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**Brief Report
On
SARI/EI Participation in the
“High Level Panel Discussion: Policy & Regulatory Aspects and Reforms”
of the POWER-GEN India & Central Asia Conference**



18th -20th May, 2016

Pragati Maidan

New Delhi, India





Brief Report

Based on the invitation from conference director of Power-Gen India & Central Asia Conference, Mr. Rajiv Ratna Panda, Head-Technical, SARI/EI/IRADe participated in the Session-1 on “High Level Panel Discussion: Policy & Regulatory Aspects and Reforms” of the POWER-GEN India & Central Asia Conference held on 18th -20th May, 2016 at Pragati Maidan, New Delhi, India

Mr. Rajiv also made a brief presentation titled “South Asian power sector and Cross Border Electricity Trade” covering a) Overview of South Asian power sector b) Regional energy resource potential: hydro potential c) Current status of Cross Border Electricity Trade (CBET) and Future CBET trading scenarios d) Key drivers for CBET and regional exploitation of energy resources e) Power sector reform in South Asia and CBET Policy governing framework f) Regional transmission capacity by 2033-34, 2040 g) Role of regional hydro power in renewable integration and grid balancing h) Key challenges and risk for CBET: Need for a comprehensive policy framework i) Brief about South Asia Regional Initiative for Energy Integration (SARI/EI) and overall framework for development of CBET in South Asia. He explained about the key drivers for CBET and highlighted that Low per capita electricity consumptions, electricity shortages, poor access to electricity, resource crunch and seasonal complementarities are the driving force for advancing CBET in the region.

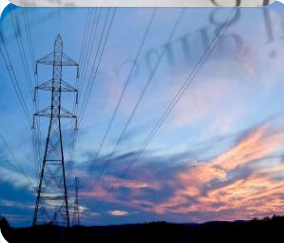


He explained in detail about the Power Sector Reform in South Asia and the CBET Policy Governing Framework in South Asia. Currently, CBET Policy Governing Framework is mainly through Bilateral Agreements/MoU between Countries and countries are taking steps on domestic Regulation and on Policy side to remove any barrier to CBET. His detailed presentation is attached as annexure-I. The session deliberated on various aspects of Policy & Regulatory Aspects and Reforms and development of power sector.



The session was chaired Shri. Gireesh Pradhan, Chairman, Central Electricity Regulatory Commission, India. The other distinguished speakers of the session were Dr. Somit Dasgupta, Member, Central Electricity Authority, India; Mr. Deepesh Nanda, CEO, Gas Power System, GE South Asia, India; Mr. Dominik Hofman, Vice President- Power and Gas Division, Siemens Ltd. India; and Mr. Rathin Basu, Chairman, Alstom India Ltd & Managing Director, Alstom T and D Ltd. (a GE group Company), India.





Annexure-I

South Asian Power Sector

&

Cross Border Electricity Trade (CBET)

High Level Panel Discussion: Policy & Regulatory Aspects and Reforms

Rajiv Ratna Panda
HEAD-TECHNICAL, SARI/EI/IRADe

Power-Gen India & Central Asia Conference
18th -20th May, 2016
Pragati Maidan, New Delhi, India



Overview of South Asian Power Sector

Total Installed capacity of around 3,47,593 MW

Afghanistan: Small Power system (1341 MW), High Electricity Imports high, Hydro Dominated.

Bhutan: Small Power system (1614 MW);Hydro Dominated, Surplus Hydro , Exporting to India. Leading Exporter of Hydro Electricity.

Bangladesh: Gas Dominated, Resource Crunch, Imports Electricity from India and in future will remain as one of the Leading electricity importing country.

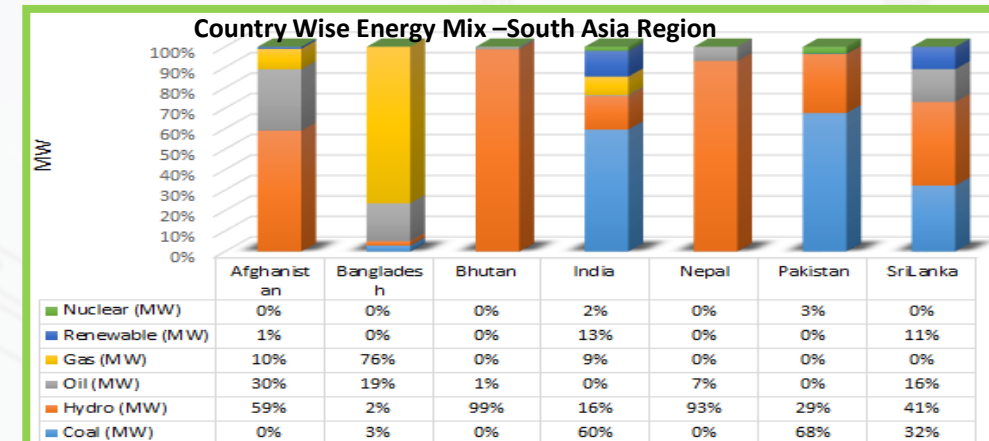
India: Large Power System, Coal dominated, reducing deficits, long terms electricity demand are huge and potential large market, The Leading Electricity importing and exporting nation. Large Renewable Capacity Addition.

Nepal: Very small power system (765 MW), Hydro based, very high deficits, Importing Electricity from India, Potential for Larger exporter for Hydro Electricity in medium term and importer of electricity in Short Term.

Sri Lanka: Hydro dominated but the flex mix is changing, High peak demand.

Country	Installed Capacity (MW)
Afghanistan	1341
Bhutan	1,614
Bangladesh	12,071
India	302833
Nepal	765
Sri Lanka	4050
Pakistan	24,829
Maldives	90
Total	3,47,593

Source : Compiled form various sources PGCB, DGPC,CEA,Annual Report NEA, Status of Industry Report NEPA, Task Force 1 Report IRADe Report on CBET south Asia: Challenges and investment



Regional Resource Potential: Hydro Potential :350 GW !

