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Integrated Research and Action for Development

Combined meeting of TF-2 and TF-3, Dhaka

Recommendations on Commercial T&C for CBET and suggesting model for PX in SA region

SARI/EI PROJECT STEERING COMMITTEE MEETING

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Agenda

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Section 1

Recommendations on institutional structure to promote CBET

Recommendations on institutional structure to promote CBET

Forum of Electricity Regulators (FER):

- To begin with, a forum having representatives from each SAC shall be created to formulate common rules & regulations, codes & standards, etc. to facilitate CBET
- In future, a Regional Regulatory Body for the SA region can be created based on the then prevailing conditions such as regulatory maturity, need for CBET, power market development etc. across SACs

Forum of National System Operators (FONSO):

- Formulate detailed guidelines for grid operation, market operation (scheduling & dispatch, energy accounting & settlement, congestion management etc.) and ensuring security and safety of the grid
- Each SAC shall identify / establish a National System Operator (NSO) with authority, resources and infrastructure
- All NSOs in the region will be members of FONSO

Forum of National Transmission Utilities (FNTU):

- Responsible for proactively co-ordinating and planning transmission system at sub-regional (e.g. BBIN) / regional (SAARC) level
- Each SAC shall identify / establish a National Transmission Utility (NTU) with authority, resources and infrastructure
- All NTUs in the region will be members of FNTU

Section 2

Recommendations on CBET PPA: Commercial aspects

Recommendations on CBET PPA: Tariff related

	Long-term	Medium-term	Short-term	Key considerations

PPA Term	**Thermal**: At least 25 years
	
	Hydro: At least 35 years
		1-5 years	Less than 1 year	• Term of long-term agreement should commensurate with useful life of the generating asset
				• Perspective of buyer (e.g. hedging price volatility) vs. seller (e.g. bankability) in case of long-term contract
				• Recommendations for long-term procurement in line with the existing cross-border trades
				• Recommendations for medium-term and short-term procurements aligned with the framework in India
				  • Such framework only prevalent in India
				  • India is the largest power market in South Asia

Tariff Structure	**Thermal**: Two-part **Hydro**: Single-part		Single-part	• Technology-specific tariff structure • Two-part tariff structure for thermal generators and single-part tariff structure for hydro generators observed across CBET PPAs reviewed by us

Recommendations on CBET PPA: Tariff related

	Long-term	Medium-term	Short-term	Key considerations
Tariff Recovery	**Single-part tariff**: Recovery based on scheduled energy at delivery point (failure to off-take treated as 'deemed delivery') **Two-part tariff**: (1) Fixed cost: based on Declared Capacity (MW); (2) Variable cost: Scheduled energy (MWh) at delivery point			• Recovery of single-part tariff as well as variable cost in case of two-part tariff is based on scheduled energy (within most SACs - it is based on actual energy at delivery point) ✓ Delivery points likely to be boundary points with India; hence, cross-border transactions will be subject to ABT/DSM at boundary points
Principle of Tariff Determination	**Competitive bidding** **Cost-plus/negotiation in case of hydro power procurement**		**Competitive bidding** **Negotiation** for smaller quantum or contingency procurements	• **Thermal:** India, the largest power market in the region, has adopted competitive bidding for all procurements except in case of hydro procurement; 250 MW procurement by Bangladesh from thermal plant (through PTC) is based on competitive bidding • **Hydro:** project implementation risks; longer gestation period - hence, procurements from hydro projects are on negotiated basis (prevailing scenario) • **Short-term:** Competitive bidding to promote competition and transparency

Recommendations on CBET PPA: Tariff related

	Long-term	Medium-term	Short-term	Key considerations
Tariff Escalation	**Competitive bidding:** To be decided at the time of tariff discovery (bidding stage) **Cost-plus/negotiation:** As per prevailing regulatory guidelines OR mutually decided		No escalation (Fixed tariff for the entire term of contract)	• Necessary to compensate for unforeseen fluctuation in prices of raw materials, services, taxes & other levies • For short-tem contracts, impact of price fluctuations is expected to be low/moderate; Hence, fixed tariff has been recommended

Recommendations on CBET PPA: Billing & Payment

	Long-term	Medium-term	Short-term	Key considerations
Billing Frequency	**Monthly**	**Monthly**	**Weekly**	• Recommendations in line with existing practices followed in most SACs and CBET contracts
Payment Currency	**USD or INR** (to be mutually decided)			• CBET PPAs are based on INR (Nepal-India, Bhutan-India) and USD (India-Bangladesh) • Payment currency shall be decided keeping in view diverse factors such as country's ability to deal with foreign currencies, volatility of local currency, local policies etc.
Payment Due Date	**30 days**	**30 days**	**15 days**	• Recommendations in line with existing practices followed in most SACs and CBET contracts • Counting from date of receipt of bill by buyer

