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SARI/EI

Integrated Research and Action for Development

Combined meeting of TFs

Study on Assessment and recommendation of commercial terms & conditions for CBET and suggesting the model of Power Exchange in South Asian region

Brief presentation on As-Is Scenario

5-6 Aug 2015

pwc

Table of Contents

Study objectives

1

This study endeavours to contribute in the recent umbrella agreement (IGFA)

Article-9 Transmission Service Agreement	• Develop the Transmission Service Agreement for Bilateral and Multilateral trade (covering Short/Medium/Long term) • Develop Transmission pricing framework
Article-11 System Operation and Settlement Mechanism	• Suggest Power scheduling and dispatch procedures. • Suggest Energy accounting system, treatment of unscheduled deviations and associated financial settlement systems
Article-12 Transmission Access	• Transmission corridor allocation mechanism • Transmission congestion management
Article-13 Facilitating Buying and Selling entities	• Institutional arrangement for granting an OA, power schedule and dispatch, system operation, license for trading etc. • Models/options for a power exchange.
Article-16 Dispute Settlement Mechanism	• Develop dispute settlement mechanism.

Study objectives

Overall aim is to assess preparedness of each SA nation for Cross Border Electricity Trade (CBET) within the region and has following objectives:

1. ***Recommend minimum set of amendments and prepare standard documents related to commercial terms & conditions, principles and procedures, agreements etc. for facilitating short-term, medium-term and long-term CBET between SA nations***

2. ***Suggest suitable model of Power Exchange in South Asian region for cross border power trading along with detailed analysis and justification***

Methodology

2

Methodology for the study (1/2)

Stage A: Project inception

- Project inception meeting
- Finalise indicative list of published reports on CBET in SA region for review
- Undertake literature review
- Submit **Inception Report**
- **Status: Completed**

Stage B: Assess prevailing commercial T&C

- Undertake review of following in each SAC:
  - ✓ Tariff structure/ principles
  - ✓ PPAs and TSAs
  - ✓ Scheduling & dispatch procedures
  - ✓ Energy accounting & settlement mechanism
  - ✓ Institutional mechanism
  - ✓ Existing CBET arrangements
- Review evolution and operation of Indian Power Exchanges
- Review other cross border power exchanges for identifying best practices which can be adopted in SA context
- Submit **Draft Report**
- **Status: Submitted**

Methodology for the study (2/2)

Stage C: Review CBPX & Suggest models

- Suggest changes/ additions in existing commercial, operational and institutional framework for promoting CBET
- Develop standard PPA and TSA for CBET
- Develop & recommend economic & efficient transmission pricing framework for CBET
- Recommend suitable models for cross border power exchange in SA region with detailed justification
- Submit **Interim Report**
- **Status: Planned**

Stage D: Disseminate key findings

- Present findings of Stage C (Interim Report) to SARI/EI Project Steering Committee, TF members, IRADe/ USAID and other stakeholders

Stage E: Final Report

- Prepare and submit **Final Report** after incorporating comments and suggestions of stakeholders

Tariff framework

3

Country-wise industry structure (1/3)

Country	Policy	Regulation	Gen.	Trans.	System Operation	Dist.	Trading
Afghanistan	Ministry of Energy and Water (MEW)	(AERA) (Proposed)	DABS	DABS	DABS	DABS	-
Bangladesh	Ministry of Power, Energy and Mineral Resources (MPEMR)	BERC	BPDB, EGCB, APSCL, NWPGC, IPPs, SIPPs, Rental	PGCB	PGCB	BPDB, WZDPC, APSCL, DPDC, DESCO, REB	BPDB
Bhutan	Ministry of Economic Affairs (MEA)	Bhutan Electricity Authority (BEA)	Druk Green Power Corporation	Bhutan Power Corporation (BPC)	BPC (NLDC)	BPC	-

Country-wise industry structure (2/3)

Country	Policy	Regulation	Gen.	Trans.	System Operation	Dist.	Trading
India	Central: Ministry of Power (GoI) State: State Govt	Central: CERC State: SERCs/ JERCs	Central: NTPC, NHPC, NPCIL, UMPPs, IPPs, MPPs State: State-owned GenCos, IPPs, CPPs	Central: POWERGRID (CTU) State: STUs	Central: POSOCO (NLDC & 5 RLDCs) State: SLDCs	Central: Nil State: State-owned Discoms, Private Licensees, Distribution Franchisees	Central: Inter-state Licensees State: Discoms / TradeCos (Include State Holding Cos)
Maldives	Ministry of Environment and Energy	Maldives Energy Authority (MEA)	STELCO, FENAKA	STELCO, FENAKA	STELCO, FENAKA	STELCO, FENAKA	-
Nepal	Ministry of Energy	DOED (ETFC)	NEA, IPPs	NEA	NEA	NEA	NEA

Country-wise industry structure (3/3)

Country	Policy	Regulation	Gen.	Trans.	System Operation	Dist.	Trading
Pakistan	Ministry of Water and Power	NEPRA	State-owned generating companies formed after restructuring of WAPDA (CPGCL, JPCL, LPGCL, NPGCL) & other IPPs	NTDC	NTDC	KESC & Distribution Companies formed after restructuring of WAPDA (total 10 in nos.)	-
Sri Lanka	Ministry of Power and Energy	PUCSL	CEB, IPPs	CEB Transmission Licensees	CEB Transmission Licensees	CEB Distribution Licensees 1-4 LECO	-

Industry structure

- Afghanistan (DABS)
- Maldives (FENAKA)
- Nepal (NEA)
- Sri Lanka (CEB)

- Bangladesh (Separate Trans. Utility)
- Bhutan (Separate Gen. utility)

- India (Separate G,T,D utilities)
- Pakistan (Separate G,T,D utilities)

G - Generation, T - Transmission, D - Distribution

Power procurement policy

No separate policy

- **Afghanistan**
- **Maldives**
- **Nepal**
- **Bangladesh**
- **Bhutan**
- **Pakistan**

Mostly, VI utilities, thus no separate procurement policy;
In case of Bhutan, no policy as country has surplus power, while in Pakistan, NTDC is central power purchasing utility

Separate power procurement policy

India	**Sri Lanka**
Multiple routes available for power procurement	Sec. 43 of Sri Lankan Electricity Act amended in 2013 to incorporate provision for power procurement

VI - Vertically Integrated, G - Generation, T - Transmission, D - Distribution; IPP - Independent Power Producer

Generation tariff framework

3.1

Type and Structure of Generation Tariff

Country	Determined by Regulator	Determined through Competitive bidding	Structure of Tariff
Afghanistan	Yes (determined by MEW/DABS)	No	Single-part
Bangladesh	Yes	Yes (selective)	Two-part
Bhutan	Yes	No	Single-part
India	Yes	Yes - Thermal No – Hydro	Two-part; Deviation from Schedule handled through DSM/UI
Maldives	Yes	No	Two-part
Nepal	Yes	No (fixed upfront <=100 MW)	Single-part
Pakistan	Yes	Yes (selective)	Two-part
Sri Lanka	Yes	No (fixed upfront for RE)	Single-part

MYT - Multi Year Tariff; DBFOO – Design-Build-Finance-Own-Operate; NEA - Nepal Electricity Authority; ETFC - Electricity Tariff Fixation Commission; IPP - Independent Power Producer; DSM - Deviation Settlement Mechanism; UI - Unscheduled Interchange

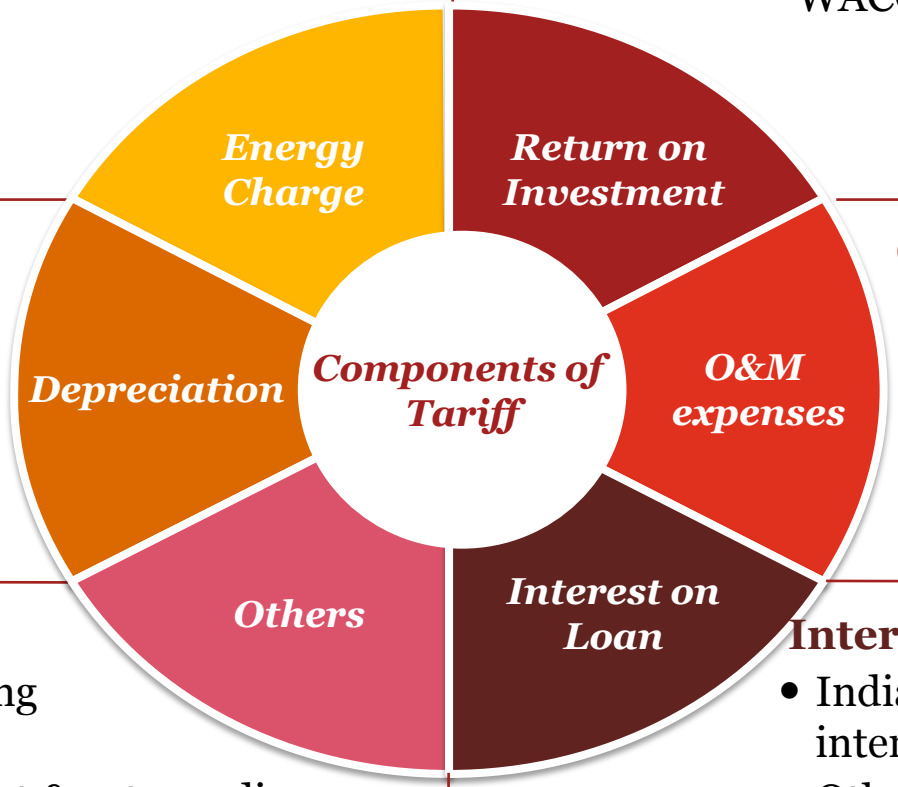
Components of generation tariff under Regulated Route

Energy Charge

- Primary & secondary fuel cost (Not applicable for hydro)

Return on Investment

- India: RoE 15.5%-16.5%
- Others: Mostly based on WACC/RoA



Depreciation

- Mostly Straight Line Method

O&M expenses

- Employee costs, A&G and R&M expenses

Other costs

- India: Interest on working capital
- Sri Lanka: Refurbishment & extra ordinary maintenance costs

Interest on loan

- India: Weighted average rate of interest
- Others: Mostly included in RoI

WACC - Weighted Average Cost of Capital; O&M - Operation and Maintenance

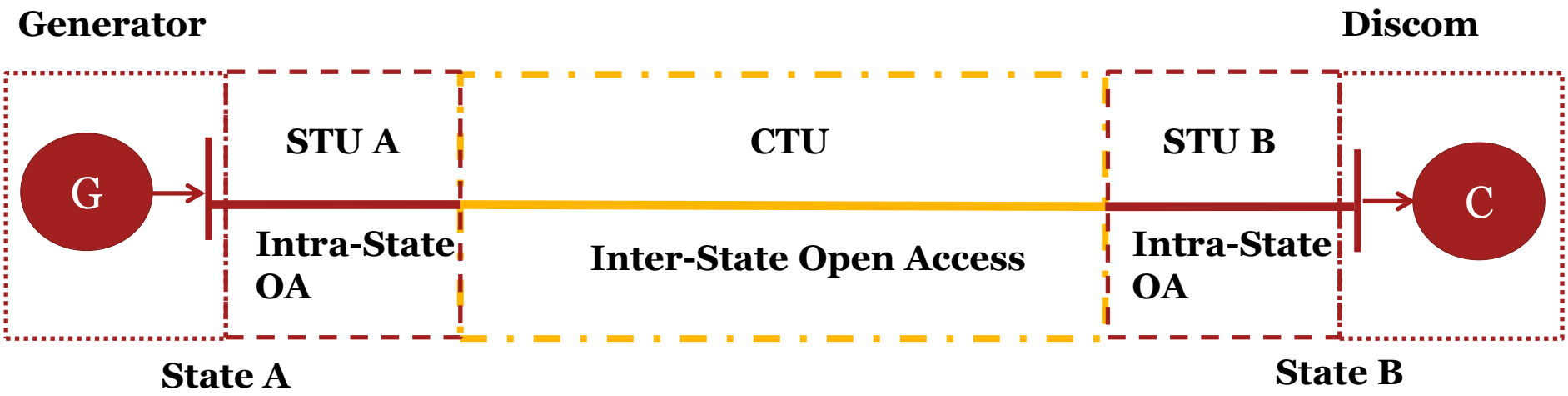
Transmission tariff framework

3.2

Approach for transmission tariff determination

Country	Determined by Regulator	Determined through Competitive bidding	Mode of Recovery
Afghanistan	Yes	No	Bundled with retail tariff
Bangladesh	Yes	No	Per unit basis (BDT 0.2291/kWh)
Bhutan	Yes	No	Bundled with retail tariff
India	Yes	Yes	Point of Connection (PoC) mechanism
Maldives	Not applicable		
Nepal	Yes	No	Bundled with retail tariff
Pakistan	Yes	No	Use of system charge (per MW)
Sri Lanka	Yes	No	Postage Stamp Methodology based on contribution to coincident monthly system peak

Illustrative STOA transaction in India



STOA from Uttar Pradesh to Gujarat

Injection	UPPTCL @ 3.59 %	UP Inj. @ 1.38%	GUJ Dr. @ 1.94%	GETCO @ 3.57%	
111.2 MW →	107.2 MW →	→ 105.7 MW	103.7 MW →	100 MW →	Total Loss @ 10.1%
3.5 Rs / kWh	19.63 P / kWh	17.28 P / kWh 3.15 P / kWh	12.29 P / kWh 3.15 P / kWh	11.6 P / kWh	Effective Tariff @ 4.6 Rs/kWh

Commercial terms & conditions of domestic PPA and TSA

1. *Term*
2. *Tariff, Structure, Recovery*
3. *Availability, Incentive & Damages*
4. *Billing, Payment-terms including rebate & surcharge*
5. *Payment Security Mechanism*
6. *Dispute Resolution*

4

Key commercial term & conditions in domestic PPA … (1/2)

Standard PPA are available for Afghanistan, Bangladesh, India, Maldives, Nepal and Sri Lanka

Parameter	Summary
PPAs reviewed	• Afghanistan, Bangladesh, India: Thermal (Gas/Coal) • Nepal: Hydro • Maldives, Sri Lanka: Renewable Energy (RE)
Term of Agreement	• Usually 20/25 years for long-term (15 years in Bangladesh)
Principle of tariff determination in PPAs reviewed	• Pre-determined: Maldives, Nepal, Sri Lanka • Competitive bidding: Bangladesh, India
Tariff structure	• Thermal in Afghanistan, Bangladesh, India: Two-part • Hydro in Nepal: Single-part • RE: Two-part (in Maldives); Single-part (in Sri Lanka)
Tariff recovery by Generator	• Single-part: Billed based on actual energy supplied • Two-part: Fixed charge linked to Plant Availability and Variable charge billed on actual energy supplied (In India, Variable charge is billed on scheduled energy and deviation from scheduled energy handled through DSM/UI mechanism)

Key commercial term & conditions in domestic PPA … (2/2)

Parameter	Summary
Availability, incentives and damages	• Normative availability is mentioned in Afghanistan (TBD based on technology) and India (90%) PPAs. Incentive and penalty mechanism is specified in India PPA • Normative availability of 80% is specified in Nepal PPA and Generator to pay penalty in case of not meeting the same • Minimum off-take obligation in Maldives PPA
Billing frequency	• Monthly (except Maldives - bi-monthly)
Currency	• Domestic currency • Foreign currency (USD) component in India & Bangladesh PPAs
Due date	• 30 days (except Maldives - 4 days and Nepal - 45 days)
Rebate	• 1% if paid within five days (only in India)
Surcharge	• Interest to be paid in case of delay (Bank Rate + 2.5%/5% or 6% per annum)
Payment security mechanism	• Letter of Credit is commonly used • Escrow mechanism and third party sale option (both only in India)
Dispute resolution mechanism	• Amicable settlement (directly or mediate by expert in some cases) • Arbitration as per prevailing rules in each SAC • Adjudication by Commission or by Tribunal (only in India)

Key commercial term & conditions in domestic TSA … (1/2)

Standard TSA available only in India*

Parameter	Summary
Term	• 35 years
Tariff	• Two-parts in transmission tariff viz. Escalable Transmission Charges and Non-Escalable Transmission Charges, determined through competitive bidding • Quoted 1st year Escalable Transmission Charges are adjusted by an index published by CERC based on WPI and CPI (IW) on a semi-annual basis • Non-Escalable transmission charges remain fixed for all 35 years as quoted by Bidder
Tariff recovery	• Recovery linked to availability of the transmission system
System availability	• Target availability for full recovery of transmission charges: 98% (AC); 95% (HVDC) • Incentive for over achievement capped at 99.75% (AC) / 98.50% (HVDC) • Penalty for under achieving availability (pro-rata reduction in transmission charges)

** TSA for procurement of Transmission Services through tariff based competitive bidding published by the Ministry of Power, Government of India in 2008 and subsequent amendments*

Key commercial term & conditions in domestic TSA … (2/2)

Parameter	Summary
Billing Frequency	• Monthly
Currency	• Domestic currency (INR)
Due Date	• 30 days
Rebate	• 2% of bill amount if paid within one day or 1% of bill amount if paid within due date
Surcharge	• 1.25% per month in case of delay
Payment Security Mechanism	• Letter of Credit - 12 months term; Value = 1.1 x Estimated average monthly charges • Provision to approach RLDC/ SLDC requesting for alteration of the despatch schedule of specific transmission system user in case of payment default
Dispute Resolution Mechanism	• Amicable settlement • Arbitration as per Indian Arbitration and Conciliation Act, 1996 or Adjudication by the Commission depending upon nature of dispute

Operational aspects in each SAC

1. *Scheduling & despatch*
2. *Energy accounting & deviation settlement*
3. *Transmission capacity allocation and congestion management*

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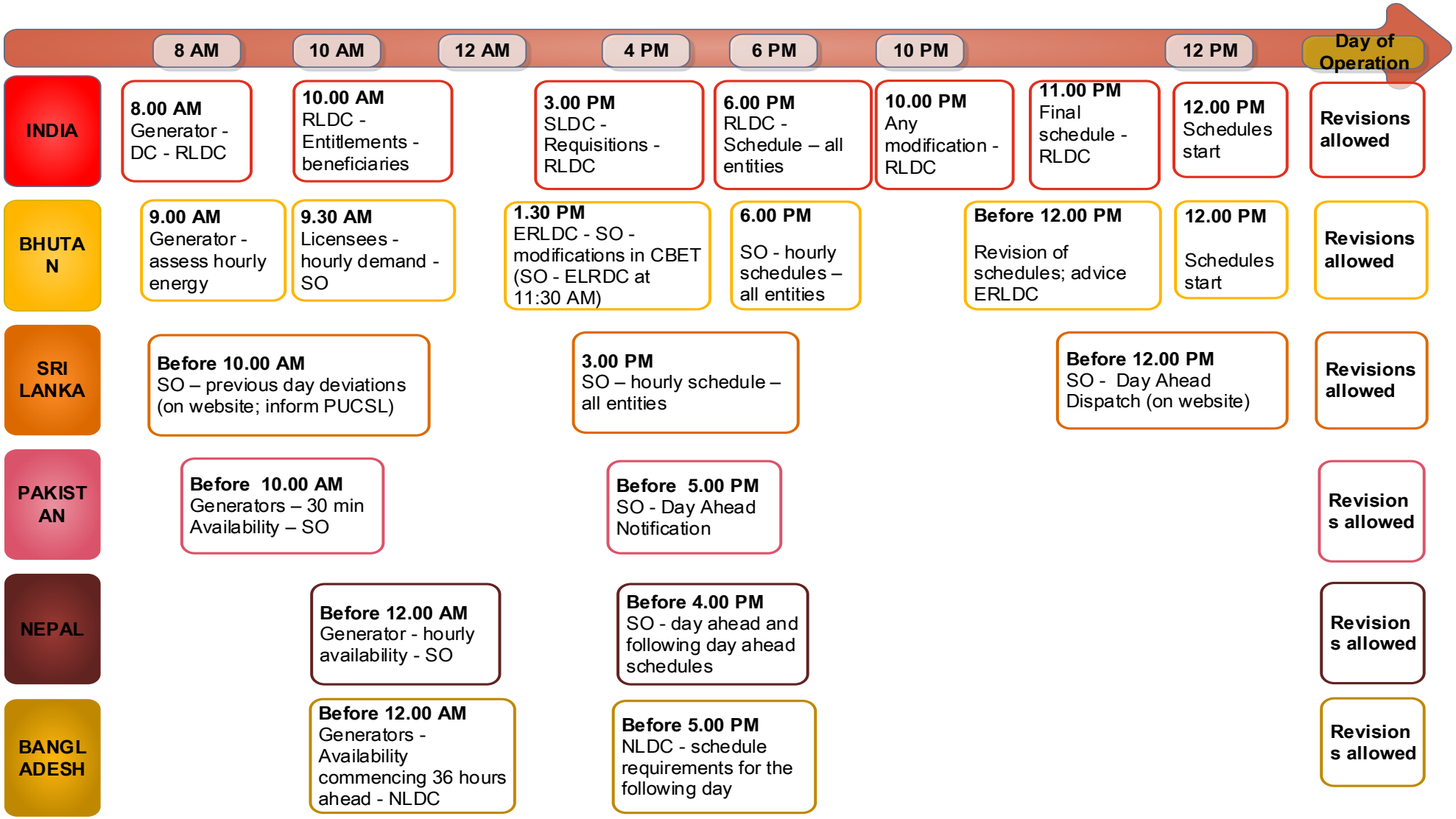
Scheduling & despatch timelines as per respective Grid Codes

