

South Asia Energy Ring and STRETS Follow on Actions

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(Presenter Gratefully Acknowledges Sources)

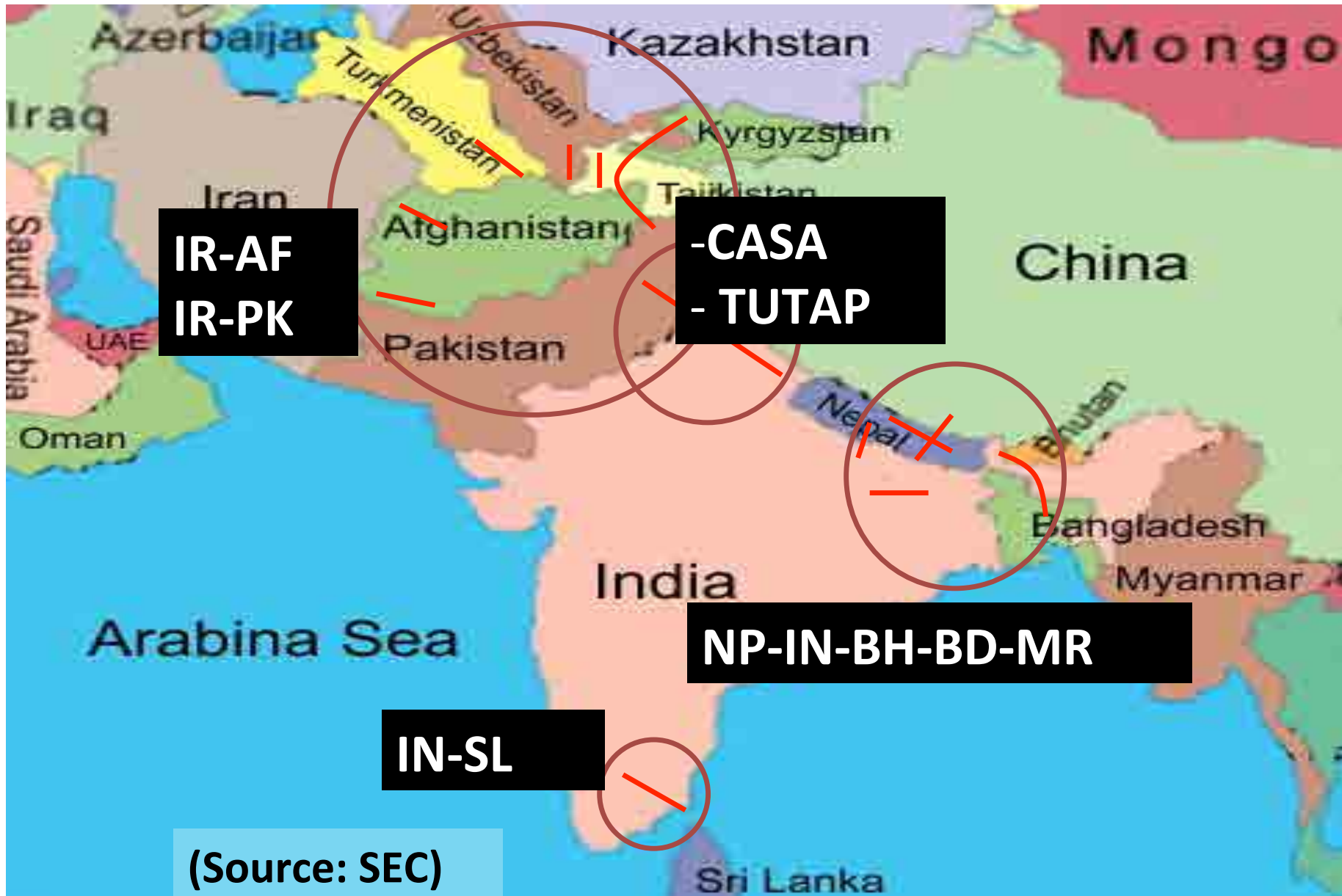
South Asia Energy Challenges

- Increasing energy deficits
- Single fuel dominance in energy mix
- Limited exploitation of renewables
- High dependence on traditional fuels
- Rising import dependence
- Lack of requisite energy infrastructure
- Regional energy source inadequacy

SAARC Energy Ring

- **Vision given by SAARC Country Leaders at 2004 Islamabad Summit**
- **Develop regional cooperation in energy for regional benefit**
- **Enhance provision of adequate and reliable energy supply**
- **Ring of possible cross border energy transfers**