Recommendations on CBET PPA: Billing & Payment

	Long-term	Medium-term	Short-term	Key considerations
Early Payment Rebate	**Within 2 days**: 2% rebate, if payment through LC or any other mode **After 2 days and within 30 days** (including the date of receipt of bill): 1% rebate			• Early payment helps the seller in better working capital management against which seller should be able to provide a rebate to buyer • Recommendation in line with the practice followed in recent CBET contracts (Bangladesh/Nepal); CERC in India also follows this principle
Late Payment Surcharge	**1.25% per month** on outstanding amount for delay beyond Due Date			• Delay in payment would affect seller's working capital; provision for late payment surcharge would inculcate practice of prompt payment by buyers • Recommendation in line with the practice followed in recent CBET contracts (Bangladesh/Nepal); CERC in India also follows this principle

Recommendations on CBET PPA: Payment security and Dispute resolution mechanisms

	Long/Medium/Short-term	Key considerations
Payment Security Mechanism	**PSM**: Irrevocable and revolving Letter of Credit (LC) [Others: Sovereign Guarantee (Optional); Sale of power to third party] **Period**: Lower of (One year, Contract duration) **Invoke**: 15 days post Due Date **Value**: (1) LT & MT: Two months of Fixed Charges (at normative availability) plus Variable Charges (2) ST: One week charges	• LC is widely used payment security mechanism in most SACs and CBET PPAs • Sovereign guarantee provided by GoB in case of NVVNL PPA with BPDB (Bangladesh)
Dispute Resolution Mechanism	**Two-tier** dispute resolution mechanism: (1) Settle Amicably; (2) Arbitration If not settled amicably within 60 days, it shall be referred to SAARC Arbitration Council OR Singapore International Arbitration Centre (SIAC)	• Two-tier dispute resolution mechanism adopted in most CBET PPAs reviewed • Singapore International Arbitration Centre (SIAC) is included in CBET PPAs reviewed • Option of SAARC Arbitration Council shall be explored for arbitrations related to cross-border PPAs

Section 3

Recommendations on CBET TSA: Commercial aspects

Recommendations on CBET TSA: Tariff related

	Recommendations	Key considerations
TSA Term	35 years	• Term of TSA is linked with the useful life of asset • TSA available only in India (TSA term is for 35 years from CoD); CBET TSAs have term of 25 or 35 years
Tariff Discovery	Based on **negotiation** between Transmission Service Provider (TSP) and Beneficiaries (Transmission System Users)	• Earlier, 400kV Tala transmission system and recently 400kV Muzaffarpur-Dhalkebar transmission line have been developed through special purpose vehicles (TSPs) • India has adopted competitive bidding to develop Inter-state transmission systems; However, most intra-state transmission systems being developed on cost-plus basis
Tariff Structure	**Single-part**	• Cost-plus approach in SACs: Single-part tariff structure • Competitive bidding framework (India): Tariff is split in to non-escalable and escalable components (payments are based on escalation factor defined by CERC semi-annually)
Tariff Recovery	Based on transmission system availability	• In most CBET contracts and in India, recovery of transmission tariff is linked to actual system availability (i.e. full recovery if actual availability >= target availability)

Recommendations on CBET TSA: Billing & Payment

	Recommendations	Key considerations
Billing Frequency	Monthly	• CBET TSAs reviewed have monthly billing; Also, similar practice followed in India
Due Date	30 days	• Due Date in India-Bhutan and India-Bangladesh CBET TSAs is 30 days • Due date in India TSA is also 30 days
Early Payment Rebate	**Within 2 days**: 2% rebate, if payment through LC or any other mode **After 2 days and within 30 days** (including the date of receipt of bill): 1% rebate	• Early payment helps the TSP in better working capital management against which TSP should be able to provide a rebate to beneficiaries • Aligned with PPA recommendations
Late Payment Surcharge	**1.25% per month** on outstanding amount for delay beyond Due Date	• Delay in payment would affect TSP's working capital; provision for late payment surcharge would inculcate practice of prompt payment by beneficiaries • Aligned with PPA recommendations