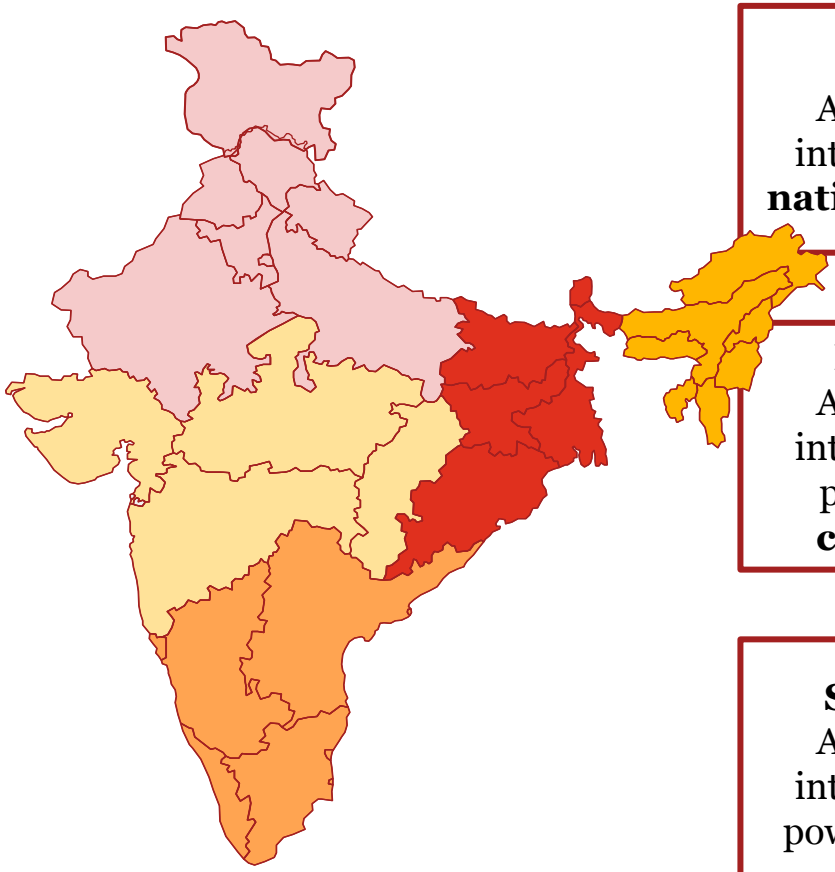


Scheduling & despatch activity to a large extent is undertaken on day-ahead basis

System Operation in India

System Operation entities are defined in Electricity Act 2003, no separate licence is granted:

- **Section 26(1)**: Central Govt. may establish a centre at the national level (NLDC)
- **Section 27(1)**: Central Govt. shall establish a centre for each region (RLDC)
- **Section 31(1)**: State Govt. shall establish a centre (SLDC)



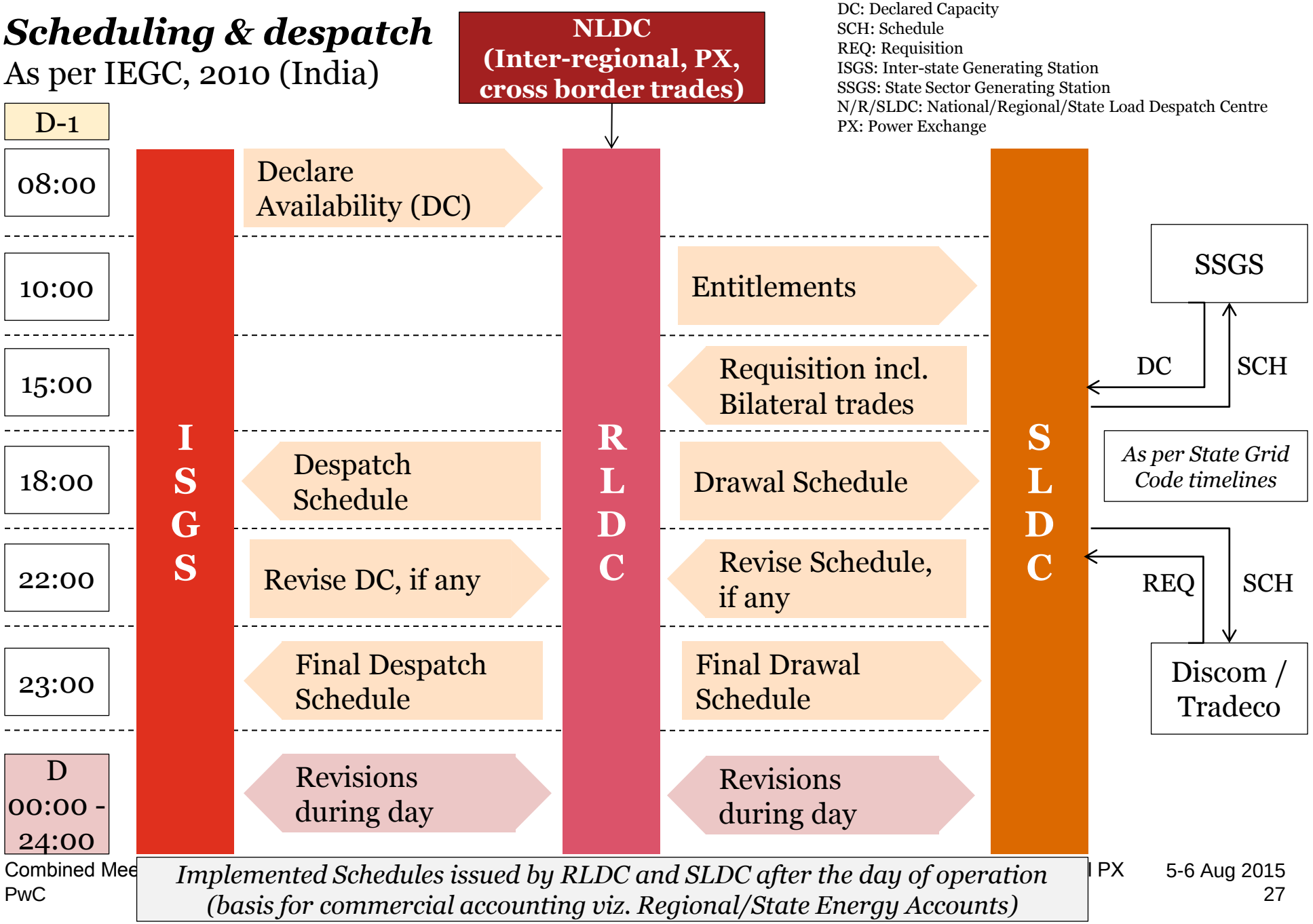
NLDC (1 no.):
Apex body to ensure integrated operation of **national power system**

RLDCs (5 nos.):
Apex body to ensure integrated operation of power system in the **concerned region**

SLDCs (33 nos.):
Apex body to ensure integrated operation of power system in a **State**

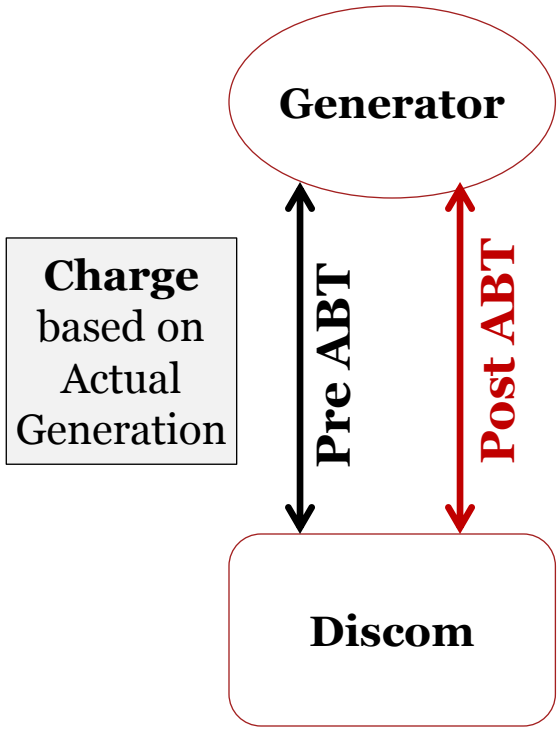
Scheduling & despatch

As per IEGC, 2010 (India)



Energy accounting & deviation settlement

Meter data used for billing in all SAC except India



Fixed / Capacity charge - based on ex-bus MW availability (DC)

Variable / Energy charge - based on ex-bus MWh schedule

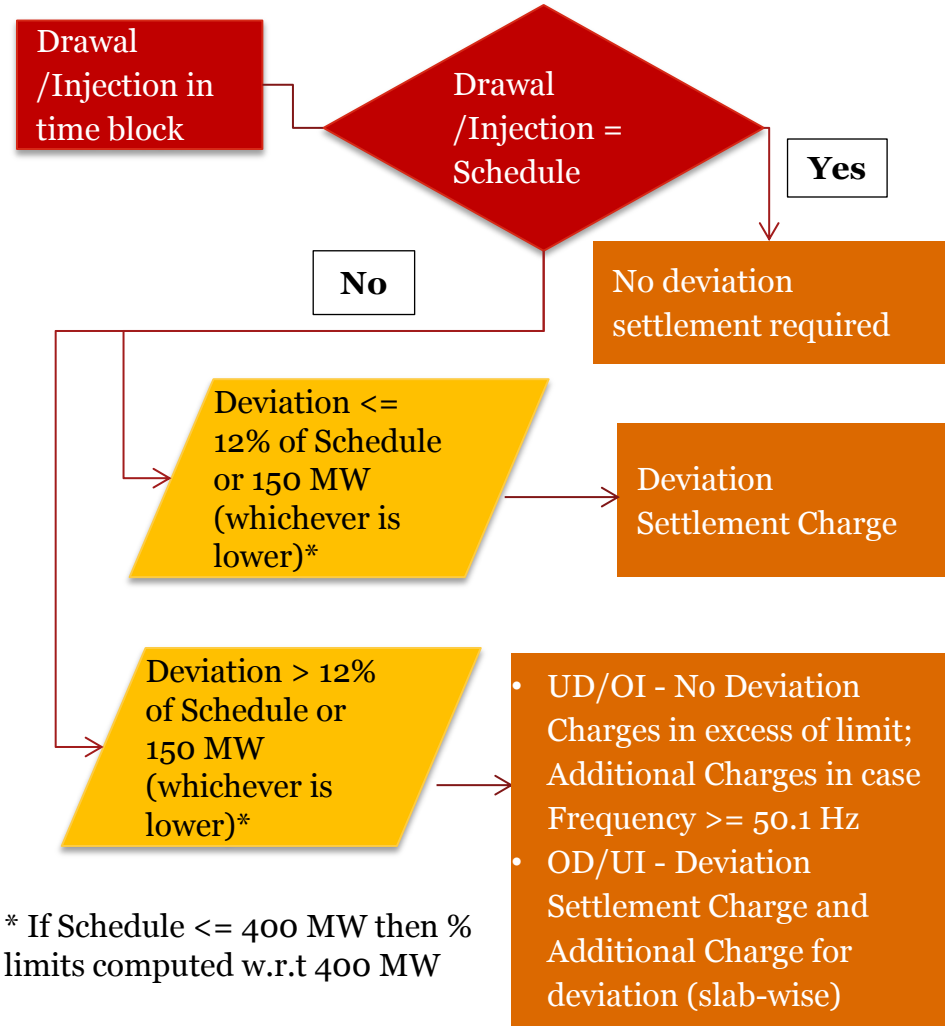
- **Regional Level:** Regional Power Committee (RPC) issue Regional Energy Account (REA) on a monthly basis containing Availability and Schedule for regional entities (viz. ISGS, State as a whole)
- **State Level:** SLDC issue State Energy Account (SEA) on a monthly basis containing Availability and Schedule for intra-state entities (viz. SSGS, Discoms)

Deviation - Difference between actual and scheduled MWh settled at frequency-linked rate

- **Pool Concept:** Paying Entities & Receiving Entities
- **Regional Level:** RPC issues Weekly Deviation Settlement Account (DSA)
- **State Level:** SLDC issues DSA (where intra-state ABT is implemented)

DSM procedure in India

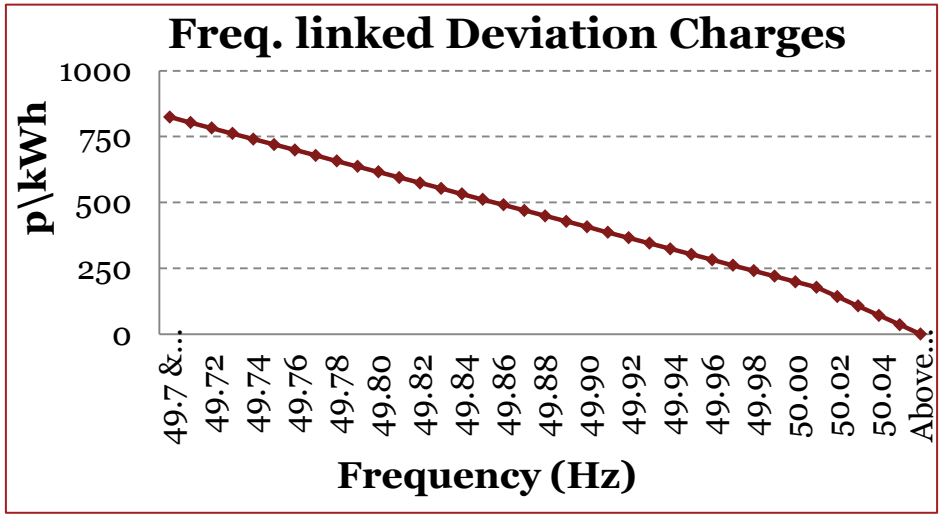
As per CERC (Deviation Settlement Mechanism and related matters) Regulations, 2014



* If Schedule <= 400 MW then % limits computed w.r.t 400 MW

Charges for Deviation

- Linked to grid frequency (in Hz)
- Defined for each 0.01 Hz
  - 35.60 paise/kWh (50.05-50.00 Hz); 20.84 paise/kWh (below 50.00 Hz)
- Cap rate for generators using coal, lignite, APM gas is 303.04 paise/kWh



Transmission planning

Country	Entity	Period of Plan	Key Inputs
Afghanistan	DABS	Period not specified	• Future demand • Upcoming generation capacity
Bangladesh	Distribution Utilities	20 years	• Peak load and energy forecasts • Long-term load demand forecasts • Least cost generation plan
Bhutan	System Operator	5 years (medium); 10 years (long)	• Load forecasts for medium, long
India	CEA, CTU, STU	CEA: 15 years (long); 5 years (short); CTU/ STU: one-year rolling network plan	• Long-term access requirements; • Medium-term and short-term access granted in case of availability of margins
Maldives	Not applicable		
Nepal	System Planning Department, NEA	15 years (long); 5 years (short)	• Demand forecasts • Least Cost Generation Expansion Plan
Pakistan	NTDC	10 years	• Generation Capacity Expansion Plan • Demand and energy forecast
Sri Lanka	Transmission Licensee	10 years	• Load forecasts • Generation Expansion Plan

Transmission capacity allocation in India

- **Total Transfer Capability (TTC):** Quantum of power that can be reliably transferred
- **Transmission Reliability Margin (TRM):** Margin kept in TTC
- **Available Transfer Capability (ATC):** Transfer capability available for scheduling LT, MT & ST transactions

SLDC to assess the TTC, TRM and ATC on its inter-state transmission corridors

RLDC to assess TTC, TRM and ATC for the inter-regional corridors at respective ends and intra regional corridors

NLDC to assess TTC, TRM and ATC for the inter-regional and intra-regional corridors

Congestion Management

Countries	Congestion Management procedure
Afghanistan*	Any congestion in transmission system is typically managed either by generation or load control. There is no specific provision detailed for congestion management in respective Grid Codes. *(* Generation or Load control is relatively easier and has least commercial implication in case of a vertically integrated utility)*
Bangladesh	
Bhutan*	
Maldives	
Nepal*	
Pakistan	
Sri Lanka	Transmission Licensee responsible for demand control and restoration of the transmission system in case outage occurs due to congestion in the system. However, there is no defined separate commercial mechanism.
India	A detailed commercial mechanism is put in place to manage congestion in transmission systems. (Please refer to sub-section below for details)

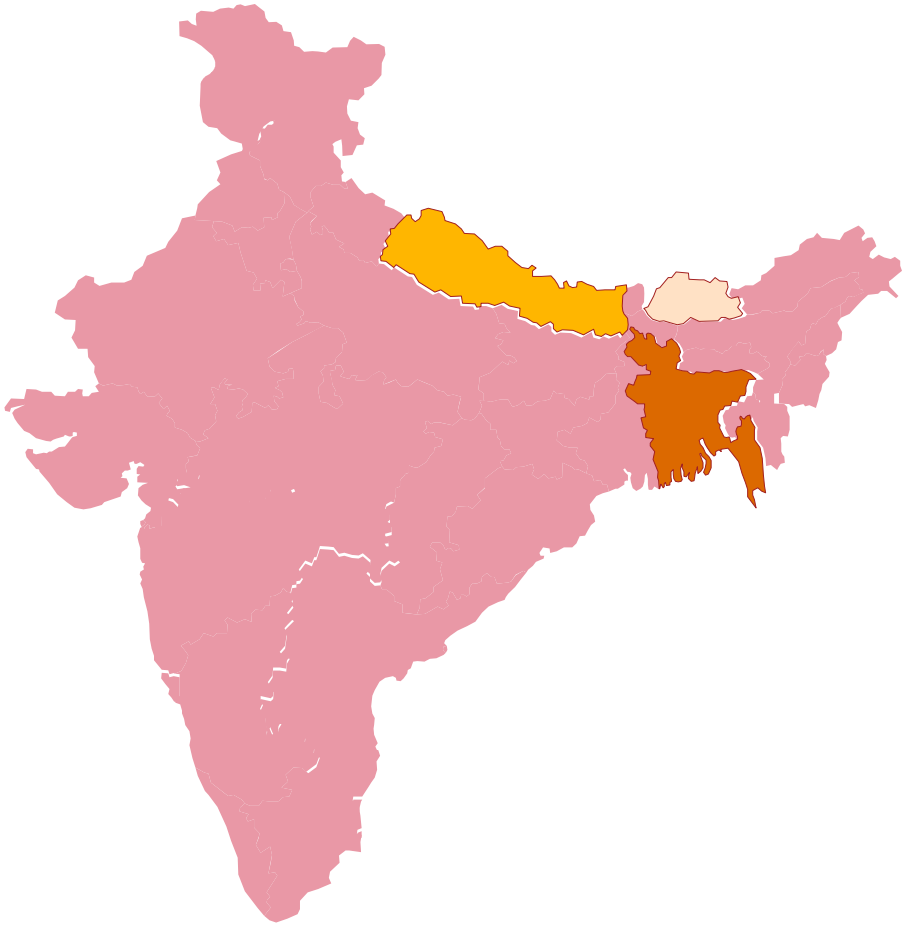
Congestion Management in India

- **Congestion charge** applied as a commercial measure to relieve the congestion
- If power flow crosses TTC limit → NLDC/RLDC may decide to apply congestion charge with a notice of at least two time blocks (warning issued if flow crosses ATC)
- Payable by entities causing congestion and Receivable by entities relieving congestion
- Congestion charges levied in addition to DSM charges
- Current rate of congestion charge: 5.45 INR/kWh
- RLDC to maintain Congestion Charge Account
  - Balance amount post settlement to be credited to Power System Development Fund (PSDF) → utilized for strategic projects, pilot projects, technical studies, capacity building etc.