SAARC ENERGY RING – POWER TRANSFERS



(Source: SEC)

IPI and TAPI Natural Gas Pipelines



IPI and TAPI Natural Gas Pipelines

- IPI - 1872 km, 5.2 BCF/d pipeline at \$7 billion (2005)
now revised down to 2.0 BCF/d shared equally for
Pakistan and India**
- TAPI -1735 km, 3.2 BCF/d pipeline at \$8 billion (2008)
about 2.0 BCF/d initially shared equally for Pakistan
and India with 0.2 BCF/d for Afghanistan**

**India gas demand in FY 2017 is estimated at about 16
BCF/d and that of power sector at 3 BCF/d**

5.0 MMTPA (\$ 500 m) LNG Terminal gives 0.55 BCF/d

SAARC Regional Energy Trade Study (SRETS)

Supported by ADB technical assistance recommended

- further analysis of proposed SAARC cross border power interconnections
- pursuing options for pipeline gas transport to the region such as TAPI and IPI
- considering additional options in the form of
 - Regional Power Market Expansion
 - Regional Refinery + product transport expansion
 - Regional LNG Terminal + more gas transmission
 - Regional Power Plant (s)

Regional Power Market Expansion

- Optimal exploitation of energy resources
- Reduction in generation reserve requirements
- Reduction in overall cost of supply
- Improved system reliability, energy security
- Incentives to resource rich countries to accelerate power development
- Cross-border connectivity, a prerequisite

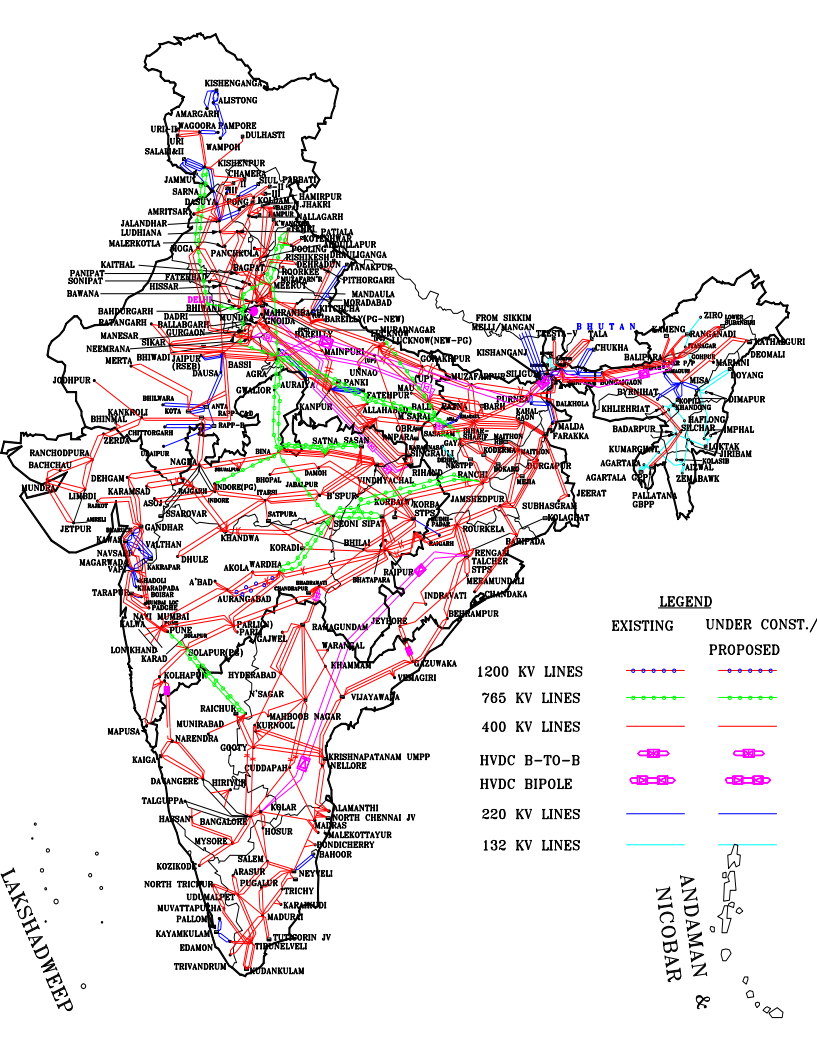
Expected Peak Electricity Demand (GW)

(Source – Author Compilation)

