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Session : Regulations for the Evolving Smart Energy Systems

Enhancing Regional Energy Cooperation in South Asia: Lessons from Success Stories and the Need for a Unified Regulatory Framework

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Enhancing Regional Energy Cooperation in South Asia



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Renewable Energy Potential

South Asia holds significant potential for renewable energy generation, particularly in solar, wind, and hydropower. Cross-border collaboration could enable countries to harness these resources more effectively.

Energy Access and Demand

Energy access remains a significant issue, with millions lacking reliable electricity. Demand is expected to triple by 2040, necessitating large-scale investments in infrastructure and renewable energy.

Infrastructure Challenges

South Asia's energy infrastructure is fragmented, with limited interconnection between countries' grids. Aging systems and differing regulations complicate cross-border energy trade.

The energy sector in South Asia faces increasing demand and supply challenges. Regional cooperation offers an opportunity to address these issues.

This presentation explores the current state of regional energy cooperation, drawing lessons from successful energy trade agreements and partnerships.

It emphasizes the necessity of a unified regulatory framework to facilitate seamless energy trade, enhance grid integration, and encourage investment in infrastructure.

By analyzing the regulatory and institutional barriers, this presentation advocates for a harmonized regulatory approach to improve energy security and support sustainable development across South Asia.

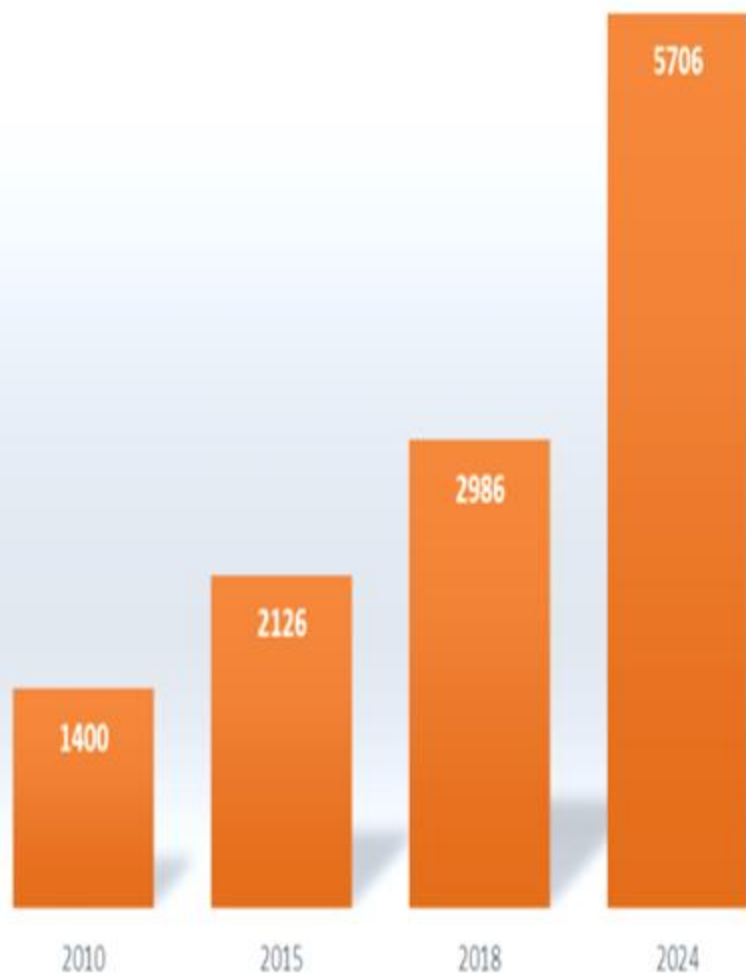
Energy Landscape in South Asia



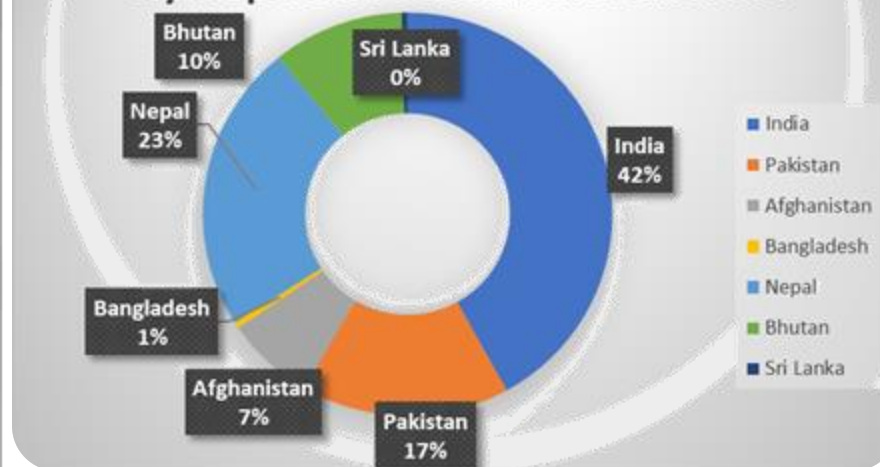
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Cross Border Electricity Trade in South Asia (MW)