Existing cross border electricity trades in SA region

6

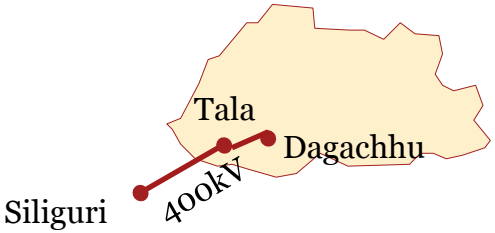
Existing cross border electricity trade between the SA nation



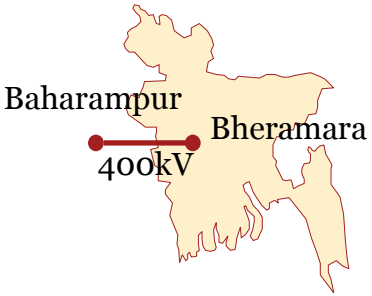
- **Bhutan → India**
  - Contract with PTC for Chukka, Kurichhu
  - Contract with PTC for Tala √
  - Contract with TPTCL for Dagachhu √
- **India → Bangladesh**
  - Long-term contract with NVVN for 250 MW √
  - Short-term contract with PTC for 250 MW √
- **India → Nepal**
  - Bilateral contracts / Treaties to the tune of 237 MW √
  - Past contracts with PTC (2011-2014) during December-April months for ~20-30 MW √

TPTCL: Tata Power Trading Company Limited; NVVN: NTPC Vidyut Vyapar Nigam

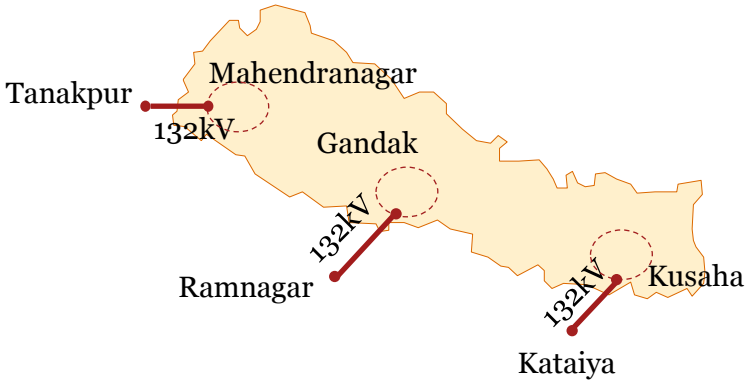
Existing cross border connectivity



- Connectivity via multiple links at 400 kV, 220 kV and 132 kV levels
- New lines planned in view of upcoming hydro plants
- Tala evacuation: Powerlinks Transmission Limited (POWERGRID 49% & Tata Power 51%)
- Agreement between Powerlinks and POWERGRID √



- 400kV Baharampur - Bheramara transmission line along with HVDC Back-to-Back stations
- New connectivity planned from Tripura side
- Agreement between POWERGRID and BPDB √



- Connectivity via three 132kV lines and eight 33kV lines on a radial mode
- 400kV Muzaffarpur (India) - Dhalkebar (Nepal), is being developed by two separate JVs on either side
- Agreement signed by NEA with both JVs (entire capacity booked by NEA) √

Key commercial terms & conditions in existing CBET PPAs … (1/5)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Parties	• Tala: DoE (RGoB) - PTC • Dagachhu: DHPCL - TPTCL	• NVVN: BPDB - NVVN • PTC: BPDB - PTC	• Treaty/Bilateral: GoI-GoN • PTC: NEA - PTC
Term	• Tala: 35 years • Dagachhu: 25 years	• NVVN: 25 years • PTC: 3 years	• Treaty/Bilateral: NA • PTC: 3-4 months from 2010-14 during Dec-Mar
Technology	• Hydro	• Thermal	• Thermal
Quantum	• Tala: 1020 MW (of which, surplus energy in excess of Bhutan's requirement) • Dagachhu: 126 MW (royalty power 12% for 12 years and 18% thereafter) - Presently entire power supplied to TPTCL	• NVVN: 250 MW • PTC: 250 MW	• Treaty/Bilateral: Approved 237 MW • PTC: ~20-30 MW
Delivery Point	• Indo-Bhutan border (400 kV Tala-Siliguri line)	• 400 kV Baharampur S/S	• Treaty/Bilateral: 132 kV links and few 33 kV links • PTC: 132 kV Tanakpur S/S

Key commercial terms & conditions in existing CBET PPAs … (2/5)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Tariff Structure	• Single-part	• NVVN: Two-part • PTC: Two-part	• Single-part
Principle of determination	• Negotiated	• NVVN: CERC (agreed based on negotiation) • PTC: Competitive bidding	• Negotiated
Tariff	• Tala: 1.8 INR/kWh for 1st year (now 1.98 INR/kWh) • Dagachhu: 2.4 INR/kWh for 1st year (started in 2015)	• NVVN: 2.40-2.86 INR/kWh (Aug'14 to May'15) • PTC: 4.26-5.00 INR/kWh (Dec'13 to May'15)	• Treaty/Bilateral: Current 5.4 INR/kWh • PTC: 4.55, 4.35, 4.30, 3.75 INR/kWh (FY11-FY14)
Escalation	• Tala: 10%/5 years till loan repay; 5%/5 years later • Dagachhu: 2%/year till 15 years. Mutual disc. post that	• NVVN: Linked to CERC • PTC: Fixed	• Treaty/Bilateral: NA • PTC: Fixed
Tariff Recovery	• Payable on actual metered energy at delivery point	• NVVN: FC on DC & VC on Schedule Energy • PTC: FC on DC & VC on Schedule Energy	• Treaty/Bilateral: Actual metered at delivery points • PTC: Payable on scheduled energy at delivery points

Key commercial terms & conditions in existing CBET PPAs … (3/5)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Trading Margin	• Tala: PTC 0.04 INR/kWh • Dagachhu: TPTCL No fixed margin	• NVVN: 0.04 INR/kWh • PTC: TBC	• Treaty/Bilateral: - • PTC: INR/kWh 0.55 (FY11), 0.35 (FY12), 0.30 (FY13), 0.25 (FY14) on account of trading margin, OA charges & trans. Losses
Billing Frequency	• Monthly	• Monthly	• Treaty/Bilateral: Monthly • PTC: Weekly
Currency	• INR	• USD	• INR
Due Date	• Tala: 30 days • Dagachhu: 10 days	• 60 days	• Monthly
Rebate	• None	• NVVN: 2% if paid through LC or 1% if paid within 25 days	• PTC: TBC
Late Payment Surcharge	• Tala: 1%/month • Dagachhu: SBI PLR+2%/year	• NVVN: 1.25%/month	• PTC: TBC

Key commercial terms & conditions in existing CBET PPAs … (4/5)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Payment Security Mechanism	• Tala: PTC to credit amount from beneficiaries to a designated account and Bhutan will have direct claim in case PTC defaults • Dagachhu: Letter of Credit ✓ Irrevocable revolving LC in schedule Bank (India) ✓ Value = Max. generating month revenue (seasonality factored) ✓ 12 months term	• NVVN: Letter of Credit; Sovereign Guarantee • PTC: Letter of Credit	• Treaty/Bilateral: NA • PTC: Letter of Credit
Dispute Resolution	• Tala: Amicable Settlement → Referred to both Governments • Dagachhu: Amicable Settlement → Arbitration at Singapore International Arbitration Centre (SIAC)	• NVVN: Amicable Settlement (3 levels) → Arbitration at SIAC • PTC: Amicable Settlement → Arbitration at SIAC	• Treaty/Bilateral: - • PTC: Amicable Settlement → Arbitration at SIAC

Key commercial terms & conditions in existing CBET PPAs … (5/5)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Scheduling & Imbalance settlement	• Tala: No such provision. But done by ERLDC at Indo-Bhutan boundary. DSM charges borne by beneficiaries • Dagachhu: DP same as Tala. Interim arrangement proposed by CERC. TPTCL is responsible for scheduling and also Eastern Region DSM pool member	• NVVNL designated as Nodal Agency for CBET between India and Bangladesh • 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	• Treaty/Bilateral: Billing on Actual Energy. No scheduling or DSM settlements • PTC: NEA used to send daily schedules to PTC and PTC coordinated with NRLDC. DSM charges were levied on NEA

Key commercial terms & conditions in existing CBET TSAs … (1/3)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Parties	• POWERGRID - POWERLINKS	• POWERGRID - BPDB	• NEA - PTCN • NEA - CPTC
Term	• 25 years	• 35 years	• 25 years
Tariff / Transmission Charge	• POWERGRID to pay POWERLINKS tariff determined as per prevailing CERC regulations • POWERLINKS filed Tariff petition for 2014-19 period	• BPDB to pay POWERGRID tariff determined as per prevailing CERC regulations • POWERGRID filed Tariff petition for its part to CERC. Provisional Tariff allowed at 240.9 million INR (FY14)	• Basis for Tariff (Nepal part) TBC: ✓ RoE, Interest on loan, Depreciation, Interest on WC, O&M expenses • Basis for Tariff (India part): Tariff to be determined by CERC as per prevailing regulations
Tariff Recovery	• Tariff to be paid on Availability (normative availability of 98%)	• Tariff to be paid on Availability	• Tariff to be paid on Availability

Key commercial terms & conditions in existing CBET TSAs … (2/3)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Billing Frequency	• Monthly	• Monthly	• TBC
Due Date	• 30 days	• 45 days	• TBC
Rebate	• None	• None	• TBC
Later payment Surcharge	• 1.5% / month in case of delay	• Applicable in case of delay beyond 60 days	• TBC

Key commercial terms & conditions in existing CBET TSAs … (3/3)

	Bhutan→ India	India→ Bangladesh	India→ Nepal
Payment Security Mechanism	• Letter of Credit ✓ Irrevocable revolving LC in schedule Bank in India ✓ Value = estimated one month charges ✓ 12 months term	• Letter of Credit	• Letter of Credit ✓ Irrevocable revolving LC in favour of PTCN / CPTC in a schedule Bank in Nepal / India ✓ Value = 105% of estimated one month charges ✓ 12 months term • NEA to also furnish Bank Guarantee valid for 12 months for an equivalent value of one year charges
Dispute Resolution Mechanism	• Amicable Settlement→ Adjudication→ Arbitration (India)	• Amicable Settlement→. Referred to both Governments	• TBC

Power Exchanges

7

Transaction in PX: Indian Experience

7.1

Types and features of Power Exchange contracts

Type of Contracts:

- Day-Ahead Market (DAM)
  - Day-ahead Contracts
- Term-Ahead Market (TAM)
  - Day-Ahead Contingency Contracts
  - Intra-Day Contracts
  - Daily Contracts
  - Weekly Contracts*

General rules for bidding for DAM:

- Trading system: Internet interface with PX
- Sellers/Buyers can bid for one or more 15 minute blocks
- Bidding time: 10:00 AM to 12:00 noon of previous day
- Minimum bid volume: 0.1 MW
- Minimum bid volume step: 0.1 MW
- Minimum bid step: Re. 1/MWh

Type of Contract:	Day-Ahead Contracts	Day-Ahead Contingency Contracts	Intra Day Contracts	Daily Contracts	Weekly Contracts
Details	Trading to a day before delivery	Trading to a day before delivery and after DAM auction	Trading on delivery day few hours before delivery	Trading up to 1 Week in advance for any calendar day	Trading up to 2 weeks in advance for any calendar week

** Weekly contracts can be revised after 2 days of start of transaction*

Discovery of Unconstrained Market Clearing Price (UMCP) and Volume (UMCV) for Day-ahead Market (double-sided closed auction)

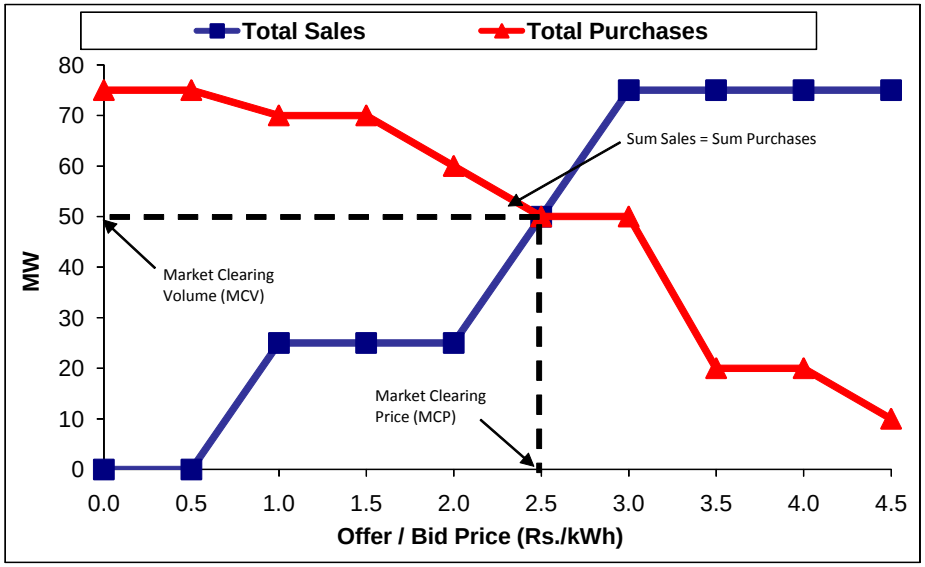
Offer / Bid No.:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Offer / Bid Price (INR/kWh):	**0.0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
Seller 1 (MW)	0	0	25	25	25	50	50	50	50	50
Seller 2 (MW)	0	0	0	0	0	0	25	25	25	25
Purchaser 1 (MW)	25	25	20	20	20	10	10	0	0	0
Purchaser 2 (MW)	50	50	50	50	40	40	40	20	20	10
Total Sales	0	0	25	25	25	50	75	75	75	75
Total Purchases	75	75	70	70	60	50	50	20	20	10
Net transaction	**75**	**75**	**45**	**45**	**35**	**0**	**-25**	**-55**	**-55**	**-65**

Seller 1 will get paid Rs. 2.5/kWh for 50MW

Seller 2 will not get despatched

Purchaser 1 will pay Rs. 2.5/kWh for 10MW

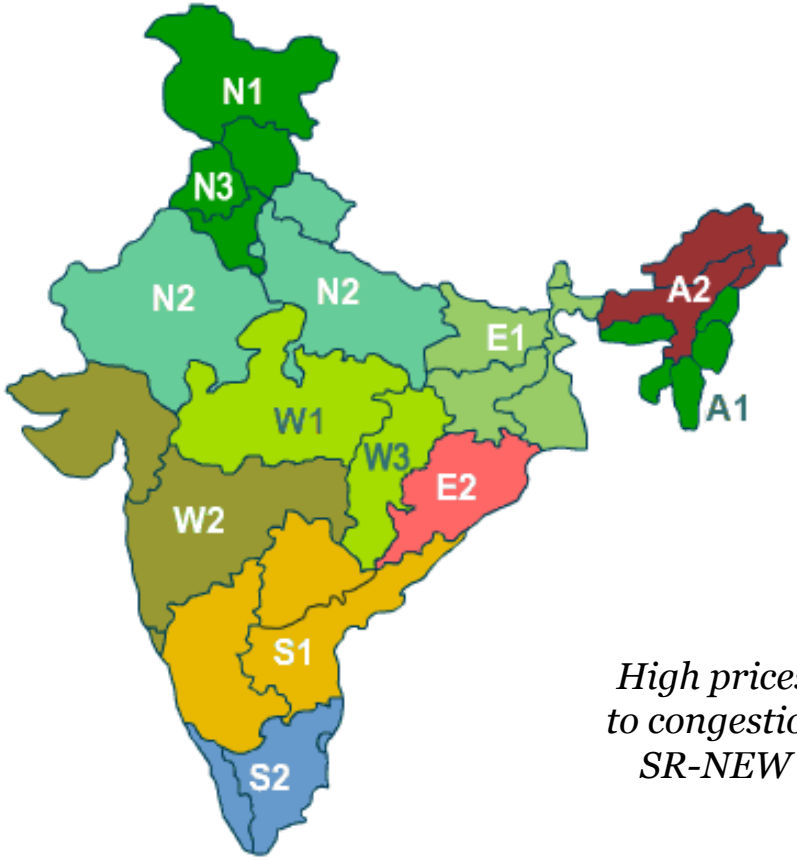
Purchaser 2 will pay Rs. 2.5/kWh for 40MW



Subsequently, transmission constraints are imposed which may lead to market splitting

Managing congestion through market splitting

Five regions divided in to 12 sub-regions (each sub-region is a separate bid area)



Region position	Sale volume	Purchase volume	Impact on price
Surplus	↓	↑	↓
Deficit	↑	↓	↑

Area Clearing Prices (INR/MWh)			
	FY12	FY13	FY14
A1	3285	3261	2445
A2	3285	3261	2445
E1	3272	2910	2424
E2	3272	2910	2424
N1	3273	3129	2552
N2	3273	3129	2552
N3	3283	3130	3106
S1	5129	6863	4734
S2	5280	7292	5583
W1	3266	3073	2518
W2	3266	3073	2518
W3	3266	2794	2252
UN_MCP	**3536**	**3487**	**2802**

High prices due to congestion on SR-NEW links

Low prices due to high generation in Chhattisgarh

Applicable charges and transaction process

	Charges
SLDC Scheduling & Operating Charges	INR 2000/client/day
NLDC Scheduling & Operating Charges	INR 5000/day divided into successful portfolios of regional entities
NLDC Application Fee	INR 5000/day divided into successful portfolios
PX Transaction Fee	INR 20/ MWh
Trading Margin	INR 70/ MWh (max)

Example for understanding charges in a PX transaction

Pre-trade Margin Check

- On D-1 day at 09:30 Hrs.
- Equal to the initial margins or average of last 7 days' trading value, whichever is more

Clearing

- On D-1 day at 12:30 Hrs.
- Preliminary Obligation =< Funds Available (including initial margin) → block funds
- Else, reject the bid

Pay-ins

- On D-1 day at 15:30 Hrs.
- Transfer from Consumer/ Member settlement account to PX account

Pay-outs

- On D+1 day at 14:00 Hrs.
- Transfer from PX account to Consumer/ Member settlement account