YEAR	2017	2032
India	200	542
Pakistan	25	75
Bangladesh	13	35
Sri Lanka	3.2	6.5
Nepal	1.2	5.0
Afghanistan	1.5	3.5
Bhutan	0.8	2.5

Indian Power Transmission (mid- 2013)

POWER MAP OF INDIA



- **765kV lines : 6,500 ckms**
- **400kV lines :115,800 ckms**
- **220kV lines : 140,000 ckms**
- **HVDC Bipole (± 500 kV): 9,000 ckms**
- **HVDC Back-to-back : 3000MW**
- **Transformation Capacity: 400,000 MVA**
- **FSC – 33 nos.; TCSC – 6 nos.**

(Source – CEA)

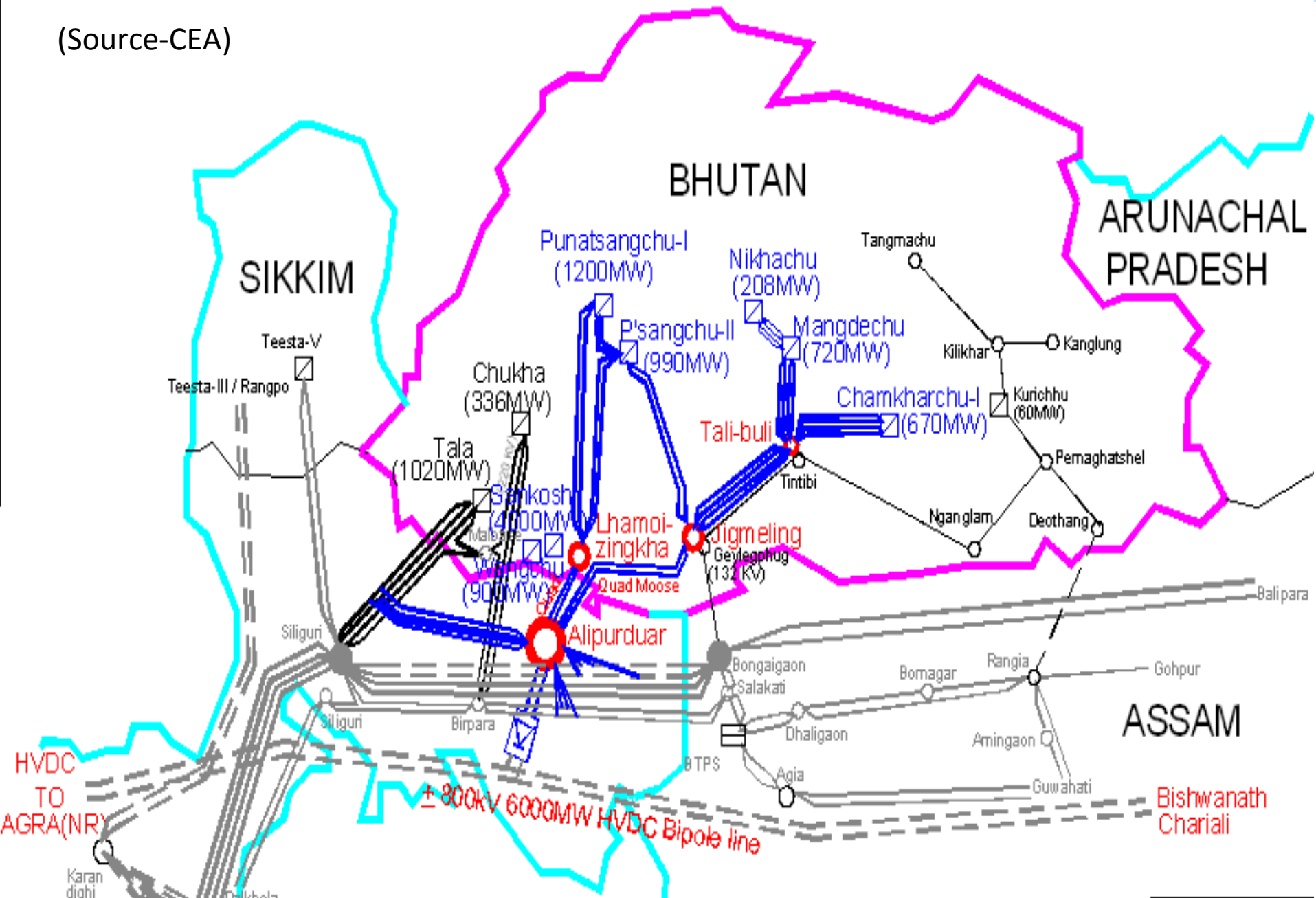
ADB SA Regional Power Exchange Study

Interconnections Considered

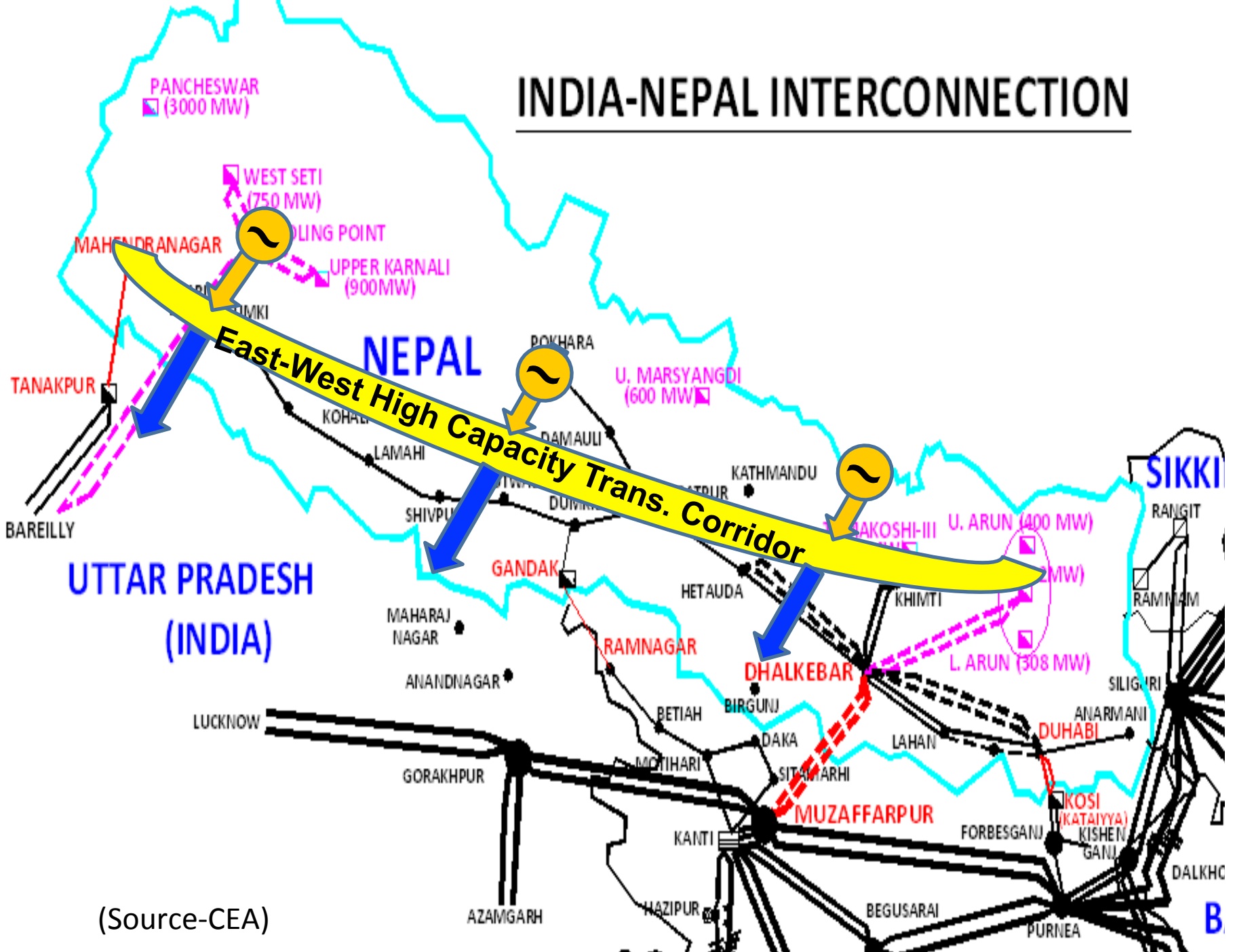
No.	Interconnection	Description	Capacity (MW)	Cost (USD million)
1	India-Bhutan	Grid reinforcement to evacuate power from Punatsangchhu I & II	Total grid reinforcement of 2,100 MW	140-160 (2010 estimate)
2	India-Nepal	Dhalkebar-Muazaffarpur 400 kV line	1,000 MW	186 (2010 estimate) including internal transmission upgrade
3	India- Sri Lanka	HVDC line with sub-sea cable	500 MW in the short-term	339 (2006 estimate) 600 (Current)
4	India-Bangladesh	HVDC back-to-back asynchronous link	500 MW	192-250 million (2011 estimate)
5	India-Pakistan	220 kV in the short term, 400 kV in the long term	250-500 MW	50-150 million (2012 estimate)
6	CASA 1000 and India-Pakistan interconnection	HVDC and 500 kV HVAC for CASA	1300 MW	Approx 1 billion (2011 estimate)