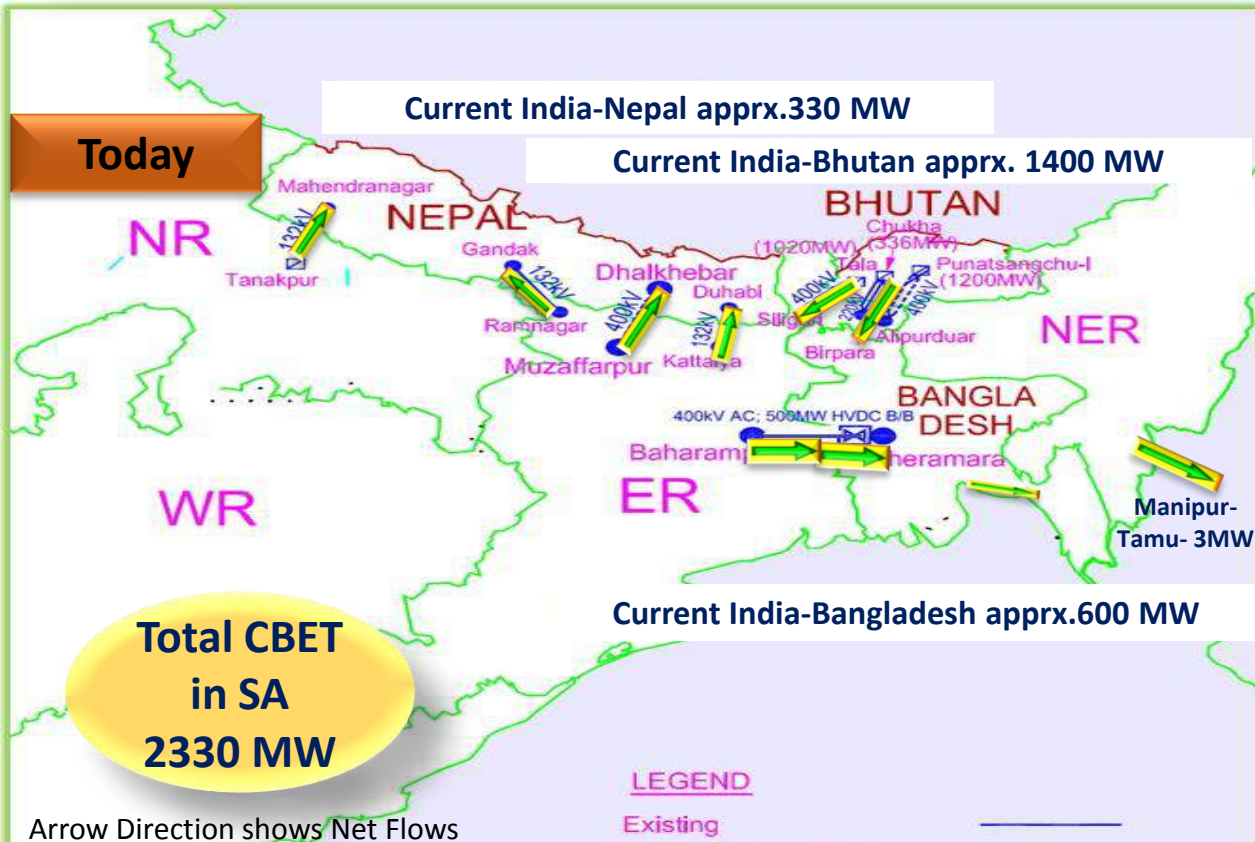
- **Vast potential of hydro power:350 GW**
- **Bhutan, Nepal, Pakistan, India, 30,83, 59, 150 GW respectively.**
- **Nepal and Bhutan can build exported oriented hydro plants.**
- **Significant Coal deposits in India and Pakistan.**
- **Coal deposits in Bangladesh yet to be exploited effectively.**
- **In addition ,there is a huge renewable energy resources like solar and wind.**

Country	Coal (million tons)	Oil (million barrels)	Natural Gas (trillion cubic feet)	Biomass (million tons)	Hydro (GW)
Afghanistan	440	NA	15	18-27	25
Bhutan	2	0	0	26.6	30
Bangladesh	884	12	8	0.08	0.33
India	90,085	5,700	39	139	150
Maldives	0	0	0	0.06	0
Nepal	NA	0	0	27.04	83
Pakistan	17,550	324	33	NA	59
Sri Lanka	NA	150	0	12	2
Total	108,961	5,906	95	223	349.33