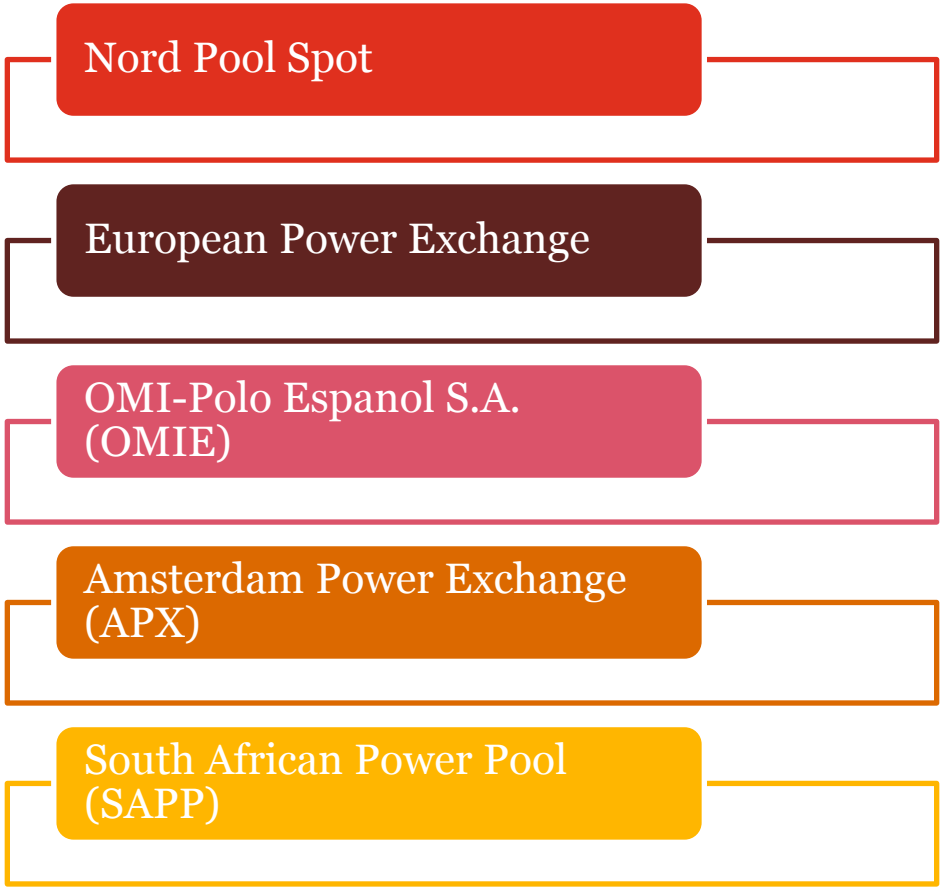
Study of Cross border / Regional PXs

7.2

Study of existing Cross Border Power Exchanges

Reviewed select Cross Border / Regional Power Exchange (RPX) on following aspects:

- Evolution
- Ownership & Governance
- Products
- Other key features



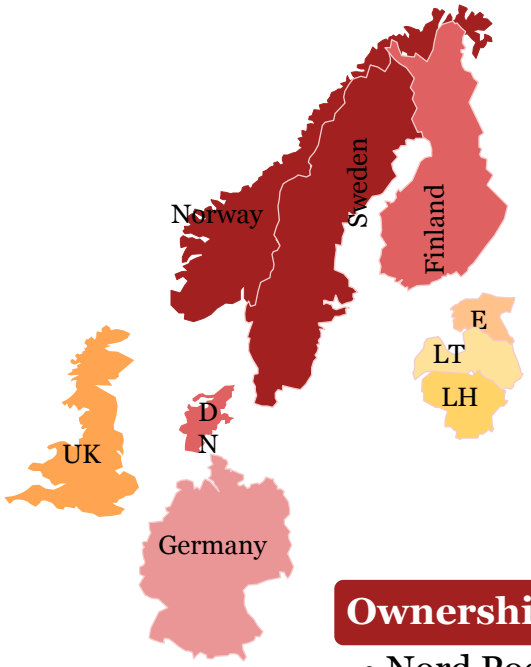
Nord Pool Spot

Evolution

- Norway was first amongst Nordics to deregulate power markets
- In 1996, Norway & Sweden established Nord Pool

- By 2000, Finland & Denmark joined the pool

- Germany (2006), UK (2010) & Baltic countries (2013) joined



Products

- Elspot: Day-ahead market (DAM)
- Elbas: Intra-day market (IDM)

Currencies for settlement

- EUR, NOK, SEK & DKK for DAM
- EUR for IDM
- To trade in a specific currency, a pledged/non-pledged account in that currency is required

Salient features:

- TSOs of Norway and Sweden established Nord Pool
- Renaming of Nord Pool after all Nordic countries joined
- Separation of Energy & Derivatives markets; NPS to handle Energy market

Ownership

- Nord Pool Spot AS is owned by Nordic & Baltic TSOs

Governance

- Governance includes Board of Directors and Customer Advisory Board

Regulator

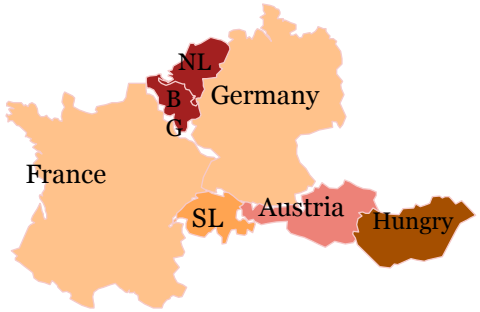
- Nord Pool Spot AS is licensed by Norwegian Water Resources and Energy Directorate (NVE) and by Norwegian Ministry of Petroleum and Energy

Disclaimer: Use of map is for demonstration purpose only and not to define, emphasise or justify political or statutory boundaries

EPEX Spot

Evolution

- Inspired by experience by Nordic countries, France (2001) & Germany (2002) established their national PXs
- In 2008, French & German PXs merged to form EPEX Spot
- Subsequently, Switzerland and Austria joined
- In 2015, HGRT took-over 36.7% of shareholding of EEX
- In 2014, EPEX spot also started operating Hungarian PX



Products

- Day ahead auction (~DAM)
- Intra-day auction (~IDM)

Currencies for settlement

- EUR

Ownership

- 2015: Powernext (50%), EEX (13.3%) and HGRT (36.7%)

Governance

- Shareholders of EPEX spot appoint a Supervisory Board
- An Exchange Council comprising of 16 members & 5 permanent guests is the governing body
- A Market Surveillance Office reporting to board & council also set up. It monitors the market regularly

Salient features:

- Nord Pool Spot made active contributions in establishment of national PXs in France & Germany
- Powernext SA (France) and EEX AG (Germany) merged in 2008 to form EPEX Spot with 50% equity each
- In 2014, EPEX Spot also started operations in Hungarian power market on behalf of Hungarian PX (HUPX)
- 2015, HGRT (holding of TSOs of Belgium, France & Netherlands) took over 36.7% share of EEX AG (Germany)

HUPX - Hungarian Power Exchange; HGRT - Holding de Gestionnaires de Réseaux de Transport; TSO – Transmission service operators

OMIE

Evolution

- OMEL, national PX of Spain, operated day-ahead market since 1998
- In 2007, Portugal joined OMEL; renamed as OMIE

Products

- Day ahead auction (~DAM)
- Intra-day auction (~IDM)

Currencies for settlement

- EUR

Salient features

- National Electricity Market Act of Spain ensured significant volume was traded on Spanish national PX – all power not traded bilaterally had to be sold through PX
- Portugese market opened and joined OMEL in 2007 – resulting in restructuring of OMEL to OMIE
- Spanish Operator OMIE takes care of physical market operation; while Portuguese OMIP handles futures market

Ownership

- Spanish company OMEL (50%) & Portuguese company OMIP SGPS SA (50%)

Governance

- OMIE is regulated by the Santiago International Agreement between Spain & Portugal on implementation of an Iberian electricity market (MIBEL)

Regulator

- CNE (Spain) & ERSE (Portugal)

OMIE – OMI-Polo Espanol S.A. (OMIE); CNE - Comision Nacional de la Energia (National Energy Commission); ERSE - Entidade Reguladora Dos Servicos Energeticos (Energy Services Regulatory Authority)

APX

Evolution

- Amsterdam and UK launched national PXs in 1999 and 2000, respectively
- In 2001, UK launched APX-UK Spot later integrated with Amsterdam PX in 2003 to constitute APX
- National PXs were launched in the Netherlands (2005) and Belgium (2006)
- In 2008, APX-ENDEX company was formed after APX acquired energy derivatives exchange ENDEX
- In 2010, APX-ENDEX and Belgian PX got merged
- In 2013, APX-ENDEX got separated into two exchanges- APX (power) and ENDEX (gas)

Salient features

- Concept of one European power exchange is next step of evolution with existing regional PX like APX being merged with others
- In 2015, APX got merged with EPEX Spot
- Next step is creation of Integrated Europe

Products

- Day ahead auction (~DAM)
- Intra-day auction (~IDM)
- UK Half –hour DAM

Currencies for settlement

- EUR & GBP

Ownership

- TenneT Holding BV (70.84%) & Elia System Operator NV (29.16%)

Governance

- Multi-layered governance structure comprising of Supervisory Board, Management Team & Market Development Advisory Board

Regulator

- ACM (the Netherlands), OFGEM (UK) & CREG (Belgium)

ACM – Authority for Consumers & Markets; OFGEM – Office of Gas and Electricity Markets; CREG – Commission for Regulation of Electricity & Gas

Integrated Europe – evolving market structure

European Commission aims to create a pan-European market with closer connection of power markets to improve efficient use of energy across national borders :

Creation of ENTSO

- In 2011, 41 TSOs from **34 countries** came together to develop network codes to facilitate integration and harmonisation of European electricity market
- It will include system connection codes, market codes and system operations codes
- Each code will be submitted to European Commission for approval
- Subsequently, it will be voted into EU Law and implemented across member states

Cross-border Intra-day (XBID) Market

- PXs and TSOs from 12 European countries (*Austria, Denmark, Germany, Belgium, Finland, France, UK, Italy, Luxembourg, Norway, Switzerland and Netherland*) initiated XBID project to cater to Intra-Day cross-zonal market
- This initiative will assist members to trade imbalances not only through available intra-day liquidity in national market but also from available liquidity in other areas
- It is expected to be operative from 2017

Price coupling of regions (PCR)

- In 2009, 7 European PXs (APX, Belpex, EPEX SPOT, GME, Nord Pool Spot, OMIE and OTE) launched PCR initiative to calculate electricity prices across Europe and allocate cross-border capacity on a day-ahead basis
- PCR Cooperation and PCR Co-ownership Agreements were signed in June 2012
- In Feb 2014, TSOs & PXs in North-Western Europe (NWE) launched PCR for NWE

South African Power Pool (SAPP)

Evolution

- Inter-Governmental MoU signed in 1994 established SAPP
- In 1995, 2 network links set-up via Botswana
- SAPP started short term market in 2001
- 2009: Launched competitive electricity market - DAM
- 2010: Operating guidelines finalized; SAPP fully operational

Products

- DAM, IDM & FPM (Forward Physical Market)

Settlement currency

- USD or ZAR

Governance

- Presently comprises of 16 utilities, independent transmission companies and IPPs from Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe
- Each member contributes an amount annually as agreed in Inter-Governmental MoU

Salient features:

- Inter-Governmental MoU gathered all national power utilities throughout region and defined the management & operating interactions
- Agreement between members defines operating rules and pricing

Key takeaways

Evolution history

- Initially, PXs may start operations in one or two countries. Subsequently, they may be expanded to other countries as cross border PX through merger & demerger or through acquisition of equity stake in national PXs

Ownership

- Cross border PXs have TSOs, national PXs or market operators as owners

Governance Structures

- Cross border PXs should have robust, multi-level governance structures including supervisory boards, management team/board and advisory committees

Products

- Day Ahead Market (DAM) and Intra Day Market (IDM), a variant of Term Ahead Market (TAM), are the main products offered on all national and Cross border PXs around the world

Settlement

- Popular practice of commercial settlement is through advance margins and collaterals as per the governing rules of the PX concerned

Way forward

Data requirement

Requesting support from Task Force Members in obtaining following data/ information which will enable us to comprehend the As-Is scenario in a comprehensive manner

Sl. No.	Information requirement	Country
1	Commercial T&C in PTC – NEA short-term contract - Rebate on early payment, Late payment surcharge	India-Nepal
2	Commercial T&C in ITSA signed by NEA for 400 kV Muzaffarpur - Dhalkebar line – Transmission Tariff for Nepal part; billing frequency, due date, Rebate, Surcharge, dispute resolution procedure	India-Nepal
3	Commercial T&C in NVVN & PTC to BPDB contracts – treatment of losses	India-Bangladesh

Next steps - Activities & Views/Inputs

Designing Framework

- Operational aspects
- Commercial aspects
- Institutional Framework

Developing PPA

- Standard Terms & Conditions
- Commercial Terms
- Other terms & Conditions

Transmission Framework

- Developing TSA- standard & Other terms
- Develop & recommend economic & efficient pricing framework

Power Exchange Model

- Selecting suitable model
- Ownership & Governance
- Key features

Thank you

Appendix 1
Supporting slides

Scope of work

Review existing studies/published literatures/reports on creation of SAREM
Review and analyze tariff structures, commercials T&C, tariff principles related to G&T prevailing in each SAC
Review and analyze for each SAC, power scheduling & dispatch procedures, energy accounting system, treatment of unscheduled deviations, and associated financial & dispute settlement systems, etc. for electricity transaction/trade in each SAC and in case of CBET also
Review and analyze prevailing institutional structure/arrangements for granting of OA, power scheduling and dispatch, transmission capacity allocations, settlement of the unscheduled deviations mechanisms and associated financial settlement, granting permission/ licenses for system operation, power trading, operating power exchanges, etc. for electricity trade transaction/trade in each of SAC in case of CBET also
Review existing/proposed long, medium and short-term agreements (PPAs, TSAs, etc.) for CEBT in SA - focus should be on commercial arrangement to see how commercial aspects have been addressed in these agreements, especially those which are already signed
Study in detail institutional set up (including international best experiences/practices) and coordination procedures relating to the power trade including PX in all SAC - specific focus on all aspects relating to PX operation in India such as market rules, various applicable charges, security mechanism, and dispute resolution etc.

PPAs in each SAC

Country	PPA	Reference
Afghanistan	Model PPA - Sheberghan Gas Generation Activity	USAID
Bangladesh	PPA between BPDB & 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

Term of the agreement

	Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
Term	25 years	15 years	LT: Above 7 years up to 25 years MT: Above 1 year to 5 years	Less than or equal to 1 year	To be specified as per the RE technology	20 years	20 years
Technology	Thermal (Gas)	Thermal (Coal)	Thermal (Coal)	-	RE	Hydro	RE

Tariff/Charges

Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
Capacity Charge: • Approved costs like EPC costs, taxes & duties, emergency spares, mobilization cost, Land lease, fees and infrastructure, Development costs, finance charges, depreciation etc. Energy Charge: • Based on the actual kWh off-take, and consists of fuel cost and the variable O&M cost Tariff indexed for forex adjustment	Reference Capacity Price: • Non-escalable component • Local escalable component • Foreign escalable component Reference Energy Price: • Price of fuel • Local variable O&M cost • Local variable O&M cost Tariff indexed for forex adjustment by truing-up	Fixed Charge: • Bidder quotes Initial Fixed Charge • Decreased by 2% per year from COD (only for LT) • Revised to reflect 30% variation in WPI from Bid Date Fuel Charge = SHR x Landed cost of Coal/GCV • Landed cost of Fuel: • Price of Fuel (linked to Bid & pre-determined cap / escalations) • Cost of transportation & washing • Cost of crushing & Other charges Fuel Options: Hydro is allowed in only MT. Also, No use of concessional fuel in MT	Single-part tariff: • Tariff determination through following: • Competitive bidding guidelines or • Mutually agreed between the generator/trader and the buyer	Two-part: • Fixed Charges and Variable • (To be specified as per the RE technology)	• Rate of NPR 4.80/kWh in wet seasons and NPR 8.40/kWh in dry seasons. • Also, escalation at the rate of 3% per annum to be applied till 5 years after completion of one year of Commercial Operation Date. Constant thereafter.	• Tariff for entire 20-year period shall be LKR 13.04 /kWh. The flat tariff will not be escalated for any reason over the entire 20-year period

Tariff recovery

Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
• Capacity charge payable in equal monthly instalments. If, Availability greater than Minimum Generation Quantity. Otherwise, capacity charge to be reduced in pro-rata. • Energy charge payable on Actual Energy.	• Payment of Capacity charge linked to Dependable Capacity (Capacity reduction on account of maintenance outage, forced outage, schedule outage) • Energy charge payable on Actual Energy	• Fixed Charge linked to Availability • Energy Charge payable on Scheduled Energy • Any deviation from Scheduled Energy is settled through DSM/UI mechanism.	• Tariff payable on Scheduled Energy		• Tariff payable on Actual Energy	• Tariff payable on Actual Energy

Availability, incentive and damages

	Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
Availability	Provision of Minimum Generation Quantity to be demonstrated by Generator for full Capacity charge recovery.	NA	Normative Availability: 85% (MT) and 90% (LT)	**Deviation** allowed from actual scheduling: 15% of contracted power as per the approved open access on monthly basis Deviation from procurer end >15%: procurer to pay compensation at 20% of tariff for the quantum of shortfall in excess of permitted 15% deviation Deviation from seller end >15%: seller to pay compensation at 20% of tariff for the quantum of shortfall in excess of permitted 15% deviation	Minimum Payment Obligation: If Consumer consumes electrical energy which is less than electrical energy equivalent to 60% PLF in any Billing Period, then consumer needs to pay aggregate fixed & variable charges equivalent to 60% PLF	Normative Availability: 80%	NA
Incentive			Incentive: 50% of Fixed Charge for Availability in excess of 90%. However, such incentive will be payable only on Despatch				
Damages			Damages: In case Availability is less than 85%, reduction in 25% of Fixed Charge to the extent of shortfall			Damages: In case of availability is less than 80%, compensation to be paid to NEA	

Billing & payment terms

Parameter	Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
Frequency	Monthly billing	Monthly billing	Monthly billing	Weekly	Bi-monthly billing	Monthly billing	Monthly billing
Due Date	30 days	30 days	30 days	9 days	5 days	45 days	30 days
Rebate / Surcharge	Pay interest for period of delay	If failed to receive payment by the due date, the Company shall be entitled to draw on the BPDB Letter of Credit	Rebate: 1% of the amount comprising the tariff if Utility pays within 5 days of submission Surcharge: Pay interest for period of delay calculated at 5% above the Bank Rate	Rebate: 2% of billed amount if payments made within due date Surcharge: 1.25% /month on all payments remaining unpaid for more than 30 days from the date of receipt of the bill	Surcharge: Pay interest for period of delay calculated at 2.5% above the Bank Prime Lending Rate per annum	Pay interest on that at the rate of 6% per annum	Any undisputed amounts unpaid after the Due Date shall bear interest at the Prime Rate compounded on a monthly basis

Payment Security Mechanism

Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
Payment guarantees in the form of escrow accounts, stand by letter of credit and scroll accounts to reduce the risk of non-payment	**Letter of Credit** • LC amount equal to 2 months of Capacity payments and Variable O&M cost at a 80% of Contracted Facility Capacity	**Default Escrow Account** • Maintained at a bank where at least 30% of Utility's total monthly revenues are deposited • 30% of annual Fixed Charge routed monthly through this Account • 20% of annual Fixed Charge withheld from 25th day of month until discharge of invoice **Letter of Credit** • LC amount equal to 20% (for LT) and 30% (for MT) of Annual Fixed Charge • LC can be encashed if dues are unpaid till 22 days from PDD **Third Party Sales** • Right to sell capacity if dues are unpaid till 1 month from PDD	**Letter of Credit** • LC amount linked to billing cycle	**Letter of Credit** • LC amount equal to 2 months of Fixed and Variable Charges at a 100% PLF	NA	NA