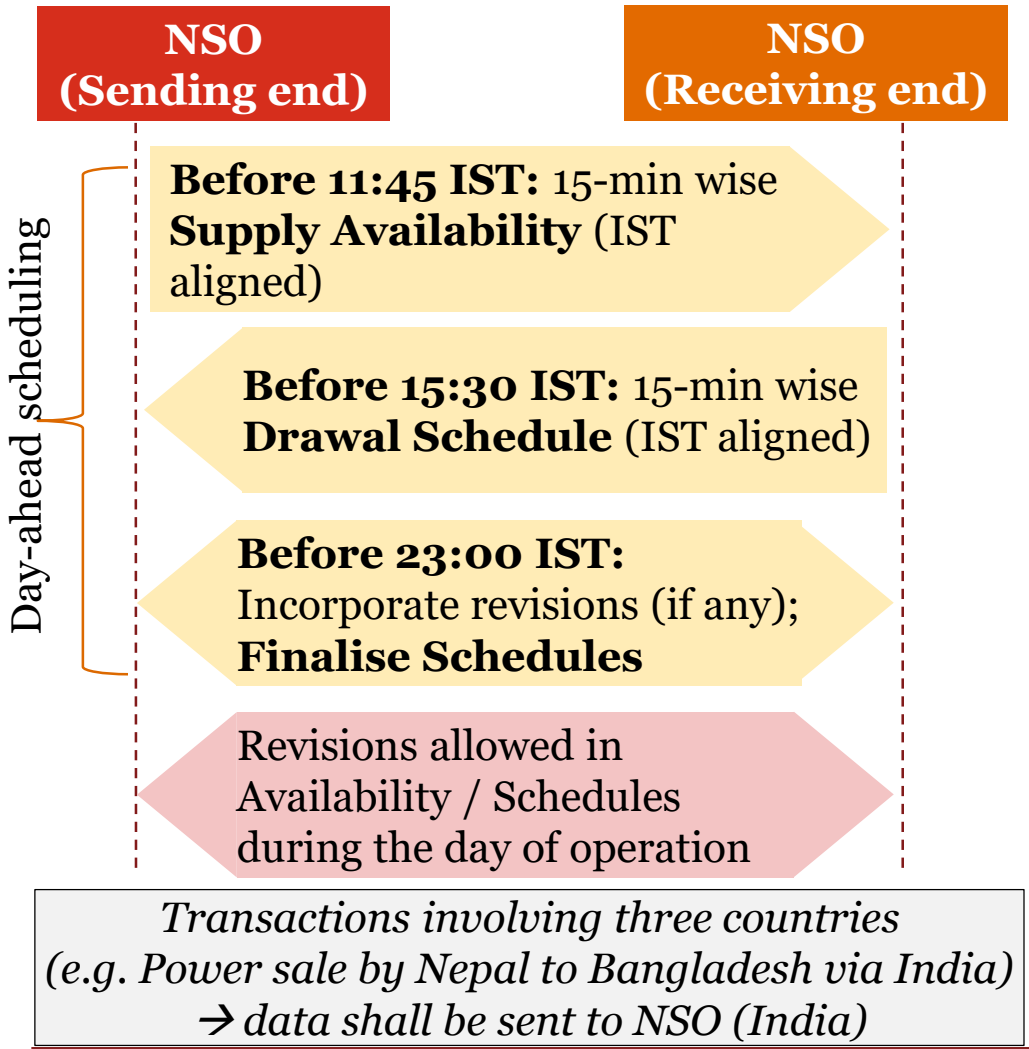
Recommendations on CBET TSA: Payment security and Dispute resolution mechanisms

	Recommendations	Key considerations
Payment Security Mechanism	**PSM:** Irrevocable and revolving Letter of Credit (LC) [Other: Sovereign Guarantee (Optional)] **Period**: 1 year **Invoke**: 15 days post Due Date **Value**: One month of transmission charges (at normative availability)	• LC is widely used payment security mechanism in most SACs and CBET TSAs • Aligned with PPA recommendations
Dispute Resolution Mechanism	**Two-tier** dispute resolution mechanism: (1) Settle Amicably; (2) Arbitration If not settled amicably within 60 days, it will be referred to SAARC Arbitration Council OR Singapore International Arbitration Centre (SIAC)	• Two-tier dispute resolution mechanism adopted in TSAs reviewed by us • Singapore International Arbitration Centre (SIAC) is included in CBET TSAs reviewed • Option of SAARC Arbitration Council shall be explored for arbitrations related to cross-border TSAs • Aligned with PPA recommendations

Section 4

Recommendations on operational aspects of CBET

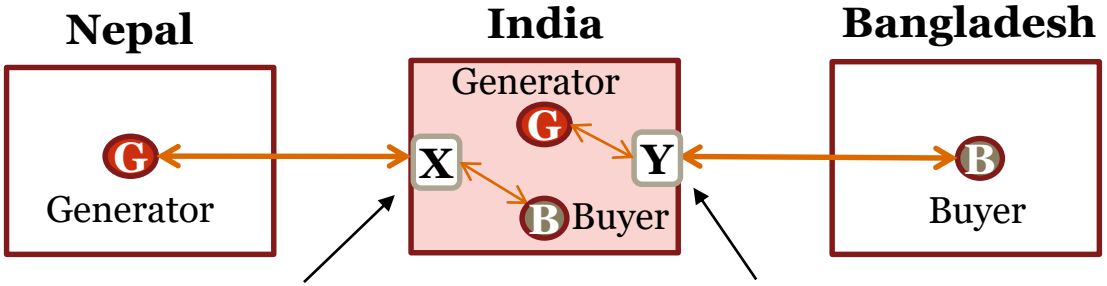
Recommendations on scheduling & despatch for CBET transactions