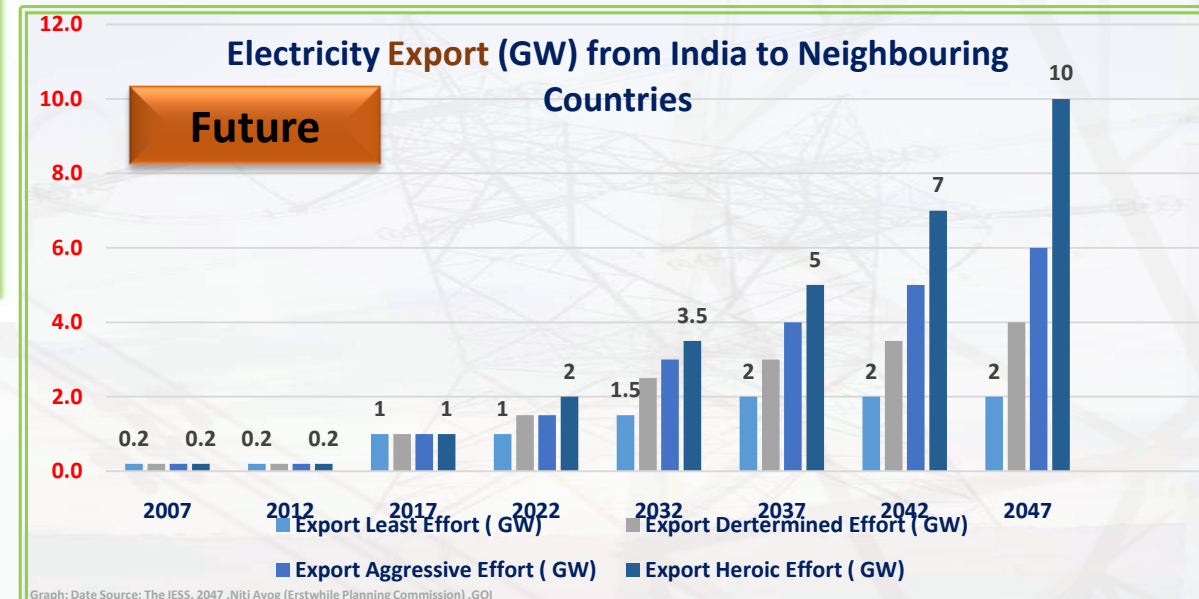
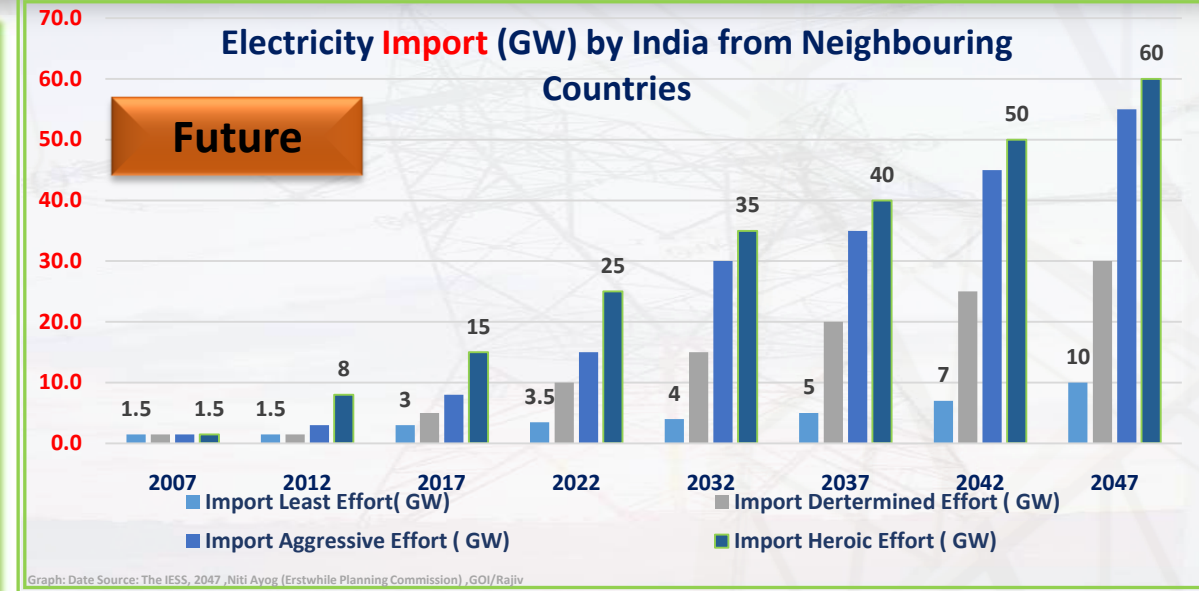
Source: SAARC Secretariat (2010) for Bangladesh, Bhutan, India, Nepal, Sri Lanka; CWC (2005) for Indian States and WAPDA (2011) for Pakistan

Renewables	Bangladesh	India	Nepal	Bhutan	Pakistan	Sri Lanka
Solar Power (Kwh/sq. m per day)	3.8 - 6.5	4 - 7	3.6 - 6.2	2.5 - 5	5.3	NA
Wind (MW)	limited potential	151,918	3,000	4,825	24,000	25,000MW

Current Status of Cross Border Electricity Trade (CBET) and Future Trading Scenarios



Bhutan → India	India → Bangladesh	India → Nepal
<ul style="list-style-type: none"> Tala: 1.80 INR/kWh for 1st year (now 1.98 INR/kWh) Dagachhu: 2.40 INR/kWh for 1st year (started in 2015) 	<ul style="list-style-type: none"> NVVNL: 2.40-2.86 INR/kWh (Aug'14-May'15) PTC: 4.26-5.00 INR/kWh (Dec'13-May'15) Tripura-Bangladesh Rs 5.50 per unit 	<ul style="list-style-type: none"> Treaty/Bilateral: Current 5.40 INR/kWh PTC: 4.55, 4.35, 4.30, 3.75 INR/kWh (FY11-FY14) NVNL-NEA PPA (80 Mw) INR 3.44



Key Drivers for CBET and Regional Exploitation of Energy Resources

- Low per Capita electricity consumptions
- Electricity Shortages.
- Poor access to electricity.
- Optimal utilization of energy resources.
- Fostering Economic Growth and Regional Integration
- Resource Crunch
- Opportunity -regional electricity market.
- Seasonal complementarities

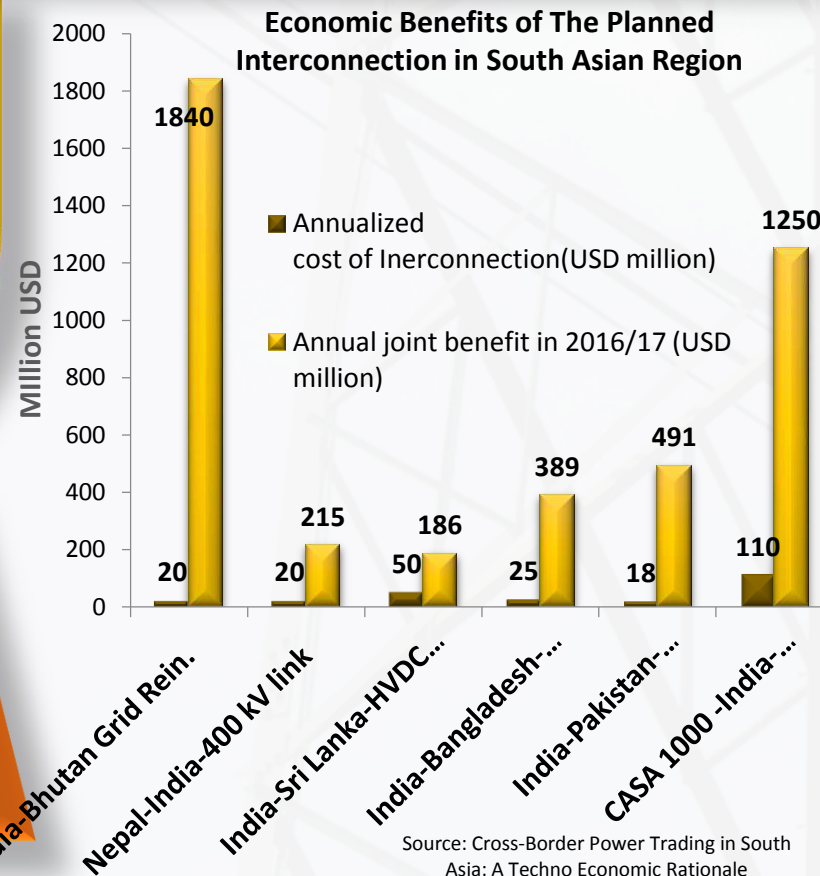
Nepal and Bhutan
Large hydropower resources; Nepal -severe power shortages, Economic benefits of Trade