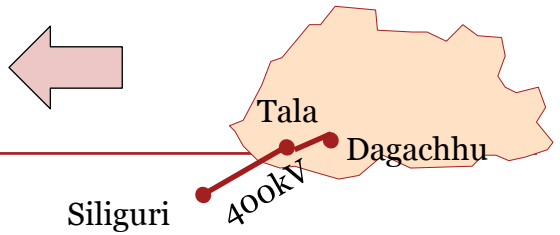
Dispute Resolution

	Afghanistan	Bangladesh	India (LT & MT)	India (ST)	Maldives	Nepal	Sri Lanka
Conciliation (Amicable settlement)	• Settlement between both parties • Mutually agreed expert	• Mutual Discussions • Referral to Chief Executive Officer • Mediation by Expert	• Independent Engineer (only for LT) • Chairman of BoD of the parties	Dispute / difference shall in the first instance be resolved amicably by mutual consultation within 15 days	Settlement between both parties	• Mutual Discussions • Referral to Chief Executives	• Settlement between both parties • Mutually agreed expert (either self-appointed or by Govt. of SL)
Arbitration Tribunal	As per provisions under the International Chamber of Commerce (ICC)'s Rules of Arbitration	As per provisions under Bangladesh Arbitration Act of 2001, (Act I of 2001)	As per provisions of Arbitration and Conciliation Act, 1996	As per Arbitration and Conciliation Act, 1996 and EA 2003	As per provisions under laws and regulations of Maldives	As per provisions under prevalent arbitration law of Nepal	As per provisions under the Arbitration Act No. 11 of 1995

Adjudication (ONLY FOR INDIA - LT & MT)

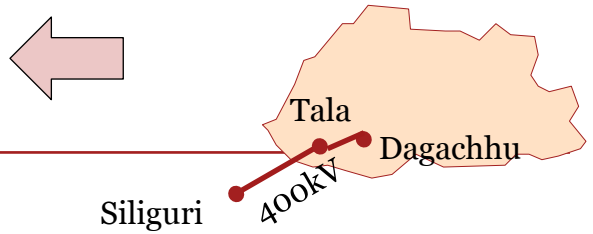
- **Adjudication by the Commission:** Required to be adjudicated by Commission as per Applicable Laws
- **Adjudication by a Tribunal:** In the event of constitution of statutory tribunal, all disputes referred to the tribunal

Bhutan → India



	Tala hydro project (PTC)	Dagachhu hydro project (TPTCL)
PPA parties	DoE, RGoB - PTC	DHPCL - TPTCL
Duration	35 years (operating years)	25 years from COD
Quantum	1020 MW (Surplus energy in excess of Bhutan's requirement)	126 MW (royalty power 12% for 12 years and 18% thereafter) - Presently entire power inclusive of royalty is being supplied to TPTCL
Delivery Point (DP)	Indo-Bhutan border (400 kV Tala-Siliguri)	Siliguri (same as Tala)
Tariff	1.8 INR/kWh for 1st year (Negotiated Tariff) Current rate 1.98 INR/kWh	2.4 INR/kWh for 1st year (Negotiated Tariff) (Transaction started in 2015)
Escalation of Tariff	Increased by 10% every 5 years till loan repayment and 5% every 5 years thereafter	Increased by 2% per annum till 15 years. Mutually discussed post 15 years.
Tariff Recovery	Payable on Actual metered energy at DP	Payable on Actual metered energy at DP
Treatment of Losses	DP falls in between the lines at Indo-Bhutan boundary. Energy at DP computed by assuming transmission losses linked to line length based on meter data. Tala to bear losses up to DP and PTC to bear losses from DP onwards.	Dagachhu to bear losses up to DP and TPTCL to bear losses from DP onwards. The delivery point for Dagachhu and Tala are same. Interim arrangement by CERC

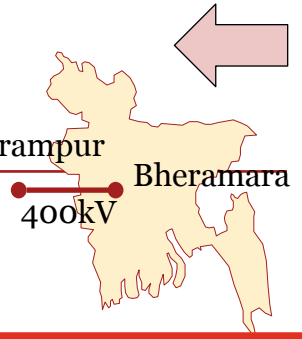
Bhutan → India



	Tala hydro project (PTC)	Dagachhu hydro project (TPTCL)
Trading Margin	Power sold by PTC to Indian beneficiaries. PTC charges 0.04 INR/kWh	Power sold by TPTCL to Indian beneficiaries. No fixed margin
Transaction Currency	INR	INR
Billing & Payment	Monthly bills; Due date 30 days; 1% per month late payment interest	Monthly bills; Due date 10 days; (SBI PLR+2%) per annum late payment surcharge
Payment Security Mechanism	PTC to credit amount from Indian beneficiaries to a designated account and Bhutan will have direct claim in case PTC defaults.	Letter of Credit • Irrevocable revolving letter of credit in a schedule Bank in India • Value equivalent to max. generating month for non-monsoon (8 months) & monsoon (4 months) period • Term of LC shall be 12 months
Dispute Resolution Mechanism	Amicable Settlement in 90 days → Referred to both Governments	Amicable Settlement in 60 days → Arbitration, Singapore
Scheduling & Despatch	No provision in PPA. Billing on Actual Energy. Pseudo scheduling is done by ERLDC	Interim arrangement (TPTCL responsible for scheduling & TPTCL made ER pool member)
Imbalance Settlement	DSM charges borne by beneficiaries	

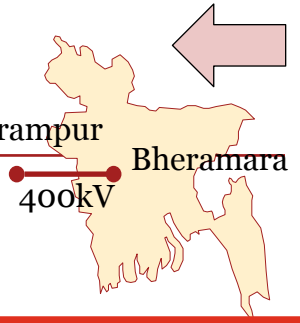
SBI: State Bank of India; DSM: Deviation Settlement Mechanism; ERLDC: Eastern Regional Load Despatch Centre

India → Bangladesh



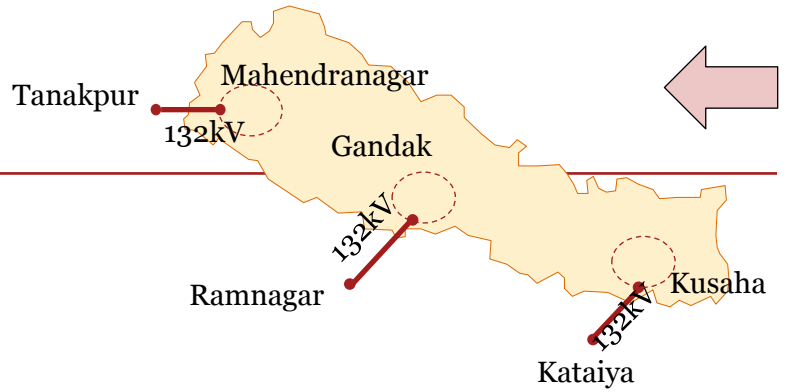
	India - Bangladesh (NVVN)	India - Bangladesh (PTC)
PPA parties	BPDB - NVVN	BPDB - PTC
Duration	25 years from commencement of supply	3 years from commencement of supply
Quantum	250 MW	250 MW
Delivery Point	400 kV Baharampur S/s	400 kV Baharampur S/s
Tariff	The tariff is determined by CERC (This principle was agreed based on Negotiation). The actual Tariff varied between 2.40-2.86 INR/kWh during Aug 2014 to May 2015 period	The tariff was discovered through competitive bidding process. The actual Tariff varied between 4.26-5.00 INR/kWh during Dec 2013 to May 2015 period
Escalation of Tariff		
Tariff Recovery	FC on DC & VC on SCH	FC on DC & VC on SCH
Treatment of Losses	TBC	TBC

India → Bangladesh



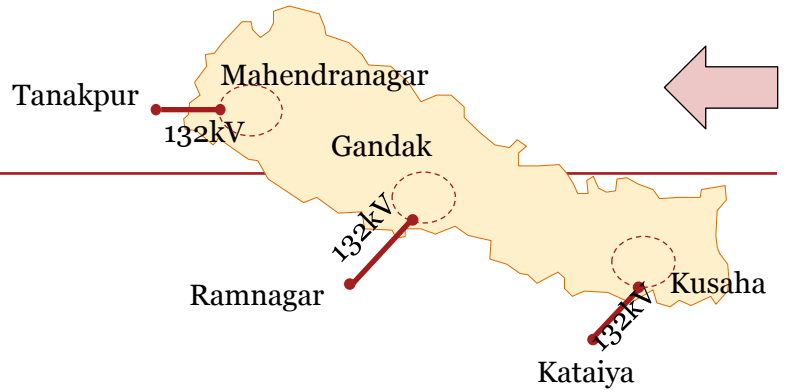
	India - Bangladesh (NVVN)	India - Bangladesh (PTC)
Trading Margin	NVVN charges 0.04 INR/kWh as trading margin	-
Transaction Currency	USD	USD
Billing & Payment	Billing is carried out on a Monthly basis. Due date is 60 days; 1.25% per month late payment interest; 2% of bill amount as rebate if payment through LC or 1% of bill amount as rebate if payment made within 25 days	On a Monthly basis
Payment Security Mechanism	Letter of Credit; Sovereign Guarantee	Letter of Credit
Dispute Resolution Mechanism	Amicable Settlement → Chairman NVVN and Chairman BPDB → Secretary (Power) GOI and the Secretary, Power Division, MPEMR, GOB → International Arbitration Centre, Singapore.	Amicable Settlement → Arbitration, Singapore
Scheduling & Despatch	NVVNL designated as Nodal Agency. NVVNL shall coordinate for each activity related to CBET between India and Bangladesh for both transactions viz. through PTC and NVVNL. All scheduling, operationalization, commercial settlement, UI settlement etc. is coordinated by NVVNL. NVVNL shall coordinate with NLDC India and NLDC Bangladesh for scheduling. On the basis of ISGS availability and percentage share allocation India-NLDC is preparing Bangladesh entitlement. Final schedule will be prepared considering ISGS allocation, approved STOA and available margin. ERLDC will only implement the approved schedule by NLDC NVVNL is made Eastern Region DSM pool member. Any DSM liability on NVVNL to be passed on to BPDB.	
Imbalance Settlement		

India → Nepal



	Long-term bilateral / treaties	Short-term PTC
PPA parties	Government of India - Government of Nepal	NEA - PTC
Duration		3-4 months from 2010 to 2014 during Dec-Mar
Quantum	Started with 5 MW in 1972. Subsequently increased to 50 MW and then 150 MW. Presently at 237 MW	46(FY11), 75(FY12), 79(FY13), 112 (FY14) MU (~20-30 MW)
Delivery Point	132 kV links and few 33 kV links	Tanakpur
Tariff	~Current rate 5.4 INR (Negotiated Tariff). Mahakali treaty (Tanakpur), one of the three river treaties has supply of 70 MUs at zero cost.	4.55(FY11), 4.35 (FY12), 4.30 (FY13), 3.75 (FY14) INR/kWh (Negotiated Tariff)
Escalation of Tariff		Fixed
Tariff Recovery	-	Tariff indicated above is payable on Scheduled Energy at Delivery Point
Treatment of losses		Energy is scheduled at Delivery Point • Up to Delivery Point (India part) - PTC is responsible for delivery up to Delivery Point. PTC has factored commercial implication on account of OA charges & transmission losses up to Delivery Point in the Tariff (as explained above) • Delivery Point Onwards(Nepal part) - NEA is responsible for transmission of energy from Delivery Point onwards

India → Nepal



	Long-term bilateral / treaties	Short-term PTC
Trading Margin	-	Tariff includes 0.55 INR/kWh (FY11), 0.35 INR/kWh (FY12), 0.30 INR/kWh (FY13), 0.25 INR/kWh (FY14) on account of trading margin, OA charges and transmission losses
Transaction Currency	INR	INR
Billing & Payment	Monthly	Weekly
Payment Security Mechanism	-	Letter of Credit
Dispute Resolution Mechanism	-	Amicable Settlement → Arbitration, Singapore
Scheduling & Despatch	Billing on Actual Energy. No scheduling or DSM settlements.	NEA used to send daily schedule to PTC and PTC coordinated with NRLDC
Imbalance Settlement		DSM charges are levied. NEA bears DSM charges either payable or receivable

Bhutan → India

	Transmission system for Tala
Parties	POWERGRID - POWERLINKS
Term	25 years
Tariff / Transmission Charge	POWERGRID to pay POWERLINKS tariff determined as per prevailing CERC regulations. POWERLINKS filed Tariff petition for 2014-19 period.
Tariff Recovery	Tariff to be paid on Availability (normative availability of 98%).
Billing & Payment	Billing is carried out on a Monthly basis. Due date is 30 days; 1.5% per month late payment surcharge in case of late payment
Payment Security Mechanism	Letter of Credit • Irrevocable revolving letter of credit in a schedule Bank in India • Value equal to estimated one month's Tariff at normative availability • Term of LC shall not be less than 12 months
Dispute Resolution Mechanism	The first level mechanism available to resolve any Dispute is through Amicable Settlement. Any disputes to be resolved through Adjudication. The final level of dispute resolution is through Arbitration as per Arbitration and Conciliation Act, 1996 (India)

India → Bangladesh

India - Bangladesh transmission line	
Parties	POWERGRID - BPDB
Term	35 years
Tariff / Transmission Charge	BPDB to pay POWERGRID tariff determined as per prevailing CERC regulations. There is a provision that if the line is used by any other beneficiary in either country in future, the Tariff will be proportionally shared by the beneficiary POWERGRID filed Tariff petition for its part to CERC. Provisional Tariff allowed at 24.09 INR Crores.
Tariff Recovery	Tariff to be paid on Availability.
Billing & Payment	Billing is carried out on a Monthly basis. Due date is 45 days; late payment interest in case payment is delayed beyond 60 days
Payment Security Mechanism	Letter of Credit
Dispute Resolution Mechanism	The first level mechanism available to resolve any Dispute is through Amicable Settlement. Any disputes pending 3 months to be referred to both Governments.

India → Nepal

	ITSA with PTCN / CPTC
Parties	NEA - PTCN
Term	25 years from COD
Tariff / Transmission Charge	Basis for Tariff (Nepal part) (TBC): • Return on Equity: 15.5% per Annum on Post Tax Basis • Interest on loan capital • Depreciation: @5.28% per annum on straight line basis till the repayment of the principal amount of the loan • Interest on WC: On normative basis and shall be equal to the short-term Prime Lending Rate of Bank • O&M expenses: @ 1.5 % of the Capital cost (Nepal part) escalated @ 5% per annum Basis for Tariff (India part) - Tariff to be determined by CERC as per prevailing regulations
Tariff recovery	Tariff to be paid on Availability (regardless of usage)
Billing & Payment	TBC
Payment Security Mechanism	Letter of Credit • Irrevocable revolving letter of credit in favour of PTCN / CPTC in a schedule Bank in Nepal / India • Value equal to 105% of estimated one month's Tariff • Term of LC shall not be less than 12 months and shall be renewed time to time NEA to also furnish the Bank Guarantee valid for 12 months for an equivalent value of one year Tariff
Dispute Resolution Mechanism	TBC

Applicable Tariff Schedule

Tala Hydro Project

1st to 5th Year	6th to 10th Year	11th to 15th Year	16th Year onwards
• 1.80 INR/kWh • COD achieved in 2006-07 • Negotiated tariff	• 1.98 INR/kWh • 10% escalation on existing tariff	• 2.18 INR/kWh • 10% escalation on existing tariff (assuming loan to be repaid fully during 1st 15 years)	• Escalation of 5% after completion of 5 years

Dagachhu Hydro Project

1st Year	2nd to 15th Year	15th Year onwards
• 2.40 INR/kWh • COD in 2015 • Negotiated tariff	• Annual escalation of 2% till completion of 15 years	• Mutually agreed price to be decided on completion of 15 years

CERC decision vide order dated 11 Sep 2014 ...(1/2)

Interim arrangement

- Settlement of all energy accounts for all plants at India-Bhutan periphery
- TPTCL shall become ER pool member for supply of power from DHPC
- No change in accounting mechanism for Tala, Chukha & Kurichhu plants
- TPTCL/Bhutan NLDC to provide following information to NLDC/ERLDC for each 15-minute time block at Bhutan-India periphery
    - Scheduled injection (on a day-ahead basis for 96 time blocks)
    - Actual injection (on a weekly basis for 7x96 time blocks)
- TPTCL/Bhutan NLDC to provide actual ex-bus injection of DHPC in each 15-minute time block to NLDC/ERLDC on a weekly basis

CERC decision vide order dated 11 Sep 2014 ...(2/2)

- TPTCL/Bhutan NLDC to provide actual ex-bus injection of DHPC in each 15-minute time block to ERCP on a monthly basis (by 2nd day of M+1)
- From the total power injected at New Siliguri (Binaguri) and Birpara, actual injection of Dagachhu power as furnished by Bhutan NLDC shall be subtracted to arrive at the total power of Tala and Chukha injected at Bhutan-India periphery
- Total power of Tala and Chukha so arrived shall be apportioned amongst Tala and Chukha in the ratio of the Tala and Chukha receipt at Bhutan-India periphery in the corresponding month of the previous year as per the published figure in the Regional Energy Accounts
- After deriving the components of injection of Tala and Chukha at Bhutan-India periphery, the existing methodology of settlement with reference to Tala and Chukha injection shall be followed by ERPC
- All CERC regulations shall be applicable for power import from DHPC

Tala (PTC) sale price in India

State Date	End Date	Sch Energy (MUs)	Name of Buyer	State	Sale price (INR/kWh)
01-Apr-15	30-Apr-15	7.93	NBPDCL	Bihar	2.02
01-Apr-15	30-Apr-15	10.95	SBPDCL	Bihar	2.02
01-Apr-15	30-Apr-15	8.48	JSEB	Jharkhand	2.02
01-Apr-15	30-Apr-15	4.10	DVC	WB, JH	2.02
01-Apr-15	30-Apr-15	3.15	GRIDCO	Orissa	2.02
01-Apr-15	30-Apr-15	28.31	WBSEDCL	West Bengal	2.02
01-Apr-15	30-Apr-15	3.26	UPPCL	UP	2.02
01-Apr-15	30-Apr-15	1.09	JVVNL	Rajasthan	2.02
01-Apr-15	30-Apr-15	1.31	J&KPDD	J&K	2.02
01-Apr-15	30-Apr-15	1.09	HPPC	Haryana	2.02
01-Apr-15	30-Apr-15	2.18	PSPCL	Punjab	2.02
01-Apr-15	30-Apr-15	0.67	NDPL	Delhi	2.02
01-Apr-15	30-Apr-15	0.96	BRPL	Delhi	2.02
01-Apr-15	30-Apr-15	0.55	BYPL	Delhi	2.02
01-May-15	31-May-15	26.90	NBPDCL	Bihar	2.02
01-May-15	31-May-15	37.15	SBPDCL	Bihar	2.02
01-May-15	31-May-15	28.78	JSEB	Jharkhand	2.02
01-May-15	31-May-15	13.91	DVC	WB, JH	2.02
01-May-15	31-May-15	10.67	GRIDCO	Orissa	2.02
01-May-15	31-May-15	96.07	WBSEDCL	West Bengal	2.02
01-May-15	31-May-15	11.08	UPPCL	UP	2.02
01-May-15	31-May-15	3.69	JVVNL	Rajasthan	2.02
01-May-15	31-May-15	4.45	J&KPDD	J&K	2.02
01-May-15	31-May-15	3.69	HPPC	Haryana	2.02
01-May-15	31-May-15	7.38	PSPCL	Punjab	2.02
01-May-15	31-May-15	2.27	NDPL	Delhi	2.02
01-May-15	31-May-15	3.24	BRPL	Delhi	2.02
01-May-15	31-May-15	1.88	BYPL	Delhi	2.02