Key considerations

- Scheduling to a large extent is on a day-ahead basis in SACs
- Timelines recommended considering intra-country scheduling timelines
- Trilateral transactions among SACs are likely to be through India by virtue of its geographical position
  - ✓ Time variation in SACs → Scheduling to be aligned with IST
  - ✓ Scheduling in each 15-min block (as scheduling & deviation settlement are 15-min block based in India); To begin with, hourly MW value may be used in all four time blocks

Recommendations on scheduling & despatch for CBET transactions - Illustration



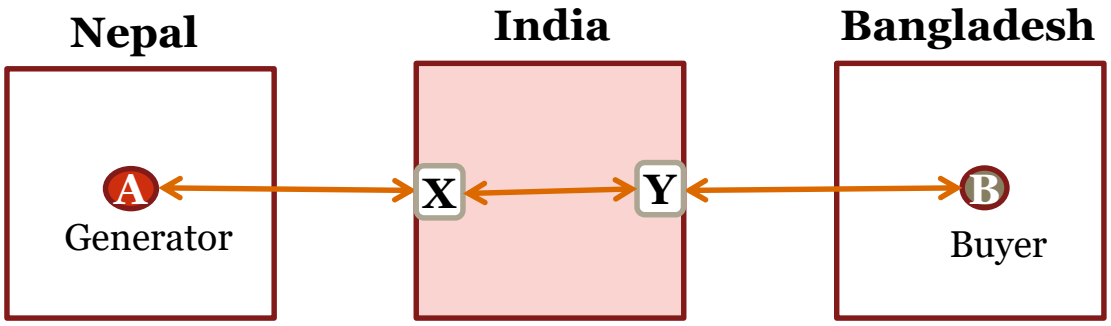
Before 11:45 IST: 15-min wise Supply Availability (IST aligned)

- Point X: NSO (Nepal) → NSO (India)
- Point Y: NSO (India) → NSO (Bangladesh)

Before 15:30 IST: 15-min wise Drawal Schedule (IST aligned)

- Point X: NSO (India) → NSO (Nepal)
- Point Y: NSO (Bangladesh) → NSO (India)

Before 23:00 IST: Incorporate revisions (if any); Finalise Schedules



Interconnection point shall be mutually agreed between Nepal and Bangladesh - either X or Y [Y in this illustration]

Before 11:45 IST: 15-min wise Supply Availability (IST aligned)

- Point Y: NSO (Nepal) → NSO (Bangladesh) & NSO (India) *[Indian system loss to be used]*

Before 15:30 IST: 15-min wise Drawal Schedule (IST aligned)

- Point Y: NSO (Bangladesh) → NSO (Nepal) & NSO (India)

Before 23:00 IST: Incorporate revisions (if any); Finalise Schedules

Recommendations on deviation settlement for CBET transactions

Scenario-A: Dedicated transmission interconnection

- Deviation (difference between Actual Injection/Drawal and Scheduled Injection/Drawal) to be attributed to either generator or buyer

Scenario-B: Common transmission interconnection (same sub-station used for multiple transactions)

- Deviation to be apportioned to individual generators and buyers based on pre-agreed principle

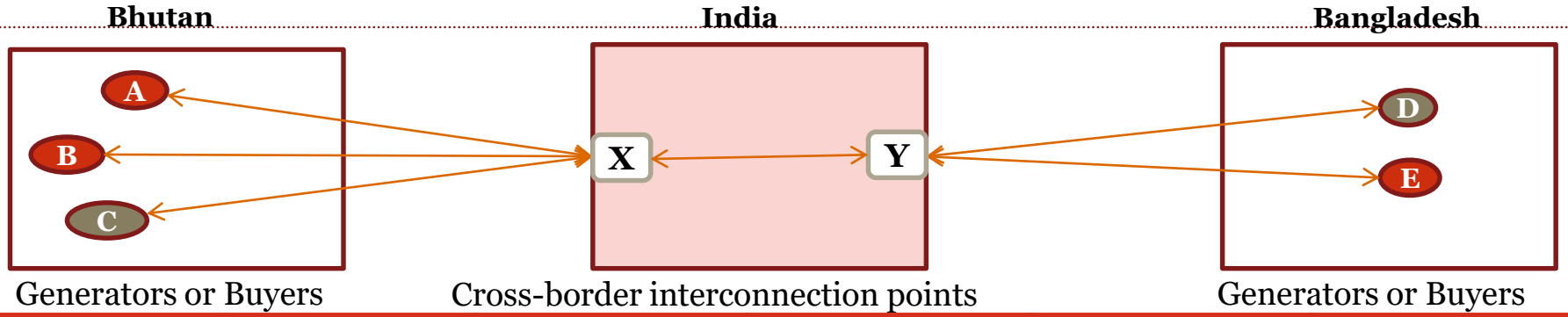
Scenario-C: Multiple transmission interconnections (multiple lines/sub-stations used for multiple transactions)