Bangladesh :Power shortages, Large Suppressed Demand, heavy reliance on natural gas and plans for large coal power

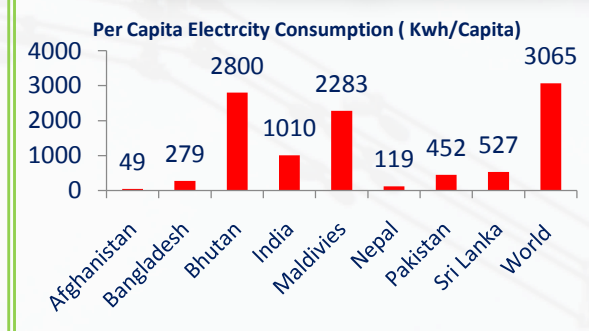
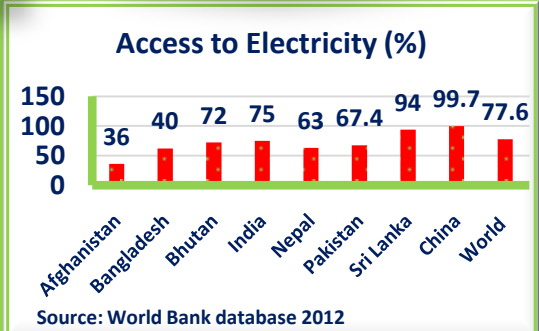
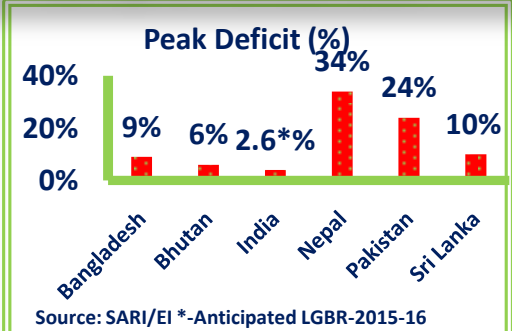
Afghanistan and Pakistan
Access to large hydropower resources, Severe power shortages, High Demand Growth

Sri Lanka
Heavy reliance on liquid fuel and plans for large coal power development

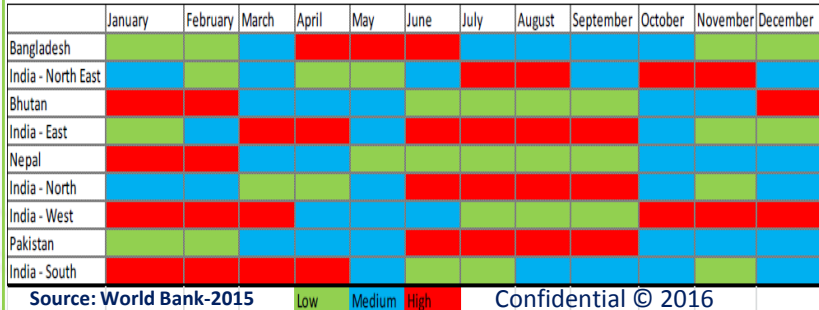
India :High demand growth, coal power dominated, power deficits, Renewable energy Growth



Source: Cross-Border Power Trading in South Asia: A Techno Economic Rationale



Seasonal complementarity in power systems in South Asia – Monthly Electricity Load Profiles across South Asian Grids



Power Sector Reform in South Asia and CBET Policy Governing Framework

Vertically Integrated

Partially un-bundled

Un-bundled

- 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)

Country	Policy	Regulation	Trading
Afghanistan	Ministry of Energy and Water	Afghanistan Electricity Regulatory Authority (AERA) (Proposed)	SB Model ,
Bangladesh	Ministry of Power, Energy and Mineral Resources	Bangladesh Energy Regulatory Commission (BERC)	SB Model , BPDB
Bhutan	Ministry of Economic Affairs	Bhutan Electricity Authority (BEA)	Export Licensees, SB Model
India	Centre- Mop, GOI State: Power/Energy Department State Government	Central: CERC, State: SERCs/JERCs	MB and MS Model Central: Inter-state Licensees State: Discoms/Trade Cos / Intra-state Licensees
Nepal	Ministry of Energy (MoE)	Electricity Tariff Fixation Commission (ETFC)	SB Model , NEA
Pakistan	Ministry of Water and Power	National Electric Power Regulatory Authority	Central Power Purchase Agency
Sri Lanka	Ministry of Power and Energy	Public Utilities Commission of SL	SB Model , CEB

CBET Policy Governing Framework

It is mainly through **Bilateral Agreements/MoU** between Countries.

India-Bhutan:

- 1. 2006 Framework Agreement on Hydropower development & Trade**
- 2. Framework IG Agreement for joint venture projects.**