Source: PTC Form IV, Apr 2015 and May 2015

Dagachhu (TPTCL) sale price in India

State Date	End Date	Sch Energy (MUs)	Name of Buyer	State	Sale price (INR/kWh)
1-Apr-15	1-Apr-15	0.05	NPCL	UP	3.04
6-Apr-15	6-Apr-15	0.37	NPCL (SCL)	UP	3.29
7-Apr-15	7-Apr-15	0.37	NPCL (SCL)	UP	3.11
8-Apr-15	8-Apr-15	0.04	NPCL (SCL)	UP	2.85
1-Apr-15	30-Apr-15	5.95	ESIL	Gujarat	2.08
1-Apr-15	30-Apr-15	6.21	ESPF	MH	2.31
6-May-15	6-May-15	0.26	NPCL	UP	2.64
7-May-15	7-May-15	0.13	NPCL	UP	2.53
1-May-15	31-May-15	7.51	ESIL	Gujarat	1.99
1-May-15	31-May-15	7.81	ESPF	MH	2.2

Source: TPTCL Form IV, Apr 2015 and May 2015

NVVN sale price to BPDB

State Date	End Date	Sch Energy (MUs)	Name of Buyer	State	Sale price* (INR/kWh)
01-May-15	31-May-15	160.71	NVVN A/c BPDB	for Bangladesh	2.50
01-Apr-15	30-Apr-15	156.50	NVVN A/c BPDB	for Bangladesh	2.43
01-Mar-15	31-Mar-15	156.50	NVVN A/c BPDB	for Bangladesh	2.43
01-Feb-15	28-Feb-15	154.60	NVVN A/c BPDB	for Bangladesh	2.85
01-Jan-15	31-Jan-15	154.61	NVVN A/c BPDB	for Bangladesh	2.86
01-Dec-14	31-Dec-14	156.00	NVVN A/c BPDB	for Bangladesh	2.40
01-Nov-14	30-Nov-14	151.08	NVVN A/c BPDB	for Bangladesh	2.58
01-Oct-14	31-Oct-14	146.33	NVVN A/c BPDB	for Bangladesh	2.63
01-Sep-14	30-Sep-14	121.96	NVVN A/c BPDB	for Bangladesh	2.70
01-Aug-14	31-Aug-14	111.38	NVVN A/c BPDB	for Bangladesh	2.67

Source: NVVN Form IV, Aug 2014 - May 2015

* Purchase price by NVVN is CERC notified tariff of respective stations. In addition, trading margin of 0.04INR/kWh is charged by NVVN to arrive at Sale price

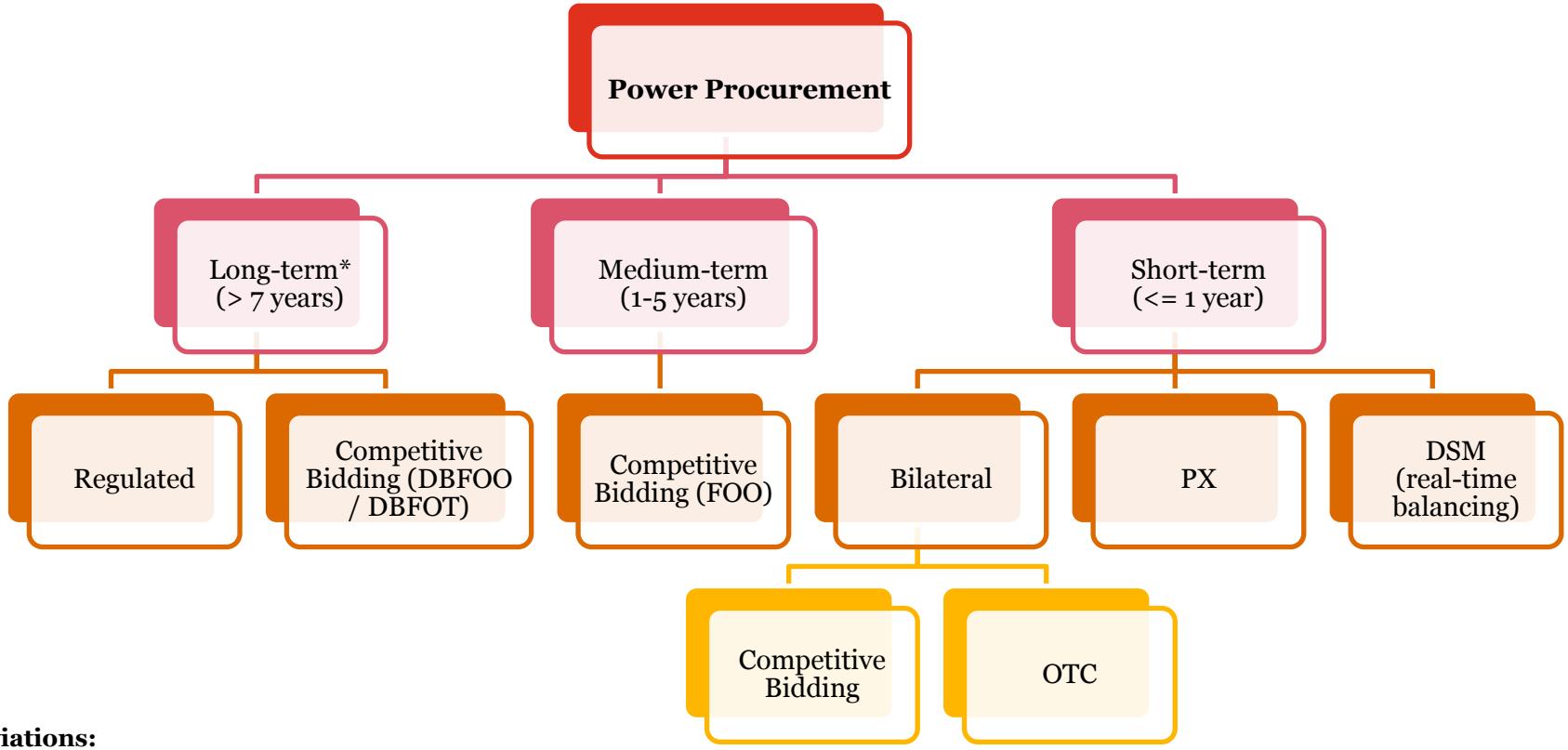
PTC sale price to BPDB

State Date	End Date	Sch Energy (MUs)	Name of Buyer	State	Sale price (INR/kWh)
01-May-15	31-May-15	185.30	BPDB	Bangladesh	4.69
01-Apr-15	30-Apr-15	172.63	BPDB	Bangladesh	4.69
01-Feb-15	28-Feb-15	148.40	BPDB	Bangladesh	4.50
01-Jan-15	31-Jan-15	101.01	BPDB	Bangladesh	4.43
01-Dec-14	31-Dec-14	64.33	BPDB	Bangladesh	4.43
01-Nov-14	30-Nov-14	80.43	BPDB	Bangladesh	4.43
01-Oct-14	31-Oct-14	172.74	BPDB	Bangladesh	4.43
01-Sep-14	30-Sep-14	159.36	BPDB	Bangladesh	4.43
01-Aug-14	31-Aug-14	163.47	BPDB	Bangladesh	4.43
01-Jul-14	31-Jul-14	163.15	BPDB	Bangladesh	4.43
01-Jun-14	30-Jun-14	143.46	BPDB	Bangladesh	4.43
01-May-14	31-May-14	129.18	BPDB	Bangladesh	4.43
01-Apr-14	30-Apr-14	127.63	BPDB	Bangladesh	4.43
01-Mar-14	31-Mar-14	179.36	BPDB	Bangladesh	4.26
01-Feb-14	28-Feb-14	167.00	BPDB	Bangladesh	4.33
01-Jan-14	31-Jan-14	161.12	BPDB	Bangladesh	4.72
03-Dec-13	31-Dec-13	144.67	BPDB	Bangladesh	5.00

Source: PTC Form IV, Dec 2013 - May 2015

* WB - BANGLADESH tariff calculated based on algebraic summation of fixed cost and variable cost. Taxes, OA etc. not considered. @60/61 INR/$

Power procurement framework in India (1/2)



Abbreviations:

DBFOO/T - Design-Build-Finance-Own-Operate/Transfer
OTC - Over The Counter
PX - Power Exchange
DSM - Deviation Settlement Mechanism

**** The Long-term competitive bidding guidelines are applicable for only thermal projects. All hydro projects are exempted from competitive bidding till Dec 2015 and would be through regulated route; DBFOO term - Power supply agreements signed for a period of 7 years and above upto a period 25 years from the commencement of power with a provision of extension of 5 years at the option of either party (Amendment to DBFOO Guidelines, May 2015).***

Power procurement framework in India (2/2)

Long & Medium-term

- Regulated route (long-term)
  - Procurement of power from intra-state generators
  - Tariff approved by ERC
  - Cost pass-thorough in annual revenue requirement (ARR)
- Competitive bidding route
  - Procurement of power through competitive bidding guidelines (DBFOO/FOO)
  - Tariff discovered through bidding
  - Tariff adopted by ERC

Short-term

- Competitive bidding route
  - Procurement of power through competitive bidding guidelines (peak period, short-term)
  - Tariff discovered through bidding
  - Tariff adopted by ERC
- Bilateral contracts
- Power Exchange

- Discoms may reject the bids received through competitive bidding, if found very high
- Volume/price restrictions by ERC on procurement of power through short-term routes

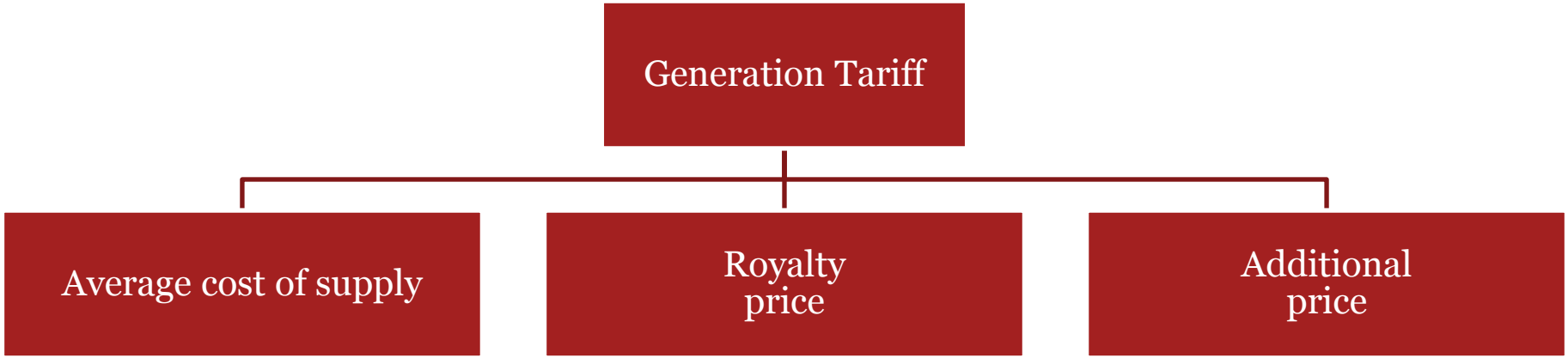
Power procurement framework in Sri Lanka

- In 2013, amendment to Section 43 of the Sri Lankan Electricity Act, 2009 was notified to include provisions related to procurement of power
- Salient features of amendment included:
  - Transmission licensee shall submit proposal to regulatory commission to procure power from any new generation plant or for expansion of generation capacity from existing plant based on future demand forecast specified in Least Cost Long Term Generation Expansion Plan
  - Upon approval of Commission, transmission licensee shall in compliance with rules *that may be made by the Commission relating to procurement*, call for tenders to develop new generation plant or expand the generation capacity of an existing generation plant
  - Any new generation plant or expansion of any existing generation plant that is being developed in accordance with the least cost long term generation expansion plan duly approved by the Commission and Cabinet of Ministers or through a permit issued by the Sri Lanka Sustainable Energy Authority for generation by renewable energy sources is exempted from tender route and can directly sell power
  - Upon closure of tender, transmission licensee shall recommend to the Commission for its approval along with the draft Power Purchase Agreement describing the terms and conditions
  - Commission after satisfaction that the recommended price meets principle of least cost shall grant its approval at its earliest convenience

Tariff framework in Bangladesh

- Bangladesh Energy Regulatory Commission (BERC) determines Generation Tariff under regulated route based on Tariff Regulations notified in 2008
- Tariff is determined as per "**cost plus approach**"
- Tariff is two-part: 1) fuel cost involved in generation of electricity; and 2) plant's fixed cost
- Fuel cost is passed as per actual, while BERC has defined norms for fixed (capacity) cost components:
  a) O&M Costs comprising of operating expenses other than fuel cost including employee expenses, repair and maintenance expenses and administration and general expenses
  b) Depreciation
  c) Income tax
  d) Return on Rate base including return on equity and debt

Tariff framework under Regulated Route in Bhutan



Average Cost of supply considered as ratio of discounted annual total cost of supply to the discounted energy volumes, with discounting applied over the Tariff Period using the WACC

For each Licensee, Authority determines volume of Royalty Energy supplied to Govt, which in turn supplies to BPC at discounted rates, for each month of the calendar year based on the average generation of the Licensee of the past three years.

Royalty Price is average cost of supply lesser than ratio of discounted subsidy amounts to the discounted royalty energy, with discounting applied over the tariff period using the WACC

Any energy delivered by a generation Licensee to a distribution Licensee above the Royalty Energy shall be termed as Additional Energy (i.e. over and above 15% cap of the royalty energy). The price for Additional Energy, termed as the Additional Price, shall be equal to the Average Cost.

Tariff determination under Regulated Route in India (1/3)

Overall Framework (as per Section 62 of the Act)

Approach to tariff determination

Annual Tariff Framework

- Tariff determined annually before start of ensuing year
- Tariff determined based on Regulations, the forecasts for the ensuing year submitted by genco and review of past trends

Multi Year Tariff (MYT) Framework

- ARR determined for Control Period -3/5 years; reviewed annually; Trued-up as per actuals / audited accounts
- Tariff determined based on Regulations, the forecasts for the ensuing year submitted by genco and review of past trends
- Provides certainty to both investors and consumers
- Incentive to Utility to improve performance
- *Uncontrollable Parameters*: Demand, inflation, fuel price etc.; Impact allowed as pass-through
- *Controllable Parameters*: Targets set to incentivize improvement and penalize inefficiency

Tariff determination under Regulated Route in India (2/3)
Thermal Plants

Capacity Charges

- Return on equity
- Interest on loan
- Depreciation
- Interest on Working Capital
- O&M expenses

Mode of Recovery

AFC is recovered through a ***Capacity Charge*** from beneficiaries in proportion to their share in saleable capacity

AFC x (NDM / NDY) x (PAFM / NAPAF)

NDM/Y = No. of days in the month/year
PAFM = Plant availability factor achieved during the month, in %
NAPAF = Normative Annual Plant Availability Factor, in %

Energy Charges

- For recovery of variable components of tariff such as fuel
  - Landed cost of primary fuel
  - Cost of secondary fuel oil consumption
  - Operating norms specified in Regulations
- Cost of coal and secondary fuel oil is approved as per the recent trends; Any variation in LPPF (weighted average landed price of primary fuel) allowed as pass-through
- Regulator arrives at estimated fuel cost and quantum of generation in ensuing year, which gives the *Energy Charge Rate* (INR/kWh)

Mode of Recovery

- Energy charge recovered from beneficiaries in proportion to their share in Scheduled Energy

Tariff determination under Regulated Route in India (3/3)
Hydro Plants

Annual Fixed Charge (AFC)

- Return on equity
- Interest on loan
- Depreciation
- Interest on Working Capital
- O&M expenses

AFC is recovered through **Energy Charge** and **Capacity Charge**, which are performance based:

- Recovery through Capacity Charge is linked to plant availability
- Recovery through Energy Charge is linked to actual generation vis-à-vis Design Energy

Mode of Recovery

- 50% of AFC is recovered through **Capacity Charge** from beneficiaries in proportion to their share in saleable capacity

$$0.5\ AFC \times (NDM / NDY) \times (PAFM / NAPAF)$$

NDM/Y = No. of days in the month/year
PAFM = Plant availability factor during month
NAPAF = Normative Annual Plant Availability Factor, in %

- Remaining 50% of AFC is recovered through **Energy Charge** with ECR (shown below) and scheduled energy

$$\frac{0.5\ AFC}{\{DE \times (100 - AUX) \times (100 - FEHS)\}}$$

ECR = Energy Charge Rate, in INR/kWh
DE = Annual design energy for the hydro station, in kWh
AUX = Auxiliary consumption, in %
FEHS = Free energy for home state, in %

Tariff framework under Competitive Bidding route (1/3)
DBFOO framework

- MoP Case-I framework, bidder was free to choose technology and fuel (such as coal, gas, hydro etc.)
- MoP introduced DBFOO framework replacing Case-I in Nov 2013
- Supplier is responsible for acquiring land, obtaining statutory clearances, securing fuel linkages etc.
- Typically participants in the DBFOO framework based bidding are players with existing plants or with planned capacities
- DBFOO framework **do not contain any provisions for hydro projects** participating in bidding

Tariff framework under Competitive Bidding route (2/3)

Tariff for DBFOO projects

Fixed Charge

- Bidder quotes "Initial Fixed Charge" taking into account various components such as O&M expenses, depreciation, finance charges etc.
- **Annual reduction of 2% in fixed charge** stipulated to ensure benefit of depreciated asset is passed-through
- Fixed charge **revised annually to reflect 30% variation in WPI**
- Payment of fixed charge on basis of **normative availability of station**

Fuel Charge

- Fuel charge on a **pass-through** principle

Alternate fuel options

- Supply from CIL linkage - based on Bid value, 101% CIL price & Actual cost of procurement
- Supply from captive mine - based on Bid value, 95% CIL price & ERC determined rate; Escalated by 2% & adjusted to reflect 60% WPI variation *[likely to be modified in lieu of Coal auction]*
- If imported coal used (captive or otherwise) - based on Bid value, pre-selected coal indices; forex risk to be borne by Utility

- Cost of Coal transportation and washing to be added

Tariff framework under Competitive Bidding route (3/3)

Tariff for DBFOO projects

Other key features of tariff determination under DBFOO route

Station Heat Rate: Incentives provided to supplier in case of improvement in pre-defined SHR

Fuel Supply Agreement: Supplier to execute a FSA as a condition precedent

Additional Fuel Supply: Supplier to make best efforts to identify additional sources of fuel supply in event of inadequate fuel supply under FSA

Normative Availability: Supplier to demonstrate availability of 90% for fixed charge recovery

Minimum Fuel Stock: Supplier to maintain minimum stock of fuel for production and supply of electricity to Utility for 7 days

Committed Capacity: Predetermined proportion of contracted capacity to be dedicated to the Utility

Select Tariffs discovered under Case-1 / DBFOO

Year	Bidder (State)	Quantum (MW)	Levelised Tariffs* (INR/kWh)
2010	Essar (Gujarat)	800	2.80
2010	Adani (Maharashtra)	1320	3.28
2012	PTC-East Coast Energy (AP)	300	3.46
2013	PTC-MCCPL (Rajasthan)	250	4.52
2013	PTC-DB Power (Rajasthan)	410	4.81
2014	NSL (UP)	300	4.49
2014	PTC-TRN (Aryan) (UP)	390	4.88
2014	Jindal (Kerala)	200	3.60
2014	Balco (Kerala)	100	4.29

Tariff framework in Nepal

Generation Tariff

Mode I: Purchase from NEAs own generation stations

NEA being vertically integrated utility, generation tariff is bundled with retail tariff

