upon by the respective countries in the long term.

Country-wise summary of suggested actions in addition to adoption of model framework

Afghanistan

- Policy guidelines for CBET to be issued by Govt. of Afghanistan
- Grid code to be developed
- Transmission planning mechanism and operational procedures for CBET to be established through regulatory provisions
- Process for obtaining approval for access to the transmission grid, to undertake CBTMPT to be developed
- The Ministry of Energy and Water (MEW) may consider issuing a notification that will allow the utility, DABS, and the regulator to interact with other similar institutions in the region, so as to allow greater regional energy cooperation.
- While developing the transmission pricing methodology, the regulator may consider a kWh linked tariff (instead of KW), or a discounted tariff for solar power, due to its low utilization factor vis-à-vis other sources.
- Further, all clean energy sources, including hydro may be considered as must-run sources (except reservoir-based hydro).

Country-wise summary of suggested actions in addition to adoption of model framework

Bangladesh

- Policy guidelines for CBET to be issued by Govt. of Bangladesh.
- In order to deal with regional planning of transmission lines, and development of regional operational procedures, amendments in chapter 4 (transmission planning) and chapter 7 (scheduling and dispatch) may be considered in BERC (Electricity Grid Code) Regulations, 2019.
- Open access regulations to be prepared
- Transmission pricing to be extended to 400 KV voltage
- Mechanism for sharing of deviation settlement mechanism charges on account of CBTMPT transactions, to be specified by BERC
- The Ministry of Power, Energy and Mineral Resources may consider issuing a notification that will allow the utilities, BPDB and PGCB, and the regulator to interact with other similar institutions in the region, so as to allow greater regional energy cooperation.
- All clean energy sources, including hydro may be considered as must-run (except reservoir-based hydro).

Country-wise summary of suggested actions in addition to adoption of model framework

Bhutan

- Policy guidelines for CBET to be issued by Govt. of Bhutan
- Open access regulations to be prepared to define procedure to obtain access to the transmission grid for undertaking cross border electricity trade.
- Mechanism for sharing of deviation settlement mechanism charges on account of CBTMPT transactions, to be specified by BEA.
- The Ministry of Economic Affairs may consider issuing a notification that will allow DHPS, and the utilities, BPC and BPSO, and the regulator to interact with other similar institutions in the region, so as to allow greater regional energy cooperation.
- All clean energy sources, including hydro may be considered as must-run (except reservoir-based hydro).

Country-wise summary of suggested actions in addition to adoption of model framework

India

- Possibility towards determining a separate transmission tariff for third party (third country) wheeling transactions can be explored.
- The Ministry of Power may consider supporting the institutional mechanism whereby the utilities in the power sector such as the system operator and the transmission utility etc. may interact with the counterpart utilities belonging to the other countries in the region, so as to allow sharing of best operational practices and promoting harmonization and excellence in the technical matters related to power system and transmission network.

Country-wise summary of suggested actions in addition to adoption of model framework

Nepal

- Electricity Act, 1992 to be amended for incorporating the provision associated with power trading and CBET.
- Policy guidelines for CBET to be issued by Govt. of Nepal
- Electricity Rules, 1993: Section 42 and 43 to be amended
- The utility may consider publishing revised master plan at least once in every three years. To that extent, amendments may be made in NEA's Grid Code, in chapter 3 (Grid planning).
- Open access directives to be issued by ERC
- Transmission pricing framework to be prepared by ERC
- Mechanism for sharing of deviation settlement charges on account of CBTMPT transactions, to be specified by ERC
- The regulator may specify the manner in which deviation charges billed by India on Nepal, are further distributed among entities within Nepal, if entities other than NEA are allowed to undertake CBET.
- The Ministry of Energy, Water Resources and Irrigation may consider issuing a notification that will allow the utilities, NEA, RPGCL, and the regulator to interact with other similar institutions in the region.
- For transmission, kWh linked tariff or a discounted tariff for solar power, to compensate for low utilization factor.
- All clean energy sources, including hydro may be considered as must-run (except reservoir-based hydro).

Country-wise summary of suggested actions in addition to adoption of model framework