- Envisaged that Scheduling would be carried out separately for each transmission link → Deviation would also to be settled separately for each link

Key considerations

- Deviation settlement essential from both commercial and grid security point of view
- Recent cross-border transactions between India and other SACs are already subject to deviation settlement mechanism (DSM)
- SACs (except India) do not have intra-country deviation settlement mechanism; Hence, we have recommended an interim methodology for upcoming CBET transactions
- Going forward, other SACs shall evolve a tailored deviation settlement mechanism best suited to local conditions (e.g. generation mix, tariff framework, number of entities, maturity of market, grid discipline issues etc.)

Recommendations on deviation settlement for CBET transactions - Illustration



Contract	Schedule at Generator / Buyer end	Schedule at Bhutan boundary (Loss: 5%)	Schedule at X (POC Injection / Drawal Loss: 1.5%)	Schedule at Y (POC Injection / Drawal Loss: 2%)	Schedule at Buyer / Generator end (Loss: 4%)
A (Generator) - D (Buyer)	100.0 MW	95.0 MW	93.6 MW	91.7 MW	88.0 MW
B (Generator) - D (Buyer)	50.0 MW	47.5 MW	46.8 MW	45.9 MW	44.0 MW
C (Buyer) - E (Generator)	-20.0 MW	-21.1 MW	-21.4 MW	-21.8 MW	-22.7 MW
Total Schedule	**130.0 MW**	**121.4 MW**	**119.0 MW**	**115.7 MW**	**109.3 MW**
Actual			**121.0 MW**	**118.0 MW**	
Deviation			**2.0 MW (excess injection)**	**2.3 MW (excess drawal)**	

Recommendations on transmission access mechanism for CBET transactions

Access to cross-border transmission links

- Access to cross-border links should be promoted through suitable framework
- Timeframe of access to be aligned with open access durations defined in India to avoid any risk of mismatch in access duration across multiple lines for a single transaction

Access to intra-country network in SACs

- Framework for access to intra-country network should be put in place to promote cross-border trade
- SACs shall strengthen institutional mechanism to grant access to its network

Key considerations

- Better transmission system planning, optimal usage of right of way/land, stronger network and better reliability
- Trilateral transactions in future are likely to be through India; Access duration adopted by India shall be followed to realise the trilateral power sale
  - Access duration for all links/networks on the contract path - from injection point to drawal point - shall match with PPA tenure
- Article 12 of IGFA 2014 provides that the Member States shall, for the purpose of cross-border trade, enable non-discriminatory access to the respective transmission grids as per the applicable laws, rules, regulations and applicable inter-governmental bilateral trade agreements

Recommendations on transmission pricing framework for CBET transactions

Approach

- Transmission pricing for each link/network on the contract path - from injection point to drawal point - needs to be separately determined

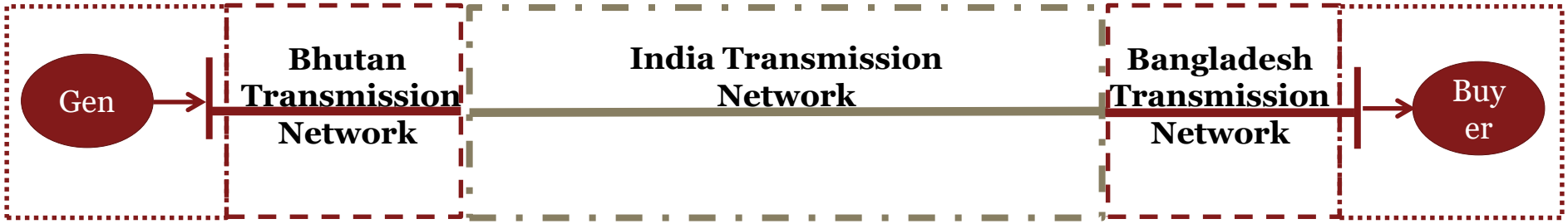
Methodology

- **India:** POC methodology for Indian part
- **For rest of the contract path**: Postage stamp methodology OR suitable mechanism shall be formulated, if not defined
  - LT & MT access: **tariff per MW**
  - ST access: **tariff per kWh**

Key considerations

- We have evaluated various options of transmission pricing
- Postage stamp methodology recommended considering prevailing industry structure, regulatory mechanism, simple to understand and ease of implementation
- Typically, transmission system is developed to handle peak MW; Hence, transmission tariff in 'per kWh' term for LT or MT access may lead to under/over recovery of revenue (especially for hydro power)