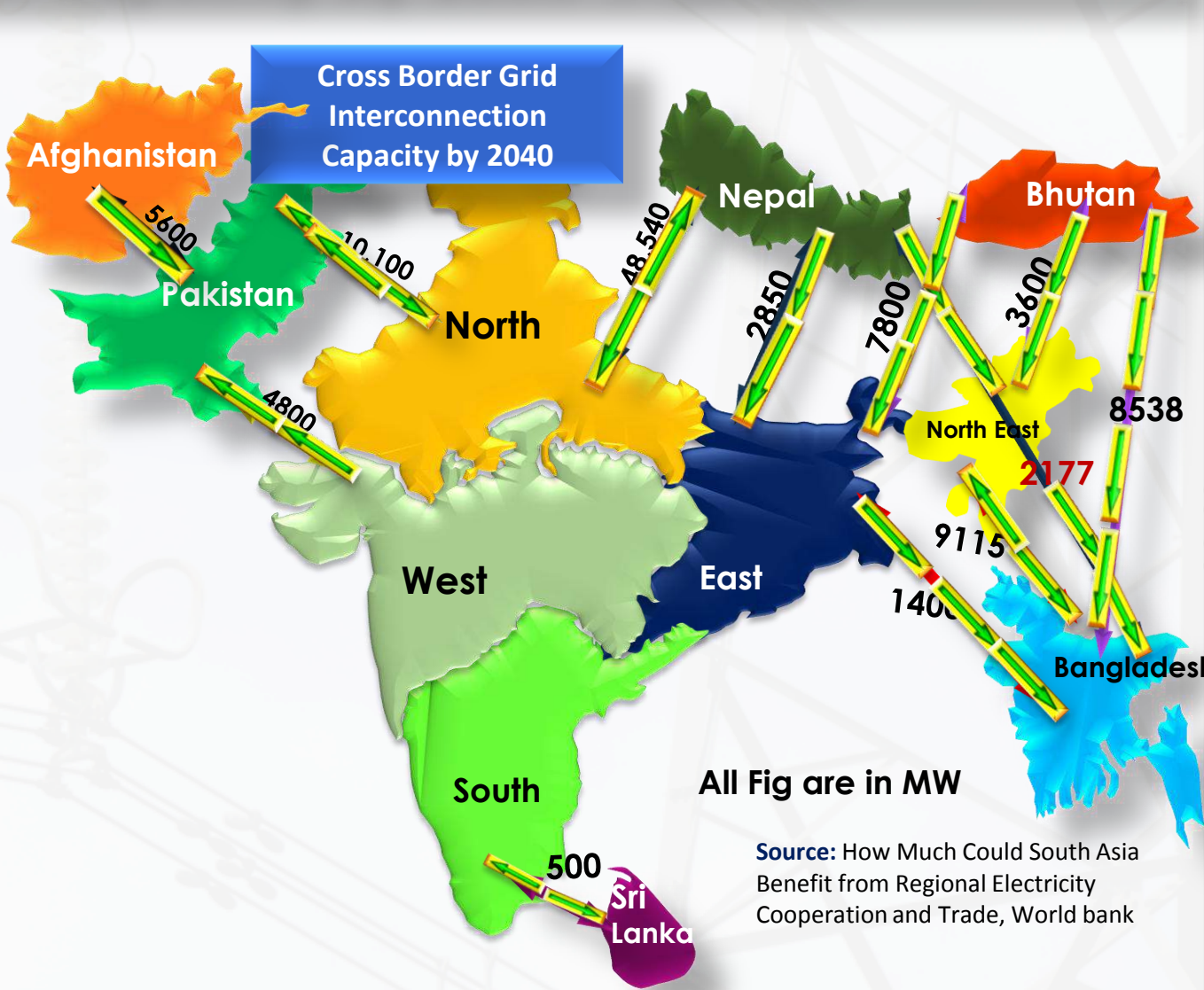
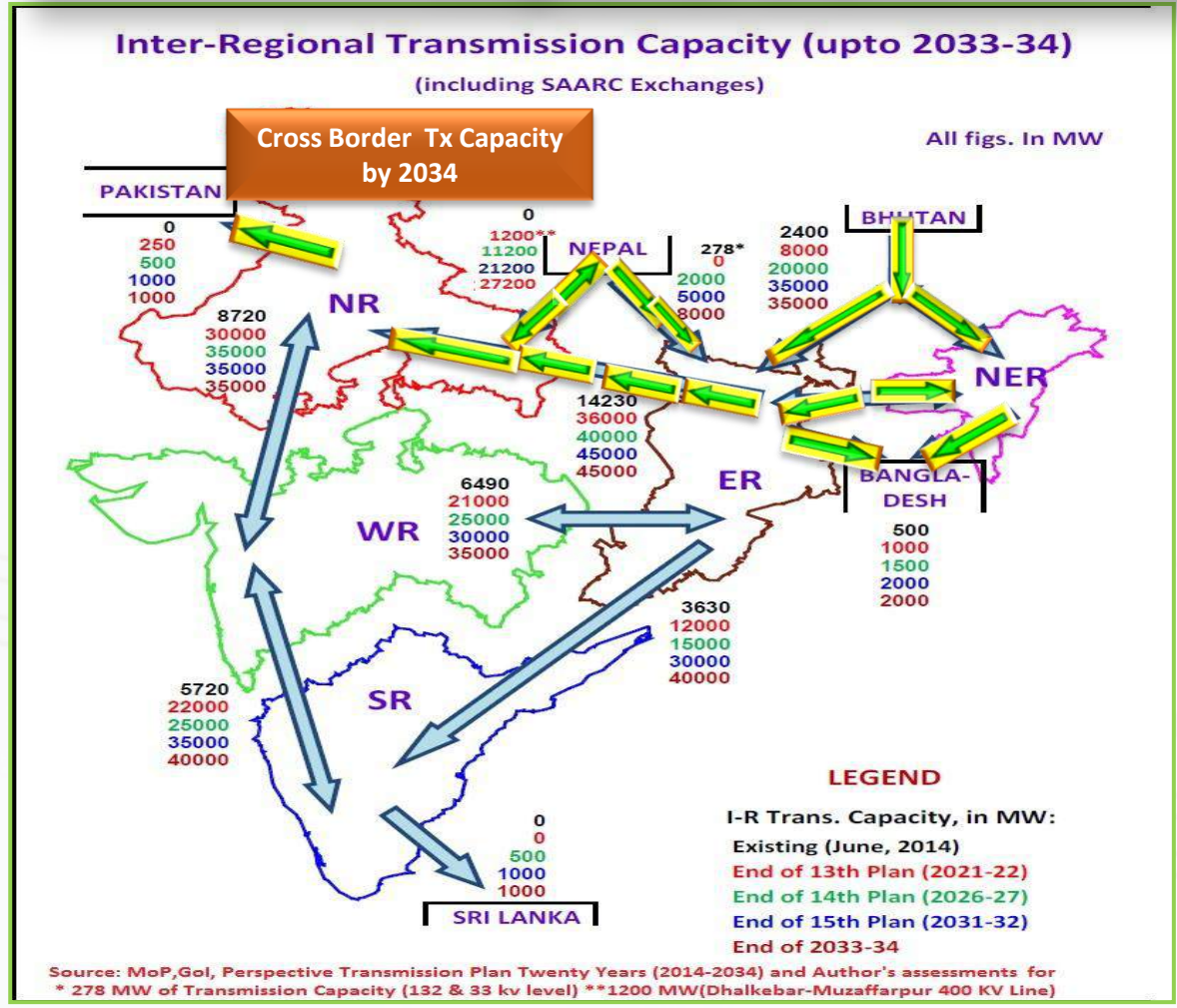
India-Bangladesh: A MoU signed on January 2010 between 2 Governments for bilateral Co-operation in the areas of Power Generation, Transmission.....

