

Holistic approach to SAARC Power Market Development

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Scenario: India-Nepal

■ *Present*

- Nepal faces an electricity shortage of about 900-1000 MW
- Economically exploitable hydro potential of 42,000 MW out of which on 1.5 % is developed.
- Nepal is connected to India by one 132 kV line, eleven 33 kV lines and one 11 kV line. Most of them have limited transfer capacity on radial mode

■ *Future Prospects*

- Expects to develop *400 MW export capacity by 2017* (Water Resources Strategy, Nepal)
- Expects to earn significant national revenue under high growth scenario by developing 22000 MW of hydropower capacity, *15000 MW for export*
- Additional 130 km, *400 kV Muzzafarpur-Dhalkbar* has been envisaged for power trading between India-Nepal (Cross-Border Power Transmission Company, a JV has been formed)

Scenario: India-Bhutan

■ Present

- Bhutan exports about 1000-1200 MW surplus power to India from its three hydro projects
 - Chukha (336 MW), Kurichhu (60 MW) & Tala (1020 MW)
- Cross border transmission link synchronized with Indian ER Grid
- Present total power transfer capacity between Bhutan and India through transmission interconnection is about 2500 MW, which is sufficient to meet the present requirements

■ Future

- Only 1,488MW out of the total estimated potential of 30,000MW has been developed so far
- New Links for enhancing export capabilities

Scenario: India-Bangladesh



■ Present

- Bangladesh faces power deficit of upto 1500-1800 MW with ~60% Electrification
- India started exporting 250MW and additional 250MW to be scheduled soon
- MoU signed between NTPC and BPDB for setting up power project (1300MW) in 50:50 Joint Venture

■ Future

- Development of 400kV, 30km double-circuit HVDC line from Bheramara (Bangladesh) to Baharampur (India) link under process would initially be able to carry up to 500MW of power and will have an ultimate power flow capacity of 1,000MW

Scenario: with PAK, SL & MYN



- Electricity Shortage of 6000 MW against Demand of more than 19000 MW
- Power Demand to grow by ~1000-1500 MW every year
- Proposed 500 MW, 400 kV HVAC line with back-to-back HVDC converter