Recommendations on transmission pricing framework for CBET transactions - Illustration



100 MW sale from Bhutan to Bangladesh via India (hypothetical transmission charges):

Sl. No.	Particular	Rate (Source of information)	Power sale from Bhutan to Bangladesh via India	
			MW or MU	INR (Rate * MU)
1	Bhutan Transmission Charge	0.2500 INR/kWh *(Assumption)*	100 MW or 57.6 MU	14,400,000
2	Bhutan - India POC Injection Charge	0.0533 INR/kWh *(Q4 FY16 POC rate, CERC)*		3,070,080
3	India - Bangladesh POC Withdrawal Charge	0.0292 INR/kWh *(Q4 FY16 POC rate, CERC)*		1,681,920
4	Bangladesh Transmission Charge	0.2291 BDT/kWh (0.1940 INR/kWh) *(PGCB/BERC)*		11,173,017
			Total Transmission Charges (INR):	**30,325,017**

Recommendations on transmission planning approach for CBET transactions

Sub-Regional / Regional Transmission Planning in SAARC Region

Forum of National Transmission Utilities (FNTU):
To be established for proactively co-ordinating and planning transmission system at sub-regional / regional level

Key considerations

- Likely emerging scenario: From bilateral transactions to sub-regional/trilateral transactions, Regional Power Exchange
- Integrated planning will help achieve economy and efficiency in planning, design and operation of an integrated system, improved reliability of power systems and better utilization of natural resources in SACs
- Article 7 of IGFA 2014 also mandates that the transmission planning agencies of the Governments to plan the cross-border grid interconnections through bilateral/trilateral/mutual agreements

Recommendations on congestion management approach for CBET transactions

Defining transfer capability limits

- Approval of long-term, medium-term and short-term transactions based on network transfer capability (Thermal limit, Stability limit (SIL), etc. to be considered)

Pre-defined priorities

- Curtail load or generation based on pre-defined priorities (ST→MT→LT); Pro-rata curtailment for same priority & duration

Commercial mechanism (in future)

- Users causing congestion pay penalty and users relieving congestion receive incentive at predetermined rate (as prevalent in India)

Key considerations

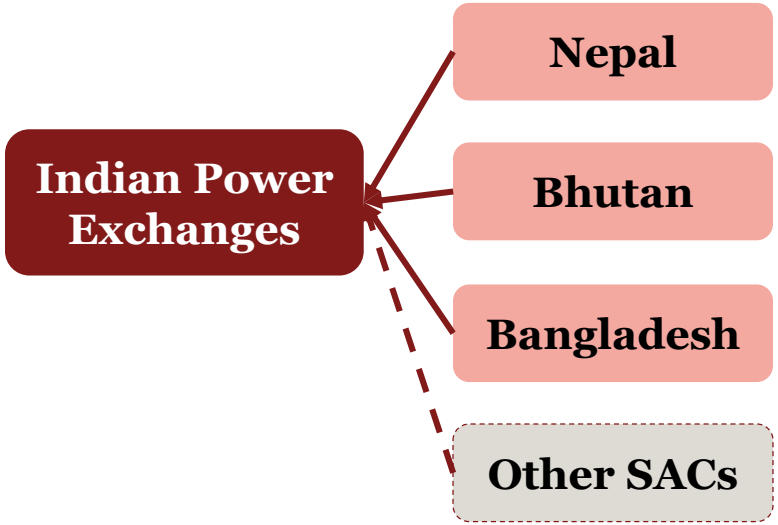
- Congestion is typically managed through generation or load control
- Commercial mechanism is in place in India
- Essential to put in place such a mechanism to ensure grid discipline and security

Section 5

Recommendations on Model for PX in SA region

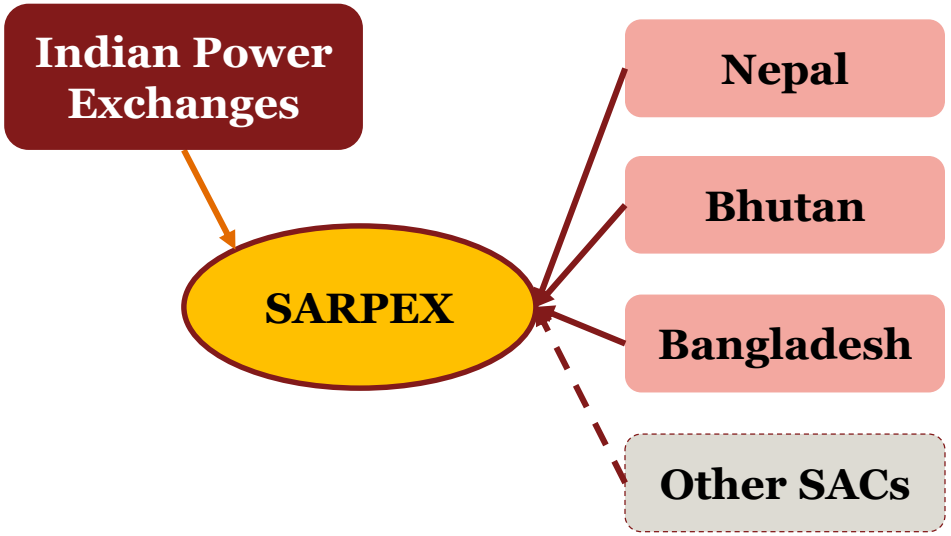
Recommendations on Model for PX in SA region