India-Nepal:- 1.Power Exchange Treaty 2. Agreement on electric power trade, cross-border transmission interconnection 3. River Treaties

Regional Agreement: SAARC Framework Agreement on Energy (Electricity) Cooperation.

Countries are taking steps on domestic Regulation and on Policy side to remove any barrier to CBET if any.

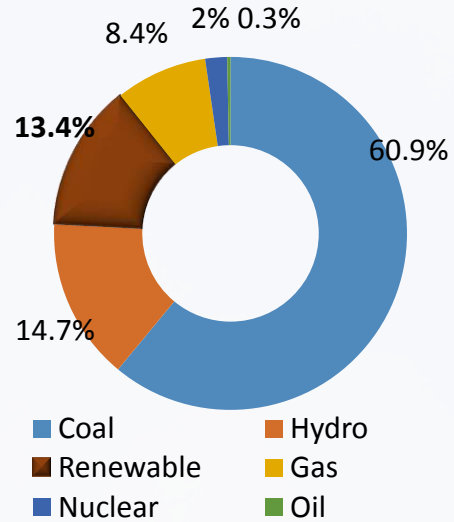
Regional Transmission Capacity by 2033-34, 2040



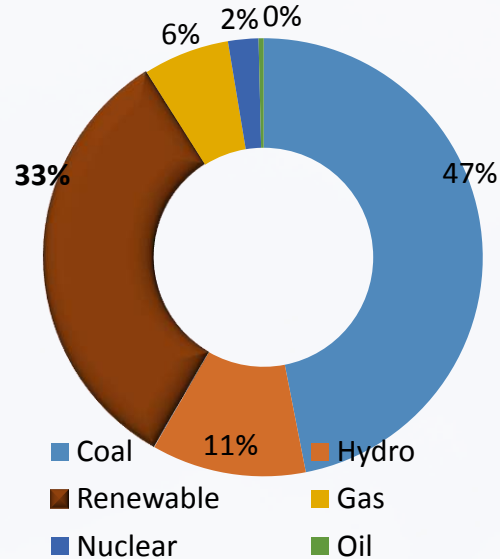
http://www.erpc.gov.in/uploads/news_pdf/141207381720%20Yr%20Trans%20Perspective%20Plan.pdf
 Significant Transmission System Interconnection (Both AC and DC) are being Planned and Proposed. Bangladesh is in the process of Planning to Import around Apprx. 6000 MW by 2034 (PMSP 2015-JICA Presentation, 4th June, 2015)

Regional Hydro Power May help in Renewable Integration and Grid Balancing

All India Installed Capacity = 288 GW
(As on 18th Feb, 2016)



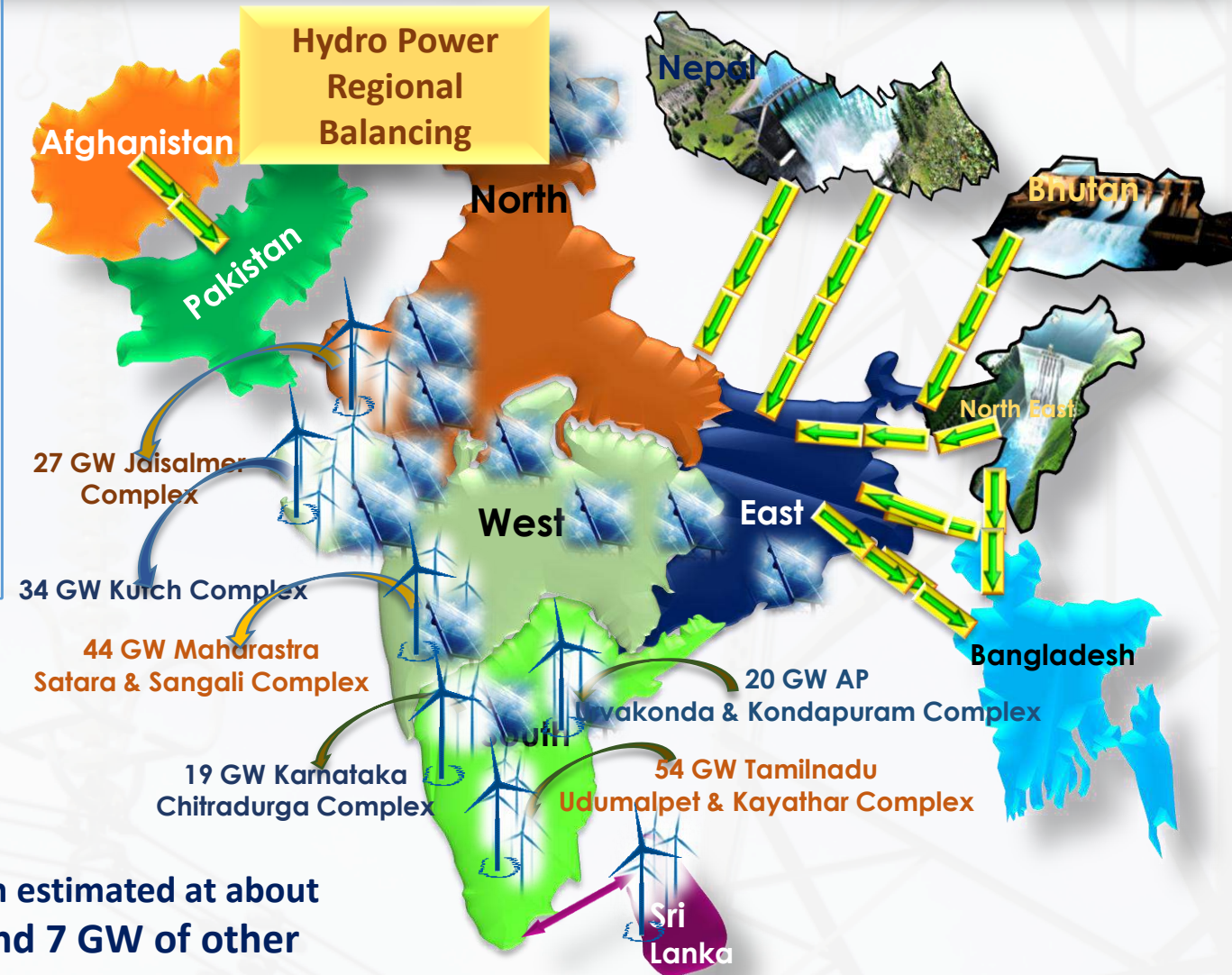
Projected All India Installed Capacity = 535 GW (Projection 2022)



•Hydro share in India has been declining over the years (45% in 1970 to Apprx 15% in 2015)

•In terms of National Electricity policy, spinning reserves at 5%. With 275 GW generating capacity existing as on date and nearly 150 GW peak demand, the quantum of reserves has been estimated at about 4 GW of primary reserve, 3.6 GW of secondary reserve and 7 GW of other reserves.