Hydropower Potential in South Asia



CBET IN SOUTH ASIA IN BU (TWH)



Approximately 21 TWh of CBET happening in South Asia on an annual basis, aided by multiple high voltage interconnections, 132 kV and above. Substantial number of new cross border lines under planning / construction:

- 765 kV Katiyar (IN) Parbotipur (BD)
- 765 kV Katiyar (IN) Parbotipur (BD)
- 400 kV New Butwal (NP) Gorakhpur (IN)
- 400 kV Punatsangchu (BH) Lhamoizingkha (IN)
- 400 kV Arun III evacuation system (through Dhalkebar Sitamarhi)
- India Sri Lanka interconnection

Currently, the key decisions relating to cross border transmission lines in South Asia are taken up on a case-by-case basis.

Except in case of 400 kV Dhalkebar - Muzaffarpur line, and dedicated transmission line of Godda thermal power plant, the conventional Government owned model have been tried out for CB lines.

In comparison, across the globe, a wider variety of manner of developing CB lines can be observed, from which key learnings can be derived for South Asia.

Key findings



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Typical business models for CBET interconnections

	Public/Govt. ownership	Owned by Government or a Government owned/controlled entity	Across the globe
	Independent Power Transmission / Concessions	Line developed by a private entity under a Build-Own-Operate-Transfer (BOOT) or similar model of concession arrangement. Sometimes, the entity may also be a JV with some amount of Govt. ownership also.	Across the globe
	Merchant Power Transmission	Line developed without any long-term revenue assurance through long term contracts – Relies on short term markets and anchor customers for revenue generation.	USA, Australia etc. Example – Basslink in Australia
	Financial ownership	While line will be developed, constructed and operated by a state-owned transmission/system operator; a private entity to have partial ownership stake, and resulting dividend/share on profits.	Europe, Africa etc. Example – Denmark Germany interconnection
	Dedicated transmission line	Dedicated line for evacuation from a power plant, typically operated by entity owning the plant also. Cost towards transmission is typically bundled within the Power Purchase Agreement (PPA) price.	Across the globe

The CBET line ownership also have a geographic element to it – Whether there is separate legal entity and ownership for infrastructure in each of the countries through which the line passes, or whether there is a single entity that has ownership of the entire infrastructure.

Regional practices on business and ownership models for CB interconnections

	Predominant Models	Exceptions
South-East Asia	Govt./public ownership model and Dedicated Transmission	IPTC – 115 kV HVAC Cambodia Thailand Interconnection
Central Asia	Govt./public ownership model and Dedicated Transmission	
Middle East	Combination of Govt./public ownership model and IPTC model, which is a Joint Stock Company of the countries (GCC Interconnection)	
Africa	Govt./public ownership model	IPTC model (220 kV HVAC Zambia - DRC interconnector line and the Mozambique Transmission Company); Dedicated transmission - 533 kV HVDC Cahora Bassa Interconnector
Europe	All models are present	
North America	Govt./public ownership model and Merchant interconnections	Dedicated transmission – Twin Rivers Paper Company
Central and South America	Govt./public ownership model and JV based IPTC model	Dedicated transmission – Itaipu Binacional