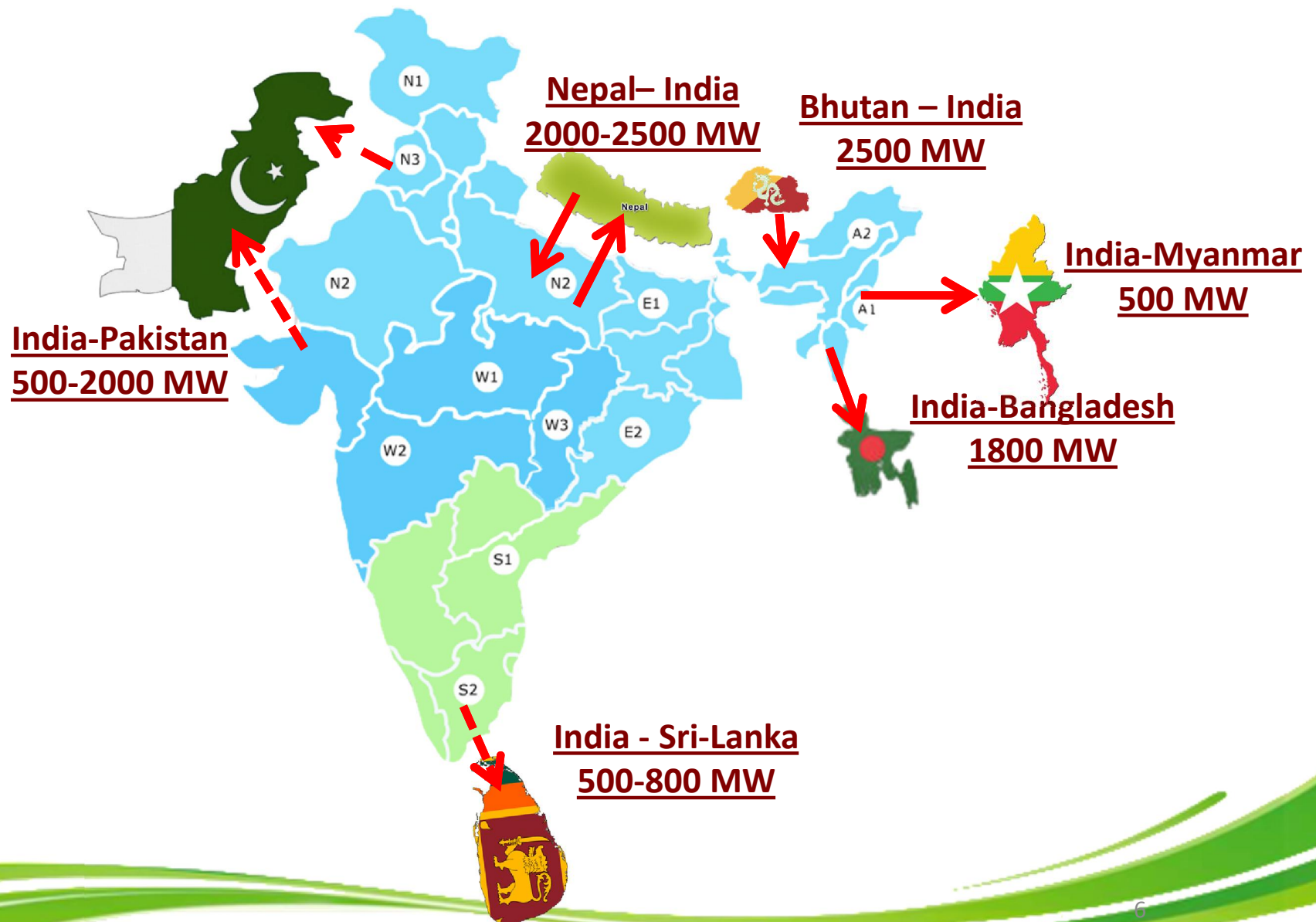


- Transmission interconnection feasibility study through land and sea route completed by PGCIL
- 400 KV Madurai (India) – Anuradhapura (Sri Lanka) HVDC bi-pole grid interconnection under conceptualization
- NTPC-Ceylon Electricity Board signed MoU (2011) for setting up coal based power in Sri Lanka

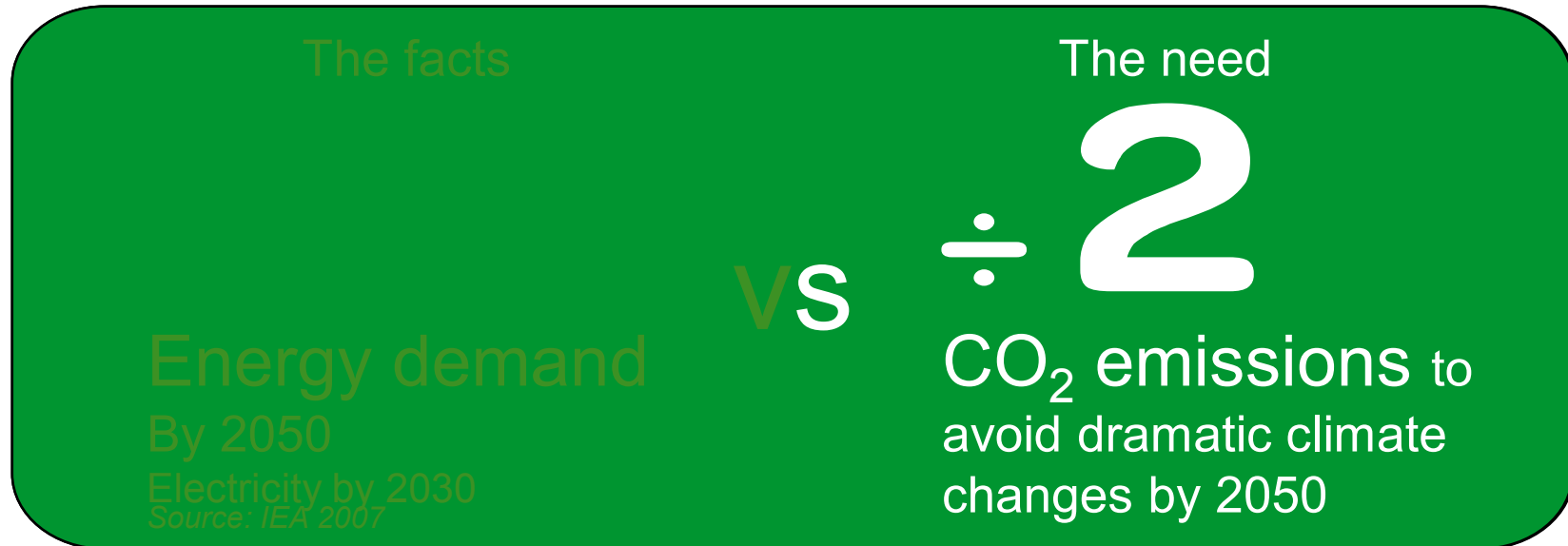


- Unexplored Hydro Power and Natural Gas
- Tamanthi (6x200MW) and Shwezeye (642MW) envisaged for export to India.
- Evacuation at 400KV level.
- Transmission system to be integrated with Indian grid.