Option 1: Extend operations of established Power Exchanges in India



- Create separate bid area for each SAC or include SAC in nearby existing bid area depending upon technical feasibility
- To begin with, include SACs having existing grid connectivity; Add other SACs as and when they get connected with Indian grid

Option 2: Set-up South Asia Regional Power Exchange (SARPEX)



- Create separate SARPEX where SACs (including India) can participate
- SARPEX can receive bids from SACs and, depending upon technical feasibility, it can receive either separate direct bids from Indian sellers and buyers OR only uncleared buy bids and sell bids from Indian PXs

Recommendations on Model for PX in SA region

In the short to medium term

- Extend operations of established PXs in India [Option 1]
- Set-up South Asia Regional Power Exchange (SARPEX) [Option 2]

In the long term

- In case domestic PXs are established in other SACs, those can be integrated/merged to create SARPEX (like EPEX, OMIE, APX etc.)

Key considerations

- Technical feasibility study to decide between Option 1 and Option 2
- Evaluate impact (if any) of inclusion of other SACs on existing Indian power market
- Consider Indian policy and regulatory directives / guidelines for cross-border power trading
- Adopt the Model keeping in view evolution of industry structure, development of power market in SACs etc.

Section 5
Way forward

Way forward

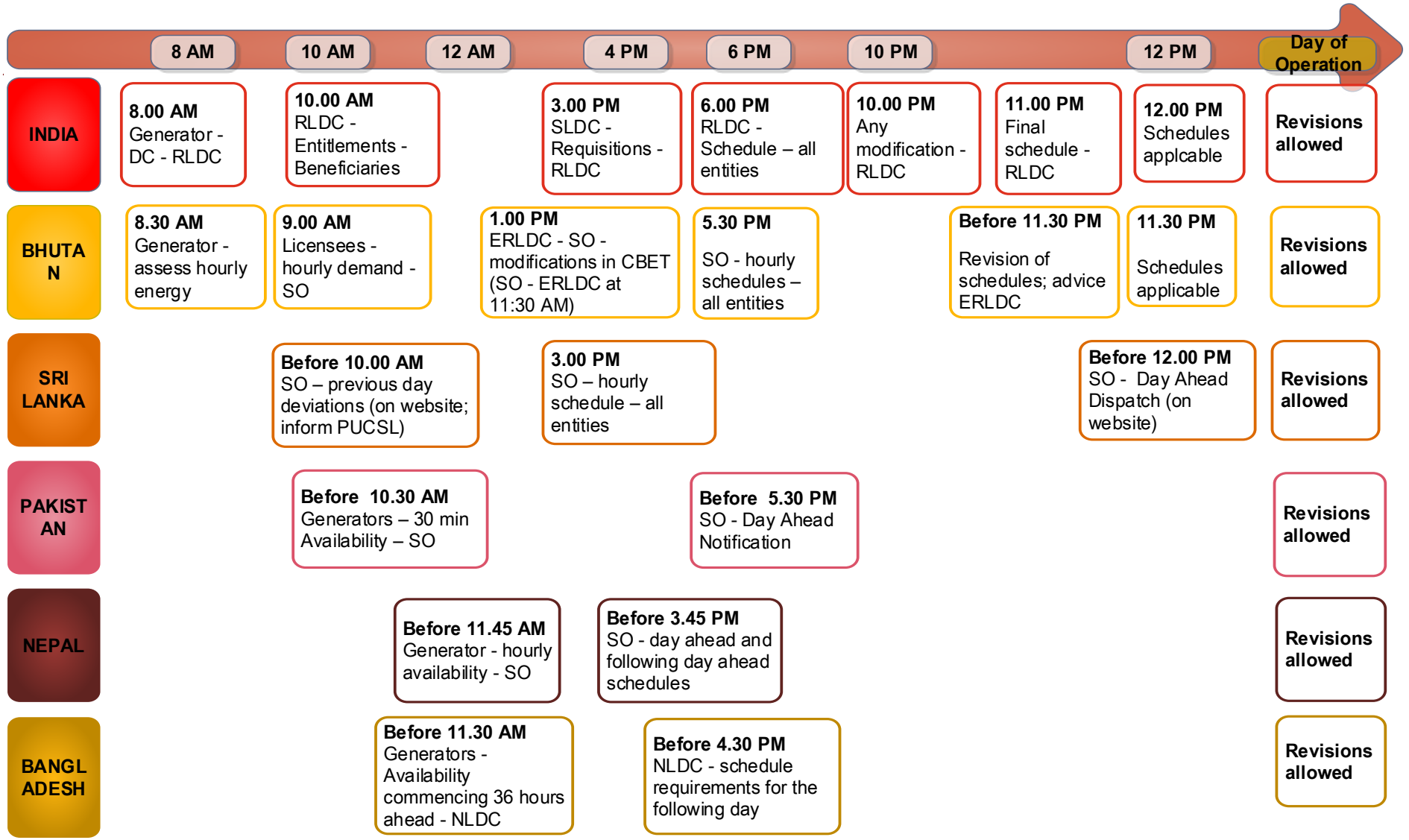
1. Finalise the recommendations
2. Submit model PPA and TSA
3. Submit the final report