Case studies of cross border transmission lines



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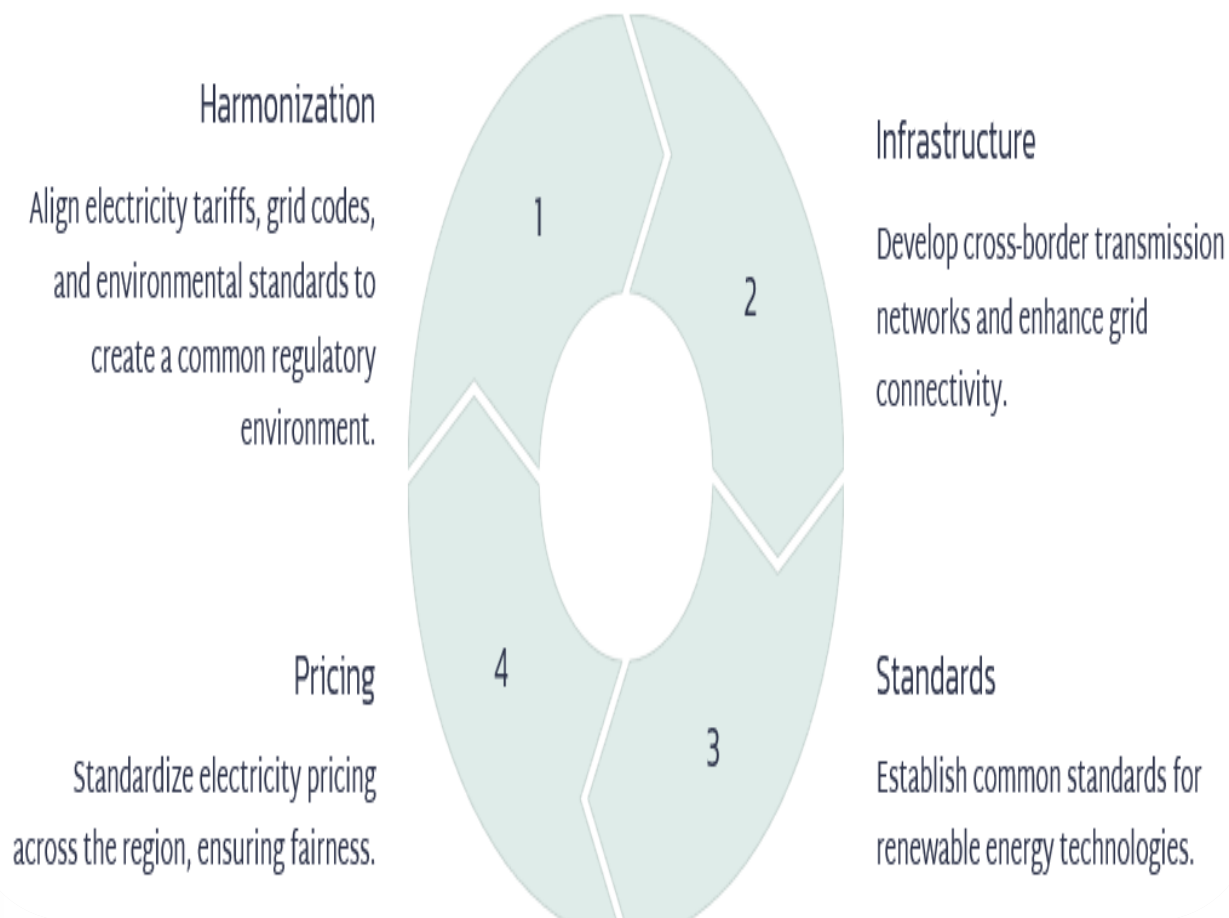
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Transmission Line	Type	Underlying arrangement	Investment entity structuring	Geographical nature	Any special features
Cambodia Thailand interconnection	HVAC	PPA	IPTC	Single Entity	ADB's first x-border private sector investment in Asia
Garabi interconnector (Argentina – Brazil)	HVDC	PPA	IPTC	Single Entity with country specific subsidiaries	
MOTRACO	HVAC	Wheeling Agreements and PPA	JV of Govt. utilities as IPTC	Single Entity	Mozal Aluminium as anchor customer
SIEPAC	HVAC	PPA and market	JV of Govt. utilities and private utilities as IPTC	Single Entity	Separate system operator and regulator
GCC interconnection project	HVAC	Multilateral Agreement	JV of Govt. utilities as IPTC	Single Entity (JV)	
NEMO LINK	HVDC	Auctions	JV of Govt. utilities as IPTC	Single Entity (JV)	Cap-and-Floor tariff regime + Auctions
Basslink Interconnector	HVDC	Market-based	Merchant	Single Entity	
Montana Alberta Tie Line (MATL)	HVAC	Market-Based	Merchant	Single Entity	
Ethiopia- Kenya Power interconnection	HVDC	Wheeling Agreements and PPA	Govt.	Govt. ownership within each border	

Challenges to Regional Energy Cooperation

- 1 Political Barriers**
Complex political relationships and tensions among countries create challenges for broader energy cooperation.
- 2 Regulatory Barriers**
The lack of standardized energy policies and regulations across South Asian countries is a major hurdle.
- 3 Infrastructure Limitations**
The region's energy infrastructure is underdeveloped, with outdated networks and limited interconnection.
- 4 Financial Constraints**
Countries face budgetary constraints, hindering investments in energy infrastructure.