SG: Trade Potential *{expected}*



Why SAARC Grid ('SG')



Source: IPCC 2007, figure (vs. 1990 level)

Frequent
power outages

Rising
electricity prices

Climate change

Conflicts for
resource access
& control

An effective way to mitigate future risk is by way of Resource Sharing among SA Nations which will most likely be by way of utilizing Cross Border Power Trading options for building common developed future

SG: Opportunity for establishment of Combined & Diverse Grid



- **42%** of South Asia population **without access to electricity**
- Per capita electricity consumption of 300 KWh against World's 2500 KWh
- Available options: *(Source: USAID Study, WB2008)*

Importing Countries	Exporting Countries				
	India	Bhutan	Nepal	Bangladesh	Sri Lanka
India	X	Significant quantities of hydro power (H)	Significant hydro power export possible	Significant amount of gas or power possible; resource uncertainty	Some peak power support possible
Bhutan	Dry season support	X	Unlikely. Similarity of resources and seasonal shortages	Small amount of thermal power and gas; connection via India (L)	No scope
Nepal	Thermal power support. Dry season support.	Unlikely. Similarity of resources and seasonal shortages	X	Small amount of thermal power and gas; connection via India (L)	No scope
Bangladesh	HVDC back-to-back link. Sharing reserves; electricity swap	Some hydro power; connection via India (L)	Some hydro power; connection via India (L)	X	No scope
Sri Lanka	Dry season and thermal power support	Unlikely (far off)	Unlikely (far off)	Unlikely (far off)	X

Growing Economies & Increasing Population - Energy security concern !!

SG: Macro Framework

■ Contracts

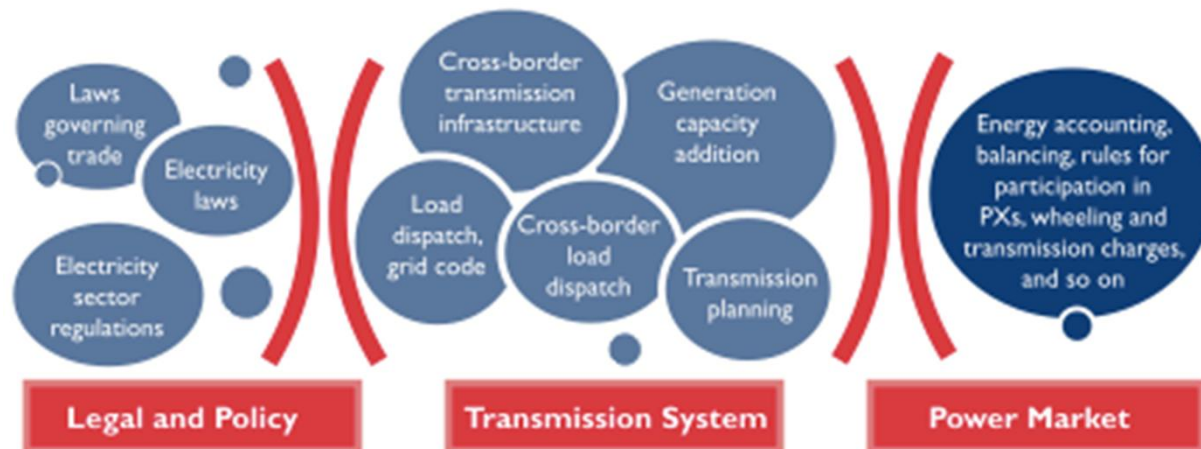
Standardization of
contracts for Perfect
Power Market