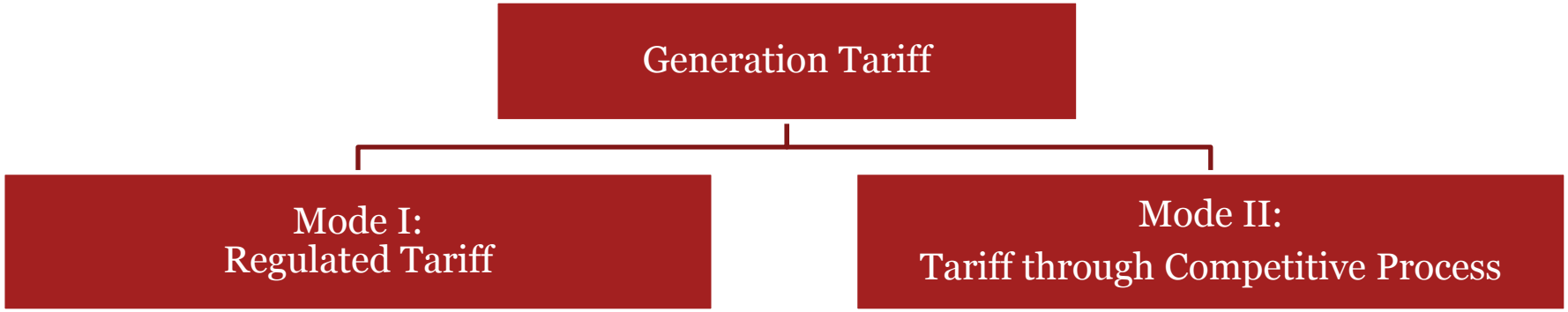
Mode II: Purchase from Independent Power Producers

Structure and mechanism of recovery of tariff for IPPs is as per T&C of PPAs

- Model PPA specifies a Single-part seasonal tariff
- Base Rate: NPR 4.80/kWh in wet seasons and NPR 8.40/kWh in dry season
- Base Rate is further escalated at a fixed rate of 3% over five periods

Duration (calculated assuming next month of Commercial Operation Date shall be 1st month)	Dry Season (From Poush (Dec-Jan) to Chaitra (Mar-Apr) (NPR In per unit)	Wet Season (From Baisakh (Apr-May) to Mang (Nov-Dec) (NPR In per unit)
1st - 12th months	8.40	4.80
13th -24th months	8.65	4.94
25th - 36th months	8.90	5.09
37th - 48th months	9.16	5.23
49th - 60th months	9.41	5.38
61st month - till the agreement period	9.66	5.52

Tariff framework in Pakistan



NEPRA is the regulatory authority which determines the tariff for electric power services in Pakistan. NEPRA determines electricity tariffs considering the principles of economic efficiency and service of quality as per the **tariff standards and procedure rules 1998**. In cases under long term PPAs, Generation Company's tariff is determined on cost plus basis. The tariff standards provide for a **Two-part tariff structure** for generation utilities. Within the Regulated regime there are two approaches that may be adopted by a generation utility (IPP) for the purpose of tariff determination:

- *Project Specific tariff*: NEPRA determines the tariff for the generation utilities on the basis of guidelines issued for tariff determination
- *Upfront tariff*: NEPRA specifies technology specific tariff for the various projects which can be adopted by the generation utilities. The upfront tariff is announced on yearly basis.

Tariff may also be discovered through an open competitive bidding process based on approved bid bidding documents. There are two options available to the procurer for structuring the bidding process:

- Bidding for a tariff
- Offering an up-front benchmark tariff and bidders to quote a discount on the benchmark price

Tariff framework in Sri Lanka

The generation tariff is determined on the basis of type of PPA in Sri Lanka:

Type of PPA	Computation methodology of Tariff
PPA between Thermal Power plant of CEB and Transmission Licensee	• For CEB Thermal Generation, the CEB Generation Licensee shall establish, for each generation unit in each Generation Plant included in the Generation License, a PPA with a **minimum duration of five (5) years** • The price formula in such a PPA shall be a **two-part tariff**, comprising: **I.** **Capacity price**, aimed at recovering fixed costs associated with each generating unit, namely: 1. Debt service 2. Efficient O&M fixed costs 3. Costs of services provided by CEB Generation Headquarters Capacity prices stated in each CEB Generation PPA shall be indexed every six months, if relevant, considering a basket of indices affecting the debt portfolio associated with each Generation Unit (thermal) **I.** **Energy price**, aimed at recovering: 1. Fuel costs (including no load heat rate and incremental heat rate) 2. Efficient variable O&M cost 3. Start-up Cost 4. Others as may deem needed
PPA between Hydroelectric Power plant of CEB and Transmission Licensee	• For CEB hydroelectric generation, the CEB Generation Licensee shall establish, for each Generation Plant included in the Generation License, a PPA **with a minimum duration of five (5) years** • The price formula shall be a **one part capacity price**, comprising: 1. Debt service 2. Efficient fixed O&M costs including any resource costs 3. Costs of services provided by CEB Generation Headquarters • Capacity prices stated in each CEB Generation PPA shall be indexed every six months, if relevant, considering a basket of indices affecting the debt portfolio associated with each Generation Unit (Hydro Electric)
PPA between IPPs/SPPs and Transmission Licensee	• The PPAs with IPPs/ SPPs shall be the agreements signed between such and the Transmission Licensee •

Tariff determination under Regulated Route
Transmission Projects

Capacity Charge

- Return on equity
- Interest on loan
- Depreciation
- Interest on Working Capital
- O&M expenses

Mode of Recovery

AFC is recovered through a ***Capacity Charge*** from beneficiaries under POC mechanism

AFC x (NDM / NDY) x (TAFM / NATAF)

NDM/Y = No. of days in the month/year
TAFM = Transmission system availability factor achieved during the month, in %
NATAF = Normative Annual Transmission Availability Factor, in %

Evolution of transmission charge sharing

Before 1991: Cost of transmission clubbed with generation tariff (Implicit)

1991-2003: Apportioned on the basis of energy drawn (Usage based)

2004-2010: Apportioned on the basis of MW entitlements (Access based)

2010 onwards: Hybrid methodology (Point of Connection charges) to reflect actual usage

Point of Connection (PoC) methodology (1/4)

- Since 2011, India has moved to simplified nodal pricing - PoC methodology
- PoC methodology is used for computation and sharing of the Inter State Transmission System (ISTS) Charges and Losses among Designated ISTS Customers (DICs)
- PoC charge depends on quantum of the power flow and location of the node (injection/drawal) in the grid and is sensitive to distance (between injection point and drawal point) and direction of power flow

- PoC charge is computed for each node of DICs based on hybrid method, which employs both - average participation method and marginal participation method
- PoC charge is independent of contract "path". It is transparent as all data used for computing the charges is shared with users

Point of Connection (PoC) methodology (2/4)

POC Charges (Declared Quarterly) - LT/MT Rate			
PoC Slab	PoC Slab Rate (INR/MW/month)	Reliability Support Charges Rate (INR/MW/month)	HVDC Charges Rate for NR / SR (as applicable) (INR/MW/month)
Slab 1	305438	22669	13979 – NR 23513 – SR ~25 Rs Cr/Month - APL Mundra
Slab 2	272649		
Slab 3	239859		
Slab 4	207069		
Slab 5	174279		
Slab 6	141489		
Slab 7	108699		
Slab 8	75909		
Slab 9	43119		

Point of Connection (PoC) methodology (3/4)

POC Charges (Declared Quarterly) – ST Rate		
PoC Slab	PoC Slab Rate (P/kWh)	Reliability Support Charges Rate (P/kWh)
Slab 1	22.27	3.15
Slab 2	19.78	
Slab 3	17.28	
Slab 4	14.79	
Slab 5	12.29	
Slab 6	9.80	
Slab 7	7.30	
Slab 8	4.81	
Slab 9	2.31	

Point of Connection (PoC) methodology (4/4)

POC Losses (Declared Weekly)
There are 9 slabs for losses in each region: • **4 slabs: Average Loss + 0.25% (each)** • **Average Loss** • **4 slabs: Average Loss - 0.25% (each)**

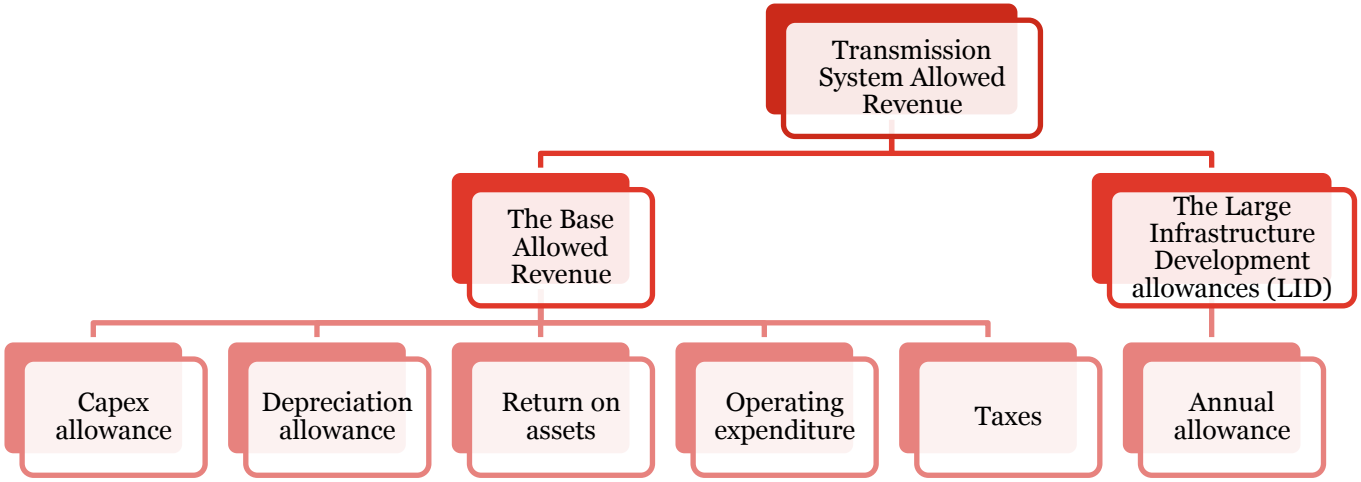
Tariff determination under competitive bidding route

Features	BOOM Model
Ownership of capital asset	Developer
Responsibility of capital investment	Green field investments by the Developer
Duration of the contract	35 years
Process Managed by	Bid Process Co-ordinator (REC or PFC) appointed by the Government of India
Project Development	All consents, clearances and permits are obtained by the Developer

- The bidder quotes the transmission charges having two components, namely:
  - Escalable transmission charges (to be escalated at rates notified by CERC);
  - Non-escalable transmission charges
- The escalable component cannot be more than 15% of the non-escalable component
  - The bidder can quote different annual tariff for various years within a specified variation band
- **Levelised Tariffs:** The tariffs quoted by the bidders are discounted at a rate prescribed by the CERC to arrive at a single figure of "Levelised Tariff (in INR/annum)" over the project life and the project/bid is awarded to the bidder with the lowest "Levelised Tariff"

Transmission tariff determination in Sri Lanka

In Sri Lanka, the Transmission Licensee is allowed to recover the Transmission System Allowed Revenue which is the revenue that the Transmission Licensee is allowed to collect from the Transmission Users for the use of the Transmission System. Tariff Methodology is approved by the Public Utilities Commission of Sri Lanka (PUCSL) in accordance with the Section 30 of the Sri Lanka Electricity Act, 2009



The Base Allowed Revenue shall be determined for a Tariff Period. The Transmission System Allowed Revenue shall be calculated based on a **forecast cash flow for the company discounted at the Allowed Rate of Return on Capital** for the Tariff Period, considering following **factors**:

- Initial Regulatory Asset Base (RAB) (the value of the assets belonging to the Licensee to provide the transmission service, excluding connection assets)
- Rolling forward of the initial RAB, considering minor Capital Expenditure (CAPEX) for the period
- Depreciation of existing non-depreciated assets
- Return on assets
- Efficient operating expenditure (OPEX)
- Taxes

Understanding applicable charges in a PX transaction (1/2)

Assumptions

- Market clearing rate: INR 3.00/kWh
- Market clearing volume: 1 MW RTC
- No. of successful portfolios: 500
- No. regional entities: 50
- Seller (Generator) state: AP
- Seller (Generator) connectivity: STU

Seller's net realization	
Cleared volume (MWh)	24.0
Clearing price (INR/ kWh)	3.00
POC Losses of AP	1.80%
STU Losses of AP	3.13%
POC Charges (per MWh)	128.90
STU Charges AP (per MWh)	84.76
SLDC Scheduling and Operation Charges (INR/day/consumer)	2000
NLDC Application fee (INR/ day)	5000
NLDC Scheduling and Operation Charges (INR/ day)	5000
No. of Successful Portfolio	500
No. of Entities	50
Exchange Fee (INR/ MWh)	20
Trading Margin (INR/ MWh)	20
Realisation rate at Seller's bus (INR/ kWh)	2.51

Understanding applicable charges in a PX transaction (2/2)

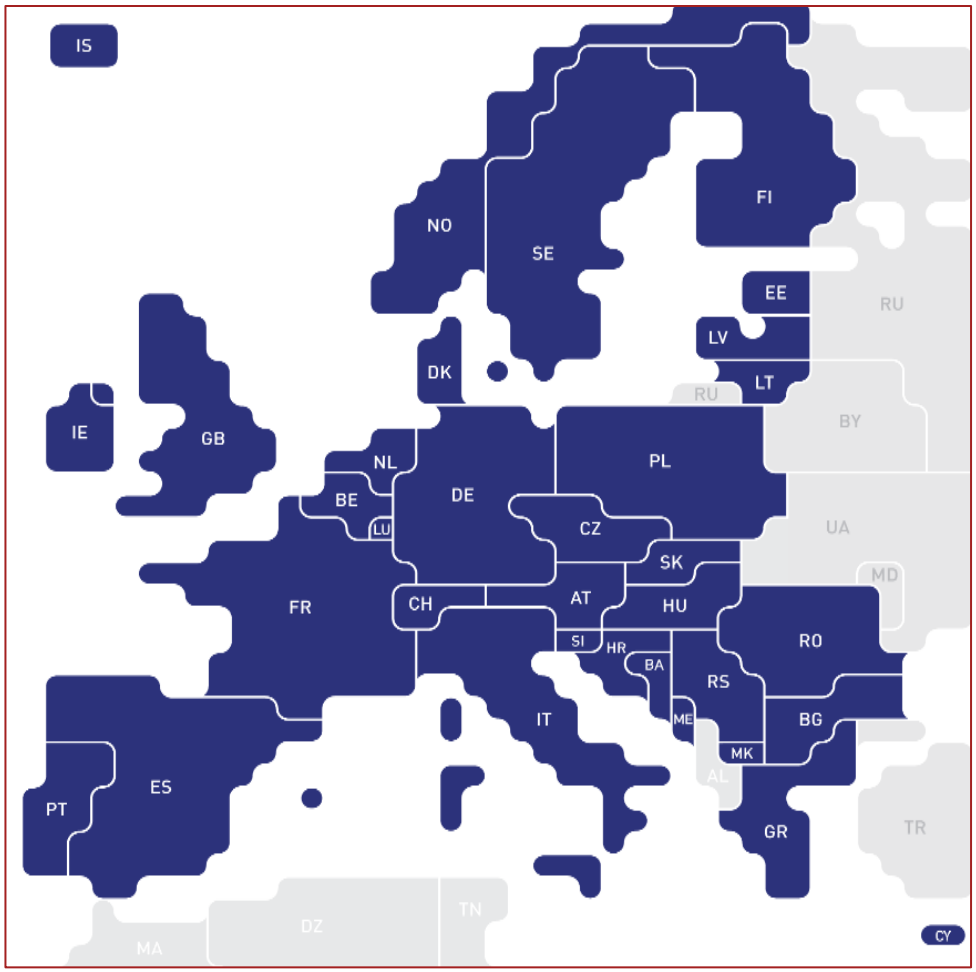
Assumptions

- Market clearing rate: INR 3.00/kWh
- Market clearing volume: 1 MW RTC
- No. of successful portfolios: 500
- No. regional entities: 50
- Buyer (Consumer) state: AP
- Buyer (Consumer) connectivity: STU

Buyer's net pay-out	
Cleared volume (MWh)	24.0
Clearing price (INR/ kWh)	3.00
POC Losses of AP	2.35%
STU Losses of AP	3.13%
POC Charges (per MWh)	168.90
STU Charges AP (per MWh)	84.76
SLDC Scheduling and Operation Charges (INR/day/consumer)	2000
NLDC Application fee (INR/ day)	5000
NLDC Scheduling and Operation Charges (INR/ day)	5000
No. of Successful Portfolio	500
No. of Entities	50
Exchange Fee (INR/ MWh)	20
Trading Margin (INR/ MWh)	20
Landed rate at Buyer's bus (INR/ kWh)	3.60

ENTSO members

AT-Austria
BA-Bosnia and Herzegovina
BE-Belgium
BG-Bulgaria
CH-Switzerland
CY-Cyprus
CZ-Czech Republic
DE-Germany
DK-Denmark
EE-Estonia
ES-Spain
FI-Finland
FR-France
GB-United Kingdom
GR-Greece
HR-Croatia
HU-Hungary
IE-Ireland
IS-Iceland
IT-Italy
LT-Lithuania
LU-Luxembourg
LV-Latvia
ME-Montenegro
MK-FYR of Macedonia
NL-Netherlands
NO-Norway
PL-Poland
PT-Portugal
RO-Romania
RS-Serbia
SE-Sweden
SI-Slovenia
SK-Slovak Republic



Source: www.entsoe.eu

Evolutionary history of cross border power exchanges

Exchange	Operating in Countries	Evolutionary history
Nord Pool Spot	Norway, Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Germany and the UK	Nord Pool started as a joint Norwegian-Swedish power exchange, in 1996. Finland and Denmark joined in 1998 -2000 period. Nord Pool Spot expanded to Germany and the UK in 2005 and 2010 respectively. The Baltic counties, Estonia, Latvia and Lithuania joined between 2010 and 2013.
EPEX Spot	Germany, France, Austria and Switzerland	EPEX SPOT was created in 2008 through merger of power spot activities of Powernext SA (Exchange established in 2001 in France) and EEX AG (Exchange formed through Leipzig Power Exchange & EEX Frankfurt in 2002 in Germany).
OMIE	Spain and Portugal	Spain's PX, OMEL, has operated a day-ahead spot market for electricity since 1998. After structural changes and entry to the Portuguese market in 2007, OMEL was changed to OMIE
APX	Netherlands, the UK, and Belgium	Launch of APX in 1999 in Amsterdam. Over time similar national exchanges opened in UK and Belgium. APX acquired these PX or bought stake in them.
SAPP	Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe	Windhoek Summit Declarations in 1992 signed by 10 member nations brings South African Development Community (SADC) into existence. Subsequently, 11 SADC members signed inter-Governmental MoU in 1994 paving the way for creation of SAPP in 1995 by 12 members. Subsequently, other member nations joined to make it a 15 nation pool for electricity.