•Regional Ancillary Market- India Has started ancillary market recently.



Key Challenges and Risk for CBET: Need for a Comprehensive Framework

Key Challenges

1. Political Conesus: Regional Cooperation and Recognition of CBET/Trade in the National Policy, Law etc.

2. Government Commitment & Policy Coordination

3. Financial Challenges, Investment, Financial Viability

4. Mechanism of Inter-connection

5. Market form of Trade

6. Regional Cooperation on Regulatory and Contractual Aspects

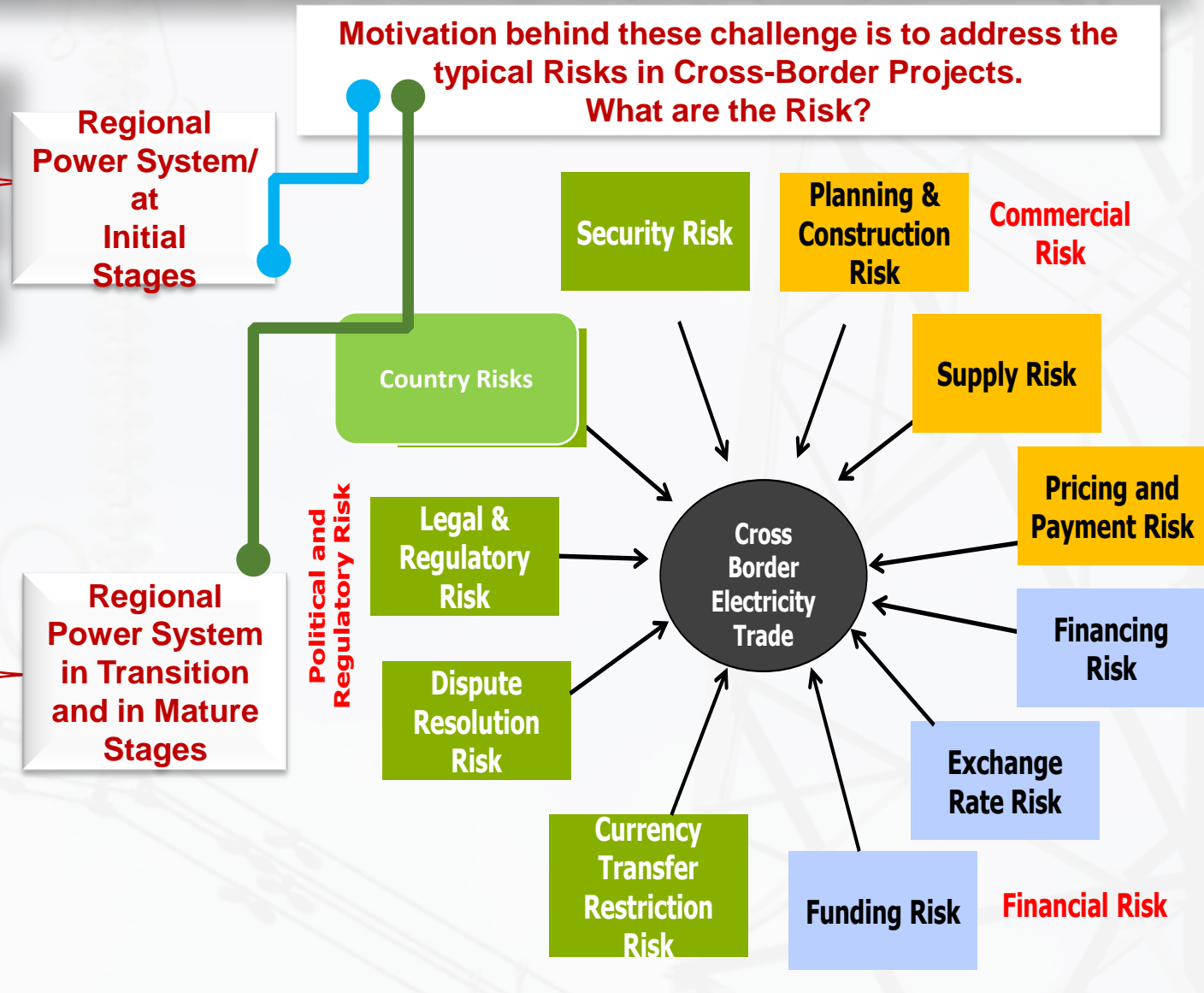
7. Open Access in Transmission

8. Transmission Charges/Pricing

9. Transmission Plan

10. Commercial Mechanisms to Settle Imbalances

11. Dispute Resolution



South Asia Regional Initiative for Energy Integration (SARI/EI)

● SARI/E is a long standing program of USAID started in the year 2000.

● Program has consistently strived to address energy security in South Asia by focusing

- 1) Cross Border Energy Trade
- 2) Energy Market Formation and
- 3) Regional Clean Energy Development.

● SARI/EI–Phase IV (2012-2017): Key Outcomes.