■ Legal Provisions

Trade Regulations
Electrical Regulations
Structuring Policies

■ Operational

Coordination among
system operators
Infrastructures
Scheduling and Dispatch



Source: USAID

Possible Strategies for Effective & Efficient market development



SG Power Market Framework

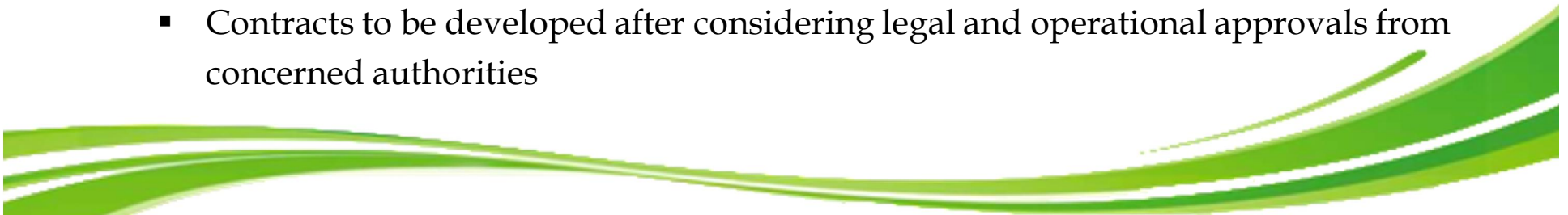


■ Product & Contract Development

- OTC contracts
 - Seasonal Contracts
 - Monthly Contracts
 - Time of Day Contracts
- Banking Contracts
- Day Ahead Contracts
- Contingency/ Auxiliary Contracts

■ Framing of Standard Contracts

- Standard contract for each products
- Standardization of the contracts shall remove the requirement of approvals for every contract
- Contracts to be developed after considering legal and operational approvals from concerned authorities



SG Power Market Framework



■ Settlement Mechanism

- Financial Settlement
 - ESCROW
 - Internationally acceptable Payment Security Mechanism
 - Other Financial Instruments
- Physical Settlement
 - Deviation Mechanism
 - Frequency Based
 - Marginal Pricing
 - Deviation Band Pricing

■ System Operation & Control

- Coordination among member state system operators
- Real time System Control & monitoring
- Power flow management
- Emergency Islanding protocols
- Energy Accounting



SG: Hard task

- Geo-political dynamics
- Project Financing
- Transmission Infrastructure Development
- Regulatory compatibility
- FOREX Risk
- Power Pricing Methodology
- Financial Settlement
- Recognition of Power Trading Companies



Who we are?



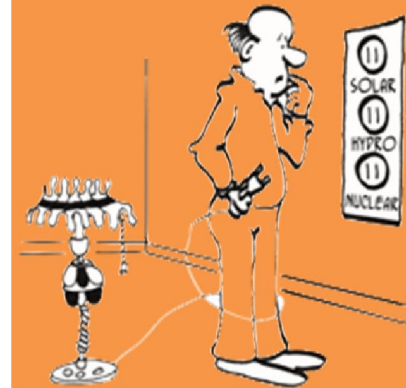
**Power
Trading**



**Power
Generation**



**Holistic
Energy
Services**



**Energy
Advisory
&
Services**

GEPL Study & Suggestions for fast-tracking Power Trade



■ *India-Pakistan*

- Quick possibilities of building 2 nos. AC Radial links of 220kV i.e. Khasa (Punjab) & Gujarat in addition to HVDC link (Long-gestation)
- Distance between nearest 220 KV s/s from border on both sides is about 40 Kms in Punjab and about 120kMs in Guj.
- Export *potential of upto 350-400 MW Radially* into Pakistan with intermittent pooling S/s for Grid Stability (if desired)

■ *India-Nepal*

- Possible up-gradation of *14 Radial links* out of available 22 Radial links for enhancing export capabilities to over 70-90 MW
- Duty of Power Import to India should be abolished
- Govt. should allow Open General License policy for fostering competition in Power Trading

GEPL Study & Suggestions for fast-tracking Power Trade



■ *India-Bangladesh*

- Quick possibilities of building 11 nos. AC Radial links from W.B & North Kohima (Tripura) for export of ~300-450MW additional Qtm.
- Possibility for additional ~700MW bypassing “*chicken neck area*” (*a very narrow patch of land (~22 km wide and ~18 km long) in the state of West Bengal having borders with Nepal on one side and Bangladesh on the other side*)
- Use of 800 kV HVDC minimizes the use of land in this vital corridor and should be encouraged by govt.

■ *India-Myanmar*

- Possible option to build Silchar (India) as power hub of 400kv & 132kV Grid S/s
- Possibility to explore Radial link establishment for quicker short term trade from Mendley

Setting the Rules for Cross-border Market does not change the way Electricity flows but Influences how Costly the Electricity we need will be produced & Procured

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