Pakistan

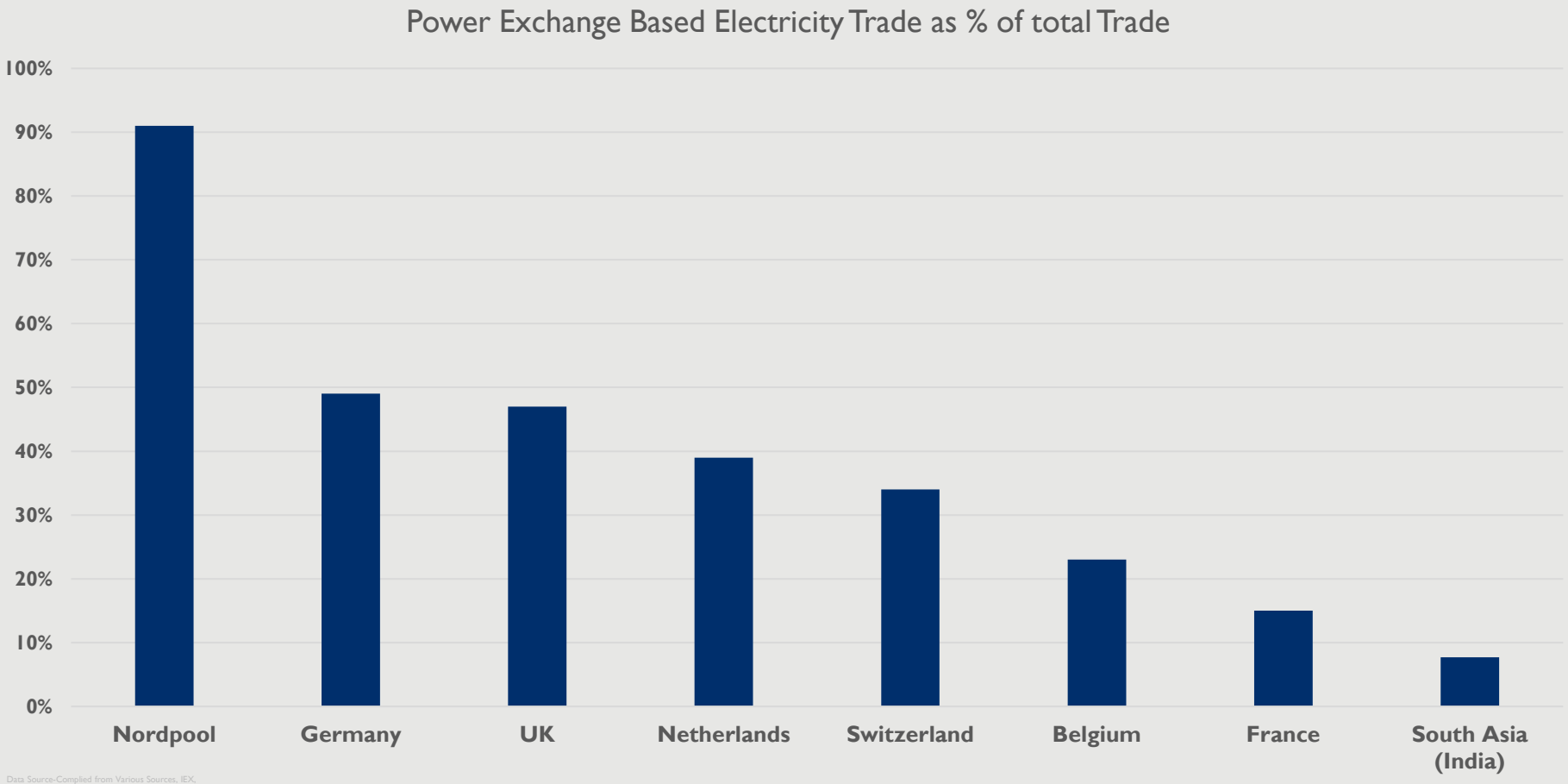
- Policy guidelines for CBET to be issued by Govt. of Pakistan
- NEPRA's Grid code regulations, 2005 to be amended (PC 4.2 - Procedure for Transmission System Expansion) to ensure that the revised Transmission System Expansion plan is published at least once in every three years; and to ensure that the plan is discussed with relevant neighboring countries.
- Open access for CBTMPT transactions to be clarified by NEPRA.
- Mechanism for sharing of deviation settlement mechanism charges on account of CBTMPT transactions, to be specified by NEPRA.
- The Ministry of Energy may consider issuing a notification that will allow WAPDA, Central Power Purchasing Agency – Guaranteed (CPPA-G), NTDC and the regulator (NEPRA) to interact with other similar institutions in the region, so as to allow greater regional energy cooperation.
- To promote clean energy sources with low capacity utilization/load factor as compared to thermal plants, the regulator may consider a purely kWh linked use of system charge (instead of KW), or a discounted use of system charge, for clean energy sources.
- All clean energy sources, including hydro may be considered as must-run (except reservoir-based hydro). This could be incorporated by amending the Scheduling and Dispatch code, of Grid Code, 2005.

Country-wise summary of suggested actions in addition to adoption of model framework

Sri Lanka

- Amend section 43 of Electricity Act, to enable Transmission Licensee to participate in CBET
- Policy guidelines for CBET to be issued by Govt. of Sri Lanka
- PUCSL's Grid code (2014) to be amended (Chapter 2, Grid Planning Code) to ensure that Transmission Development plan for CBET lines is discussed with relevant neighbouring countries.
- Open access regulations to be issued
- Mechanism for sharing of deviation settlement mechanism charges on account of CBTMPT transactions, to be specified by ERC.
- The Ministry of Power and Renewable Energy may consider issuing a notification that will allow CEB and the regulator (PUCSL) to interact with other similar institutions in the region, so as to allow greater regional energy cooperation.
- While developing the transmission pricing methodology, the regulator may consider a kWh linked tariff (instead of KW), or a discounted tariff for solar power, due to its low utilization factor vis-à-vis other sources.
- All clean energy sources, including hydro may be considered as must-run (except reservoir-based hydro). This could be incorporated by amending the Grid Code.

Power Exchange in EUROPE Power Exchange Based Electricity Trade as % of total Trade



Data Source-Complied from Various Sources, IEX.