The Need for a Unified Regulatory Framework



KEY TAKEAWAYS / RECOMMENDATIONS (1)



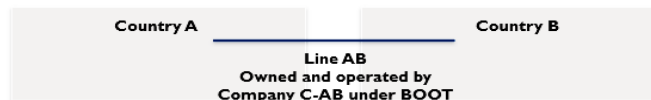
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1. Structuring of line ownership across borders:

There are models that can be adopted beyond the existing border-based approach

Proposed Solution



- Company C-AB can be JV of transmission utilities of A and B; or an entirely private third party.
- If legal provisions prevent foreign incorporated entities from operating, Company C-AB can set up fully owned subsidiaries in Country A and Country B, which then look after the respective line segments.
- Easier to package the single project for awarding a BOOT based contract – Attractive for investors.
- Line can have stand-alone tariff mechanism, de-linked with domestic transmission tariff regime.

Examples

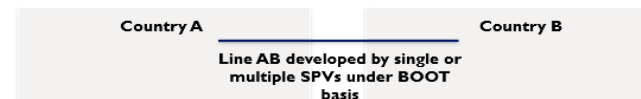
- Nemo Link Limited (UK-Belgium) : 50:50 JV of National Grid (Great Britain) and Elia (Belgium)
- Cambodia Thailand Power Transmission Limited (CPTL)
- MOTRACO (South Africa-Eswatini-Mozambique)
- Argentina-Brazil Garabi Interconnector (CIEN - CTM, TESA)
- Transmission lines of Itaipu Binacional Ltd.

2. Business Model:

More PPP based business models can be introduced in the region

Proposed Solution

BOOT based PPP options will provide an option for Governments to utilize their capital and resources elsewhere.



If the limitations in legal or policy framework preclude the possibility of 100% private ownership, JV models can be explored, which has already been implemented in the case of 400 kV Dhalkebar-Muzaffarpur.

Examples

- Cambodia-Thailand Power Transmission
- Garabi interconnector (Argentina-Brazil)
- Central American Interconnection (SIEPAC)

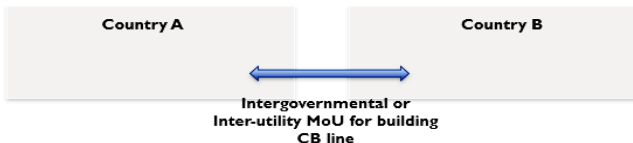
3. Decision on building CB lines:

Inter-governmental and Inter-utility MoUs will be relevant for countries who want to interconnect with countries other than India

Proposed Solution

In the long-term context, South Asian countries may also be exploring interconnections that does not involve India, such as Bangladesh-Myanmar. In such cases, the countries could consider entering into an Inter-governmental MoU/treaty or Inter utility MoU for the development of such lines.

For lines interconnecting with India, existing mechanisms of JWG, JSC and Designated Authority approvals may continue.



Examples

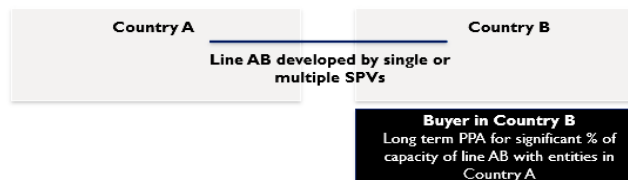
- Central American Interconnection (IG treaty)
- MOTRACO (IG-MOU)
- Kenya-Tanzania interconnection (Inter utility MoU)

4. Investment decision:

In the absence of firm PPAs for full capacity between Governments, and Inter-governmental or Inter-utility MoUs, anchor customers can be identified who can commit to a major share of line usage

Proposed Solution

When countries or state-owned utilities are unable to arrive at a consensus in long term assurance on payment of transmission charges, it could be ventured to identify an anchor customer, who can be a large industrial consumers, or a group of such anchor customers, who can ensure blocking and utilization of a substantial portion of line capacity.