Supporting Slides

PPAs reviewed

Country	PPA	Reference
Afghanistan	Model PPA - Sheberghan Gas Generation Activity	USAID
Bangladesh	PPA between BPDB and Developer (competitive bidding)	Bangladesh Power Development Board
Bhutan	Model PPA not available	
India	Model PPA - DBFOO, FOO	Ministry of Power, Government of India
Maldives	Standard PPA for Renewable Energy projects (Draft)	Maldives Energy Authority, Maldives
Nepal	Model PPA for hydro projects	Nepal Electricity Authority, Nepal
Pakistan	Model PPA not available	
Sri Lanka	Standardized PPA for Renewable Energy Development	Ceylon Electricity Board, Sri Lanka

Scheduling & dispatch in SACs



Scheduling & Deviation Settlement for existing CBET transactions

Bhutan→ India	India→ Bangladesh	India→ Nepal

• Bhutan hydro stations (Chhukha, Tala and Kurichhu) exporting power to India are not covered under ABT/DSM mechanism
• Scheduling done by ERLDC at India-Bhutan border point. DSM charges as per prevailing mechanism in India are computed are borne by beneficiaries
• Dagachhu:
  • Delivery Point same as Tala
  • Interim arrangement proposed by CERC
  • TPTCL is responsible for scheduling and imbalance settlement
  • TPTCL has become Eastern Region DSM pool member
	• NVVNL designated as Nodal Agency for CBET between India and Bangladesh (including PTC trades)
	• NVVNL shall coordinate with NLDC India and NLDC Bangladesh for scheduling
	• NVVNL is made Eastern Region DSM pool member
	• Any DSM liability on NVVNL to be passed on to BPDB
	• Scheduling is done at 400 kV Baharampur S/S
		• Treaty/Bilateral: Billing on actual energy. No scheduling or DSM settlement
		• PTC: NEA used to send daily schedules to PTC and PTC coordinated with NRLDC. DSM charges were levied on NEA

Transmission Pricing Models

Transmission Pricing Frameworks	Allocative Efficiency	Distance sensitivity	Directional sensitivity	Complexity
Postage Stamp: Summing-up all transmission costs and allocating to a User (Uniform charges) based on demand or energy drawl	Low			Low
Contract path: Defined fictitious contract path for a transaction (from source to sink) and allocate the costs of transmission elements on path	Medium	√		Medium
Distance based MW mile: Charges applied to a User based on a beeline distance between injection and receipt points and magnitude of transmitted power	Medium	√		Medium
Power flow based MW mile: Considers real network conditions using power flow analysis. Cost allocated based on extend of use of each network. Charges are determined as a function of magnitude, path and distance travelled by the transacted power	High	√	√	High
Point of Connection (PoC): Methodology takes into consideration location and is sensitive to distance and direction of the node in grid. PoC methodology adopted in India is hybrid of Average participation method and Marginal participation method	High	√	√	High

Suggested Model for Power Exchange

In order to propose a model for CBPX in SA region, we undertook a detailed review of existing International practices in setting-up of CBPX. Review was focused on aspects related to evolution, ownership & governance, products and other key features.

- Nord Pool Spot
- European Power Exchange (EPEX Spot)
- OMI-Polo Espanol S.A. (OMIE)
- Amsterdam Power Exchange (APX)
- Integrated Europe Model
- South African Power Pool (SAPP)

Key takeaways from review:

- **Evolutionary History**

  Initially, PXs started operations in one or two countries & expanded through merger / demerger or acquisition
- **Ownership**

  TSOs, national PXs or market operators
- **Governance Structures**

  Robust, multi-level governance structures
- **Products**

  DAM, TAM, Intra day
- **Settlement**

  Advance margins and collateral