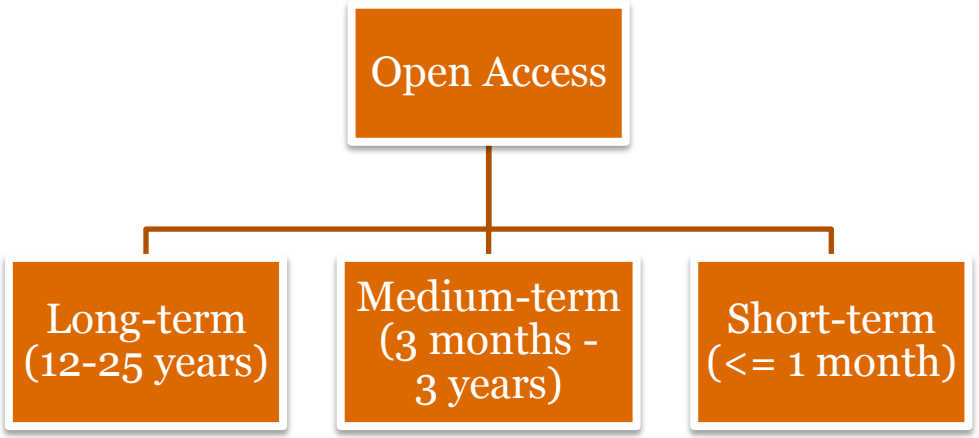
Ownership of existing cross border power exchanges

Exchange	Owner	Equity Share	Category	Type
Nord Pool Spot	Statnett SF	28.20%	Norway TSO	Government-owned
	Svenska Kraftnät	28.20%	Sweden TSO	Government-owned
	Fingrid Oyj	18.80%	Finland TSO	Government-owned
	Energinet.dk	18.80%	Denmark TSO	Government-owned
	Elering	2.00%	Estonia TSO	Government-owned
	Litgrid	2.00%	Lithuania TSO	Government-owned
	Augstsprieguma tikls	2.00%	Lativa TSO	Government-owned
EPEX Spot	Powernext	50.00%	Physical commodity and derivate exchange (energy)	EEX (55.79%)
	HGRT (Holding Gestionnaires de Réseaux de Transport SAS)	36.70%	Elia (Belgium), RTE (France) and Tennet (Netherlands) TSO hold shares in HGRT	All three TSO are Government / partially Government-owned
	EEX	13.30%	Market for Energy, commodity products	Eurex Zürich AG (62.82%)
OMIE	OMEL	50.00%	Spain Market Operator	Government-owned
	OMIP SGPS, S.A	50.00%	Portuguese Market Operator	Privately-owned
APX	TenneT Holding BV	70.84%	Netherlands TSO	Government-owned LLC
	Elia System Operator NV	29.16%	Belgium TSO	Partially Government-owned
SAPP	Non-profit organisation created through an Inter-Government MOU by Southern African Development Community (SADC)			

What is Open Access? (1/3)

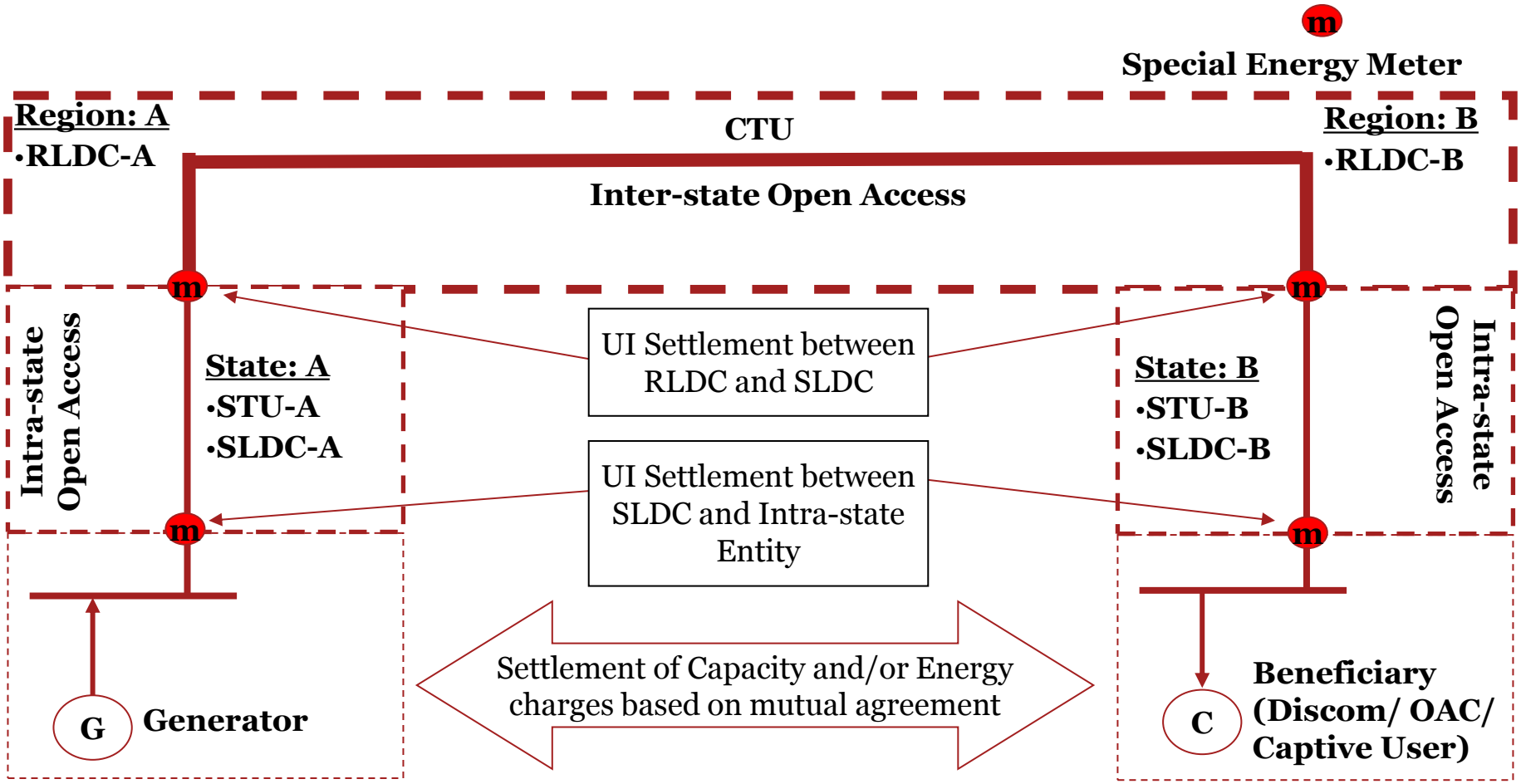
As per E Act '03 Section (2) (47)

*the **non-discriminatory** provision for use of **transmission line** or **distribution system** or associated facilities with such line or system by **any licensee or consumer or a person engaged in generation** in accordance with the **regulation** specified by the appropriate Commission*



- Long-term access provided even with system augmentation. Medium & Short-term access to be accommodated within available margins.
- Categories shown above are for inter-state OA; Intra-state OA to be obtained in case entity is connected to state network
- Time horizons or categories of OA for intra-state open access may vary state to state; Criteria for allowing OA remains the same

Typical bilateral STOA transaction (2/3)



Open access charges payable by Generator or Beneficiary:

1. Transmission network charges to STU-A, STU-B and CTU
2. System Operation charges to SLDC-A, RLDC-A, SLDC-B and RLDC-B
3. Cross Subsidy Surcharge and Additional Surcharge (if applicable)

Nodal agency for granting open access (3/3)

Category of transaction	Long-term	Medium-term	Short-term
Case1: Both Seller & Buyer are located within the state	STU	STU	SLDC
Case2: Seller & Buyer are located in different states but in the same region			RLDC (Consent from both SLDCs*)
Case3: Seller & Buyer are located in different states and in different regions)		CTU	RLDC of region where drawal point is location (Consent from both SLDCs*)
Case4: Collective transaction through Power Exchanges	-	-	NLDC (NOC from SLDC*)

** If connected to state network*

Granting of licence for power trading

Trading is defined as "distinct licensed activity" in the Indian Electricity Act 2003.

Institutional Mechanism for Granting Licence

- **CERC** has jurisdiction on inter-state matters. Application to be made to CERC for inter-state trading licence
- **SERC** has jurisdiction on intra-state matters. Application to be made to SERC for intra-state trading licence
- As per the Electricity Rules, 2005 Clause 9: Traders with inter-state trading licence issued by CERC can undertake intra-state trading. No separate licence is required from SERC

Trading Licence Regulations

CERC issued trading licence regulations in 2009 specifying terms and conditions for issuance of trading licence

- Domicile; Full time professionals (SO & Finance); Net Worth and Liquidity requirements
- 4 Categories based on volume limits
- 46 traders as on Dec'14 (~15 are active)

Trading Margin Regulations

CERC issued trading margin regulations in 2010 for short-term trades (<= 1 year)

- Up to 4 p/kWh if sale price <= 3 INR/kWh
- Up to 7 p/kWh if sale price > 3 INR/kWh

Granting of licence for power exchange

PX is a neutral electronic trading platform to facilitate buying and selling of electricity by the participants across the nation.

Institutional Mechanism for Granting permission

- **CERC** has formulated Power Market Regulations 2010. PX can be operated by obtaining permission under these regulations.
- There are no such regulations by any **SERC**. Hence, no intra-state PX can be setup.

Indian Energy Exchange (IEX)

- Promoted by FTIL and PTC
- Other shareholders: Tata Power, Reliance Energy, REC, IDFC, LANCO, ADANI
- Launched in June 2008
- Market share > 92%

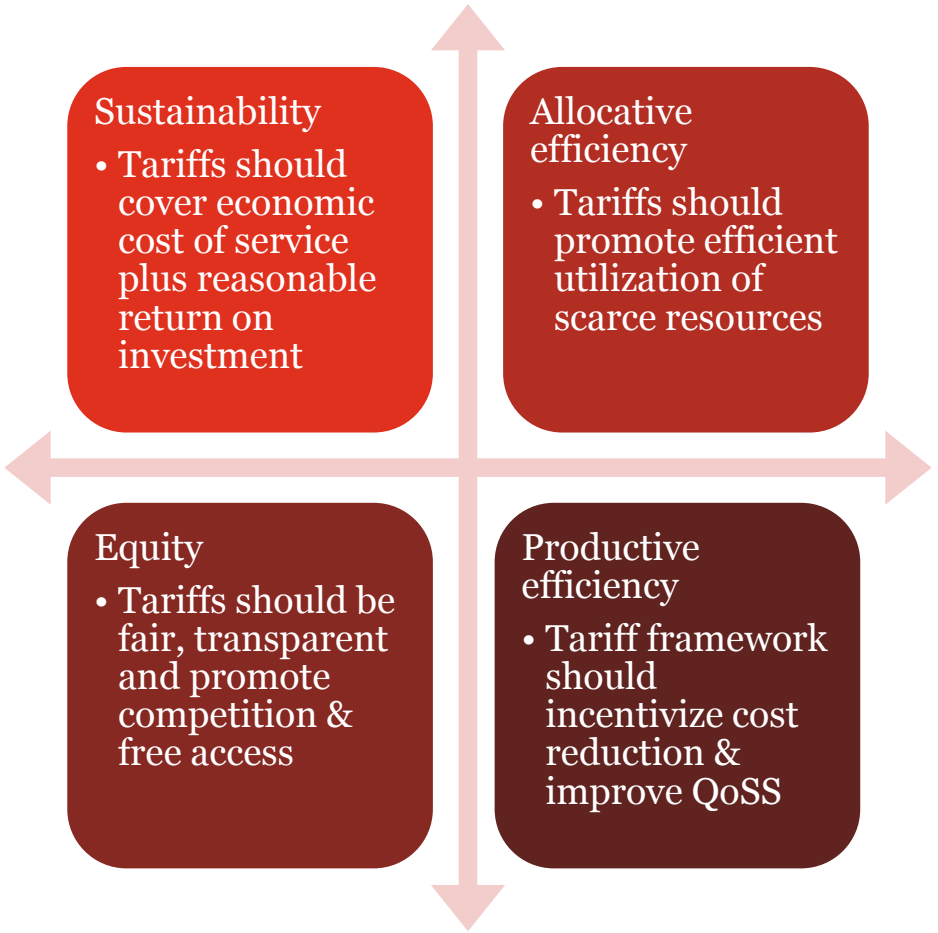
Power Exchange India (PXIL)

- Promoted by NSE and NCDEX
- Other shareholders: PFC, GUVNL, JSW Energy, GMR Energy, JSPL
- Launched in October 2008
- Market share < 8%

Guiding principles for tariff determination

The guiding principles for tariff determination are by and large similar across all SA nations:

- Promote efficiency
- Attract investment
- Ensure financial viability
- Simple and transparent



QoSS: Quality of Supply & Services

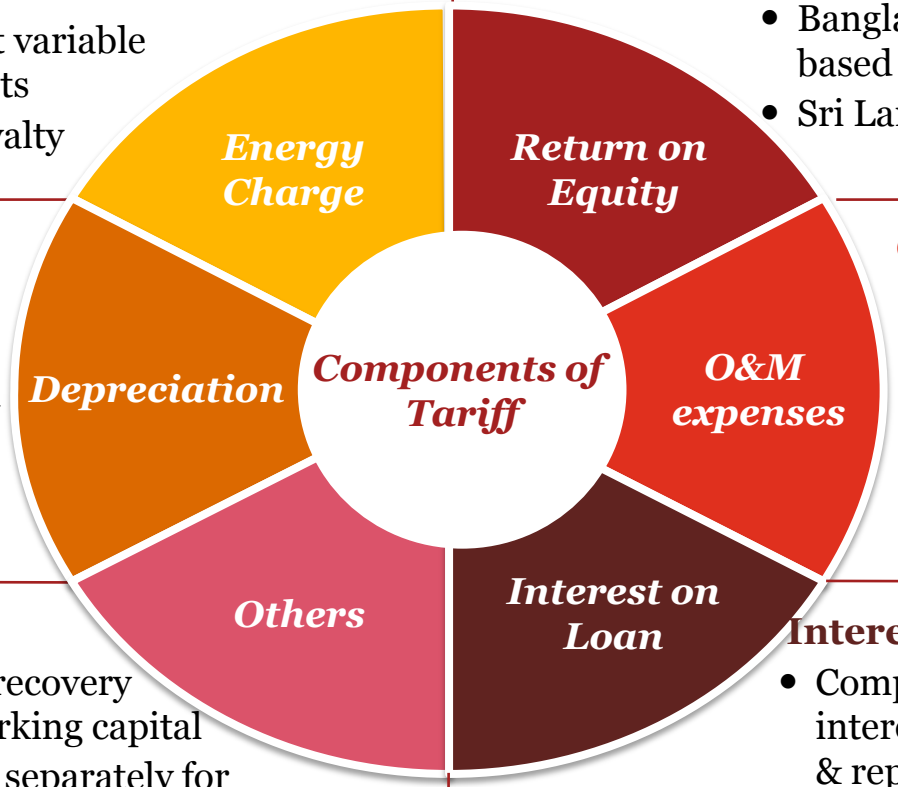
Components of generation tariff under Regulated Route

Energy Charge (Fuel)

- Derived on the basis of the landed fuel cost of a generating station (excluding hydro)
- Sri Lanka: includes efficient variable O&M costs and start-up costs
- Bhutan: includes cost of royalty energy

Return on Equity

- India: 15.5%-16.5% depending on technology plus additional 0.5% if project completed as per the schedule
- Bangladesh, Bhutan: No rate specified; based on WACC
- Sri Lanka: profit based on accounts



Depreciation

- Calculated annually based on Straight Line Method
- Sri Lanka: based on audited accounts

O&M expenses

- Includes employee costs, administrative & general expenses and repair & maintenance expenses
- Sri Lanka: divide into fixed & variable costs

Other costs

- India: Regulator allows for recovery of interest on normative working capital
- Sri Lanka: Regulator allows separately for refurbishment and extra ordinary maintenance costs also

Interest on loan

- Computed on weighted average rate of interest based on actual loan portfolio & repayment equal to depreciation
- Sri Lanka: based on audited accounts

WACC - Weighted Average Cost of Capital; O&M - Operation and Maintenance

Legislative and Regulatory framework

	AFG	BAN	BHU	IND	MAL	NEP	PAK	SRI
Legis-lation	Separate Act awaited	NEP issued in 1996, revised in 2004	Electricity Act of Bhutan, framed in 2001	Electricity Act enacted in 2003, changes proposed in 2014	No separate Act	Electricity Act 1992 and Electricity Regulation 1993	Power Policy enacted in 2002	Energy Policy and Strategies 2006 and Electricity Act 2009
Regul-ator	Setting-up of regulatory authority (AERA) in progress	BERC is sector regulator	BEA is sector regulator	CERC & SERCs are sector regulator	MEA is sector regulator	DOED/ ETFC are sector regulator	NEPRA is sector regulator	PUCSL is sector regulator

NEP - National Energy Policy, Bangladesh; BERC - Bangladesh Energy Regulatory Commission; BEA - Bhutan Electricity Authority; MEA - Maldives Energy Authority; DOED - Department of Electricity Development, Nepal; ETFC - Electricity Tariff Fixation Commission, Nepal; NEPRA - National Electric Power Regulatory Authority, Pakistan; PUCSL - Public Utilities Commission of Sri Lanka

Transmission Planning in SAC ….. (1/2)

Afghanistan	Bangladesh	Bhutan	India
• DABS, integrated utility in Afghanistan is responsible transmission planning. DABS, depending upon the future demand and upcoming generation capacity additions, plans for the transmission system	• Distribution Utilities (DU) to determine peak load and energy forecasts of their respective areas • Transmission Licensee and System Planner integrate the load forecasts submitted by each of the DUs • System Planner to prepare a least cost generation plan for the Power System to meet the long-term load demand as per the forecast (20 years) • System Planner to prepare a 20 years long-term transmission plan for the expansion of the transmission system compatible with the above load forecasts and generation plan	• System Operator shall prepare medium-term (5 years) and long-term (10 years) load forecasts for the overall system • System Operator shall review and revise all plans for the expansion of the generation capacity • Transmission Licensee shall conduct grid planning studies, load flow studies, short circuit studies, stability studies etc.	• CEA, CTU and STU are responsible for transmission planning • CEA prepares 15-year perspective plan and 5-eyar short-term plan (Part of National Electricity Plan) • CTU prepares one-year rolling network plan (at inter-state level) • STU prepares one-year rolling network plan (at intra-state level) • Network planning by CTU / STU takes into account only long-term access requirements; Medium-term and short-term access granted in case of availability of margins • Transfer capabilities, reliability margins (TTC, ATC, TRM) are computed by CTU & NLDC, RLDC, SLDC to ascertain the available transmission capacity for medium-term or short-term open access • SLDC to assess TTC, TRM and ATC on its inter-State transmission corridors considering the meshed intra-State corridors for exchange • RLDC to assess TTC, TRM and ATC for the inter-regional corridors at respective ends and intra-regional corridors 3 months in advance • NLDC to assess TTC, TRM and ATC for the inter-regional and intra-regional corridors

Transmission Planning in SAC ..... (2/2)

Nepal	Maldives	Pakistan	Sri Lanka
• System Planning Department (SPD), NEA shall review historic demand and prepare 15 years demand forecasts • Least Cost Generation Expansion Plan is prepared based on the demand forecast • SPD to prepare of short-term (5 years) Grid Expansion Plan and Development of long-term (15 years) Grid Expansion Plan (TDP) • Load flow studies shall be performed to evaluate the behaviour of the Grid for the existing and planned Grid facilities	• Power generation and distribution is through decentralized mini-grids. Hence, there is no transmission system	• Each year, NTDC shall prepare and submit to NEPRA a 10-year Indicative Generation Capacity Expansion Plan (NTDC Plan) • The NTDC Plan shall be based on a 20-year load demand and energy forecast • The NTDC Plan shall be used as an input to the preparation of NTDC's Transmission System Expansion Plan (TSEP) • The TSEP shall be presented to NEPRA each year as part of the Annual System Reliability Assessment and Improvement Report	• Transmission Licensee shall collect load forecasts from various stakeholders and validates the same • Transmission Licensee shall collect information from the Generation Expansion Plan and other information like Generation dispatch, transmission projects on the completion dates etc. • Transmission Licensee shall carry out system studies and prepare Long-term Transmission Development Plan for 10-year period • The plan shall be updated at least once in two years

No Specific information is available on Transmission Planning in respect of Maldives and Afghanistan