Relevant in Indian context, where large corporates are looking for clean power sources from outside India also, especially hydropower.

Examples

- MOTRACO interconnection, which facilitates purchase of energy from Eskom of South Africa, for sale to the Mozal aluminium smelter in Mozambique.
- The “anchor” customer was the Mozal aluminium smelter plant. The aluminium plant had significant electricity demand and was willing to pay MOTRACO a wheeling charge for the reliable energy it received. The aluminium plant also paid the cost of electricity purchased from ESKOM.

KEY TAKEAWAYS / RECOMMENDATIONS (2)

5. Transmission tariff models:

CB interconnections ultimately require assurance of an annuity payment, which could be collected in any forms. Most international examples follow a Regulated Tariff or bilaterally agreed tariff model.

Proposed Solution

The model is already in practice in the case of Indian portion of Dhalkebar-Muzaffarpur line, where annual transmission payment calculation methodology is specified in the Implementation and Transmission Service Agreement (ITSA).

There is potential for extending Tariff Based Competitive Bidding (TBCB) regime to cross border lines also.



Examples

- Central American Interconnection (SIEPAC) – Annuity Payment determined by regulator CRIE
- GCC Interconnection – Tariff determined by Advisory and Regulatory Committee
- NEMO link – Tariff determined by UK Regulatory OFGEM under a cap and floor pricing regime
- Cambodia-Thailand Interconnection – Tariff specific in commercial agreement

6. Cost and revenue sharing:

In case of JV formed by Govt owned utilities, there are uniform, infrastructure-based and benefit-based cost and profit sharing options.

Proposed Solution

Uniform sharing

Equal ownership share of each of the countries

Infrastructure-based

Shared in ratio of CB infrastructure planned in each of the countries

Benefit based

Shared in ratio of estimated benefits from CB interconnections

In case of a single private entity owning the entire cross border line, this point becomes moot anyway, as capital expenditure of respective state-owned utilities are avoided.

Examples

- Uniform Sharing**
 - Central American Interconnection (SIEPAC)
- Infrastructure-based**
 - Kenya-Ethiopia Interconnection
 - Kenya-Tanzania Interconnection
- Benefit based**
 - GCC Interconnection

7. Regional markets:

Liberal access to regional power markets can facilitate faster development of CB lines, as concerns on small quantum of untied capacities can mitigated through market options.

Proposed Solution

The availability of regional markets for energy trade has been a key enabler in various regional interconnections such as Central American Interconnection, NEMO link etc. Adequate access to a regional electricity market reduces the need for entire line capacity to be tied up under 100% long term PPAs (though a substantial portion of capacity still have to be under long term PPAs in South Asian context).

South Asia is also moving towards improved regional electricity market, and therefore this aspect is already being addressed by the countries.

In longer term, even transmission line capacity of CB lines can be auctioned out, through market platforms.

Examples

- Central American Interconnection – Use of market platform for trading
- NEMO link – Auction of line capacity through market platforms

8. Regional financing of CB transmission infrastructure:

There is a potential for countries in the region to come together to financially support regional lines whose benefits extend beyond two countries

Proposed Solution

Some of the cross-border transmission lines have benefits that extend beyond the countries at the two endpoints of such lines. There could be additionalities that could benefit the region as a whole in the form of improved reliability, or improved evacuation of renewable energy etc.

In the medium to long-term, South Asian countries may also explore such options, which provide some form of viability gap support or concessional loans or grants to cross border lines that have regional benefits, spanning beyond the beneficiary countries.

[Potential for linkages with SAREP's ongoing support related to South Asia Forum for Energy Investment]

Examples

Regional Transmission Infrastructure Financing Facility

- European Union – Projects of Common Interest (PCI)**
 - Grants from Connecting Europe Fund (CEF) with over €5 billion budget
 - PCI eligibility determined by European Commission, assisted by ACER
 - Eligibility requirement: increase market integration, OR help the EU's energy security OR contribute to the EU's climate and energy goals by increasing renewables integration.
- South African Power Pool - Regional Transmission Infrastructure Financing Facility (Under development)**

WAY FORWARD AND ACTION PLAN



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Enhancing regional energy cooperation in South Asia holds significant promise. A unified regulatory framework is essential to unlocking the full potential of regional energy integration.

South Asia must align regulatory frameworks, infrastructure, and investments to create a sustainable, integrated energy market. If implemented successfully, these efforts will foster economic growth, energy security, and environmental sustainability across the region.

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