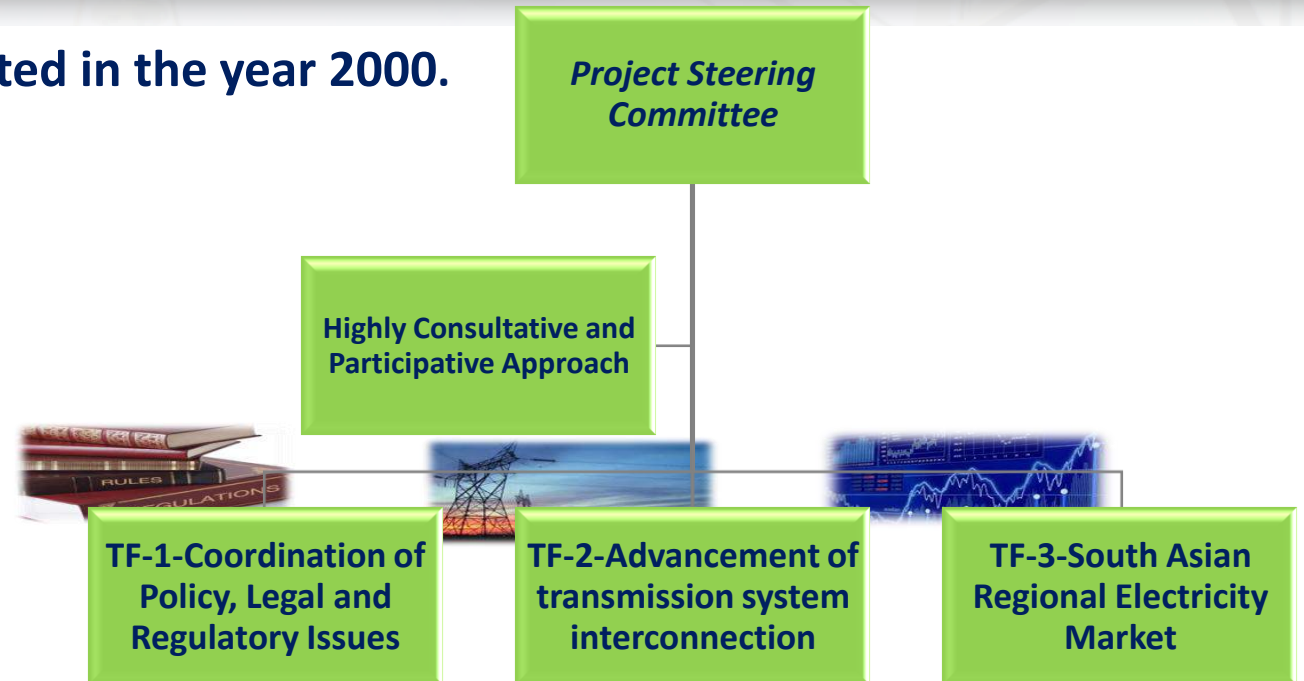
Three Key Development Outcomes:

1. *Coordinate policy, legal and regulatory issues.*
2. *Advance transmission interconnections.*
3. *Establish South Asia Regional Electricity Markets.*

● First Three Year of the Program is Completed.

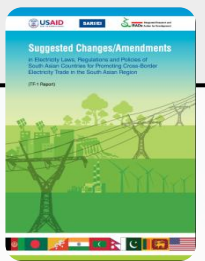
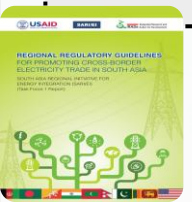
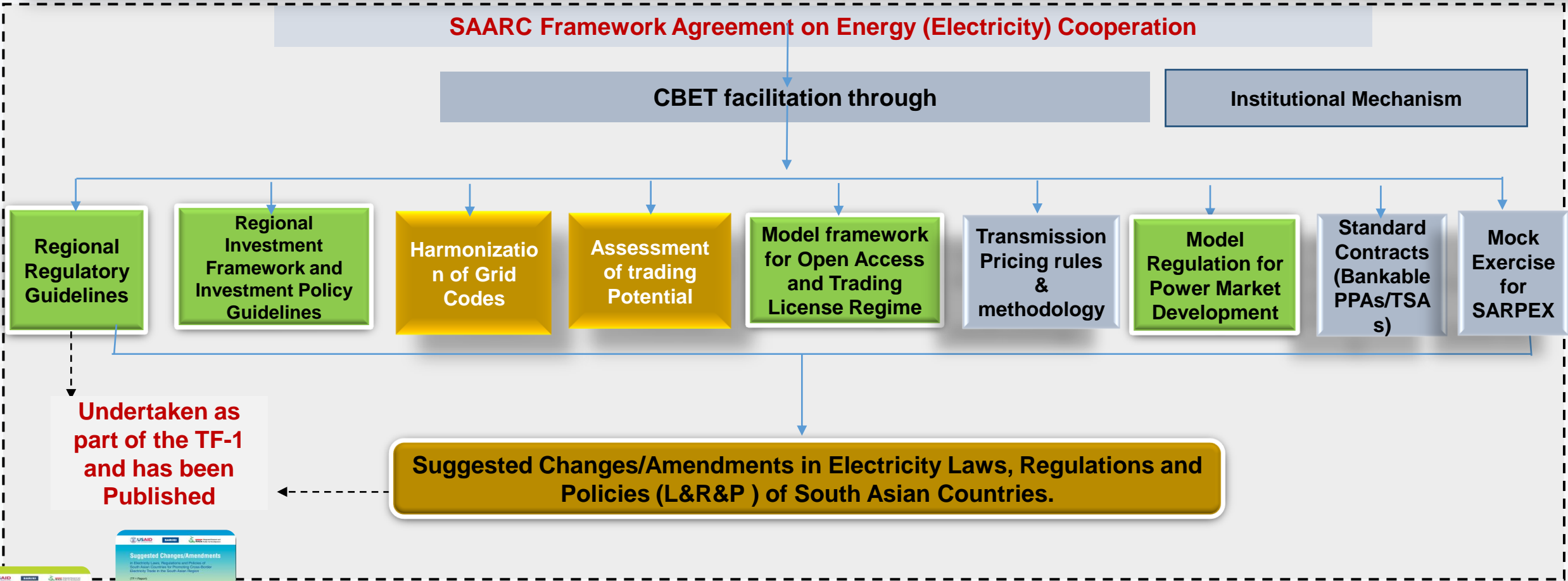
● Demand Driven ‘Bottom Up’ Approach

● IRADe, a regional organization, is implementing partner



- **Project Steering Committee (PSC)** consist of government nominated Senior level officials from the country governments, SAARC, ADB, Independent Energy Experts/Diplomats.
- Intergovernmental Task Forces: Task Force Members are represented by government nominated members from Regulatory Technical , market related institution of each SA countries.

Overall Framework for development of CBET in South Asia





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Thank You