India – Bhutan Interconnection

(Source-CEA)



INDIA-NEPAL INTERCONNECTION

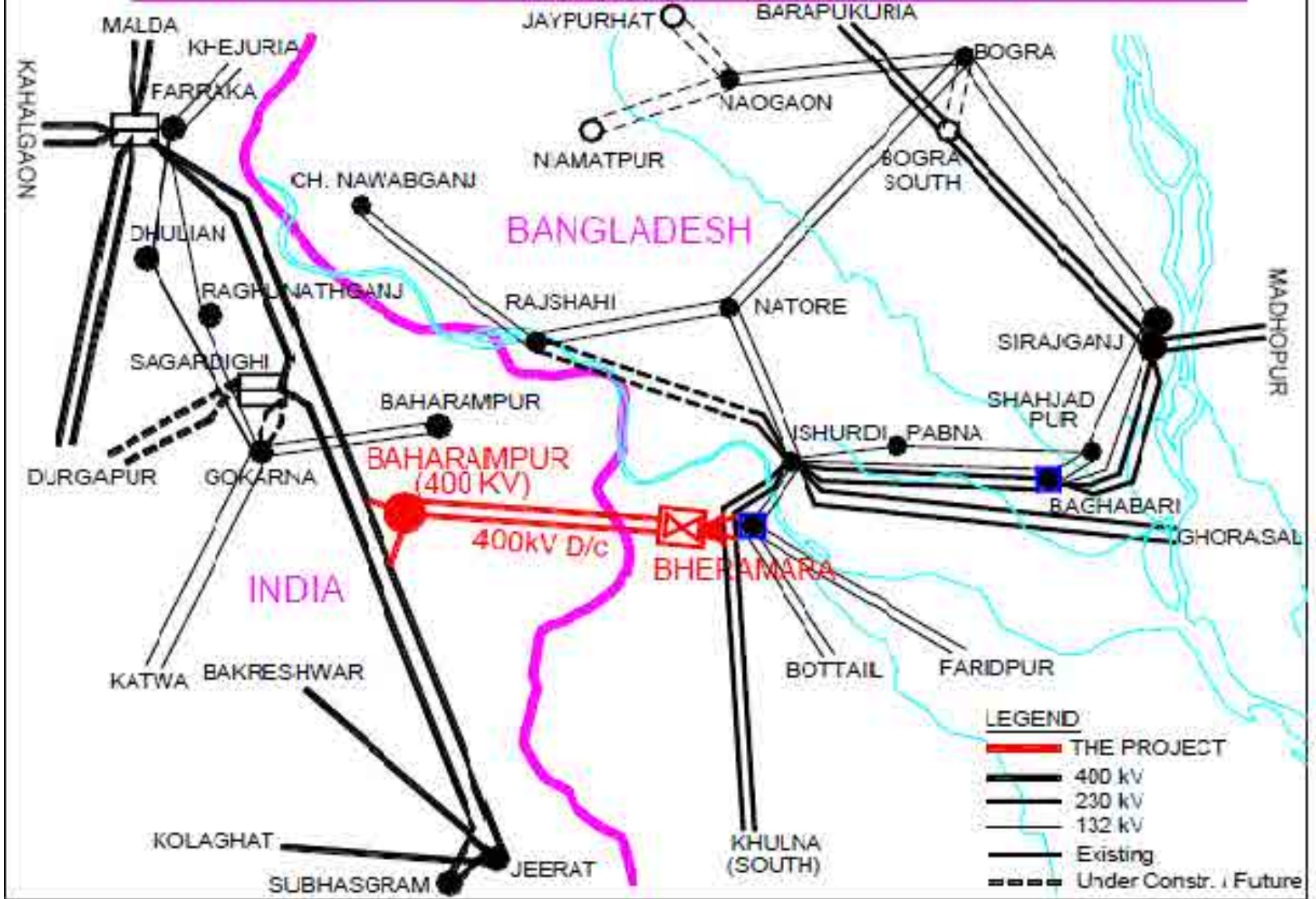


(Source-CEA)

Proposed IND-SRI HVDC Power Link



INTERCONNECTION BETWEEN INDIA AND BANGLADESH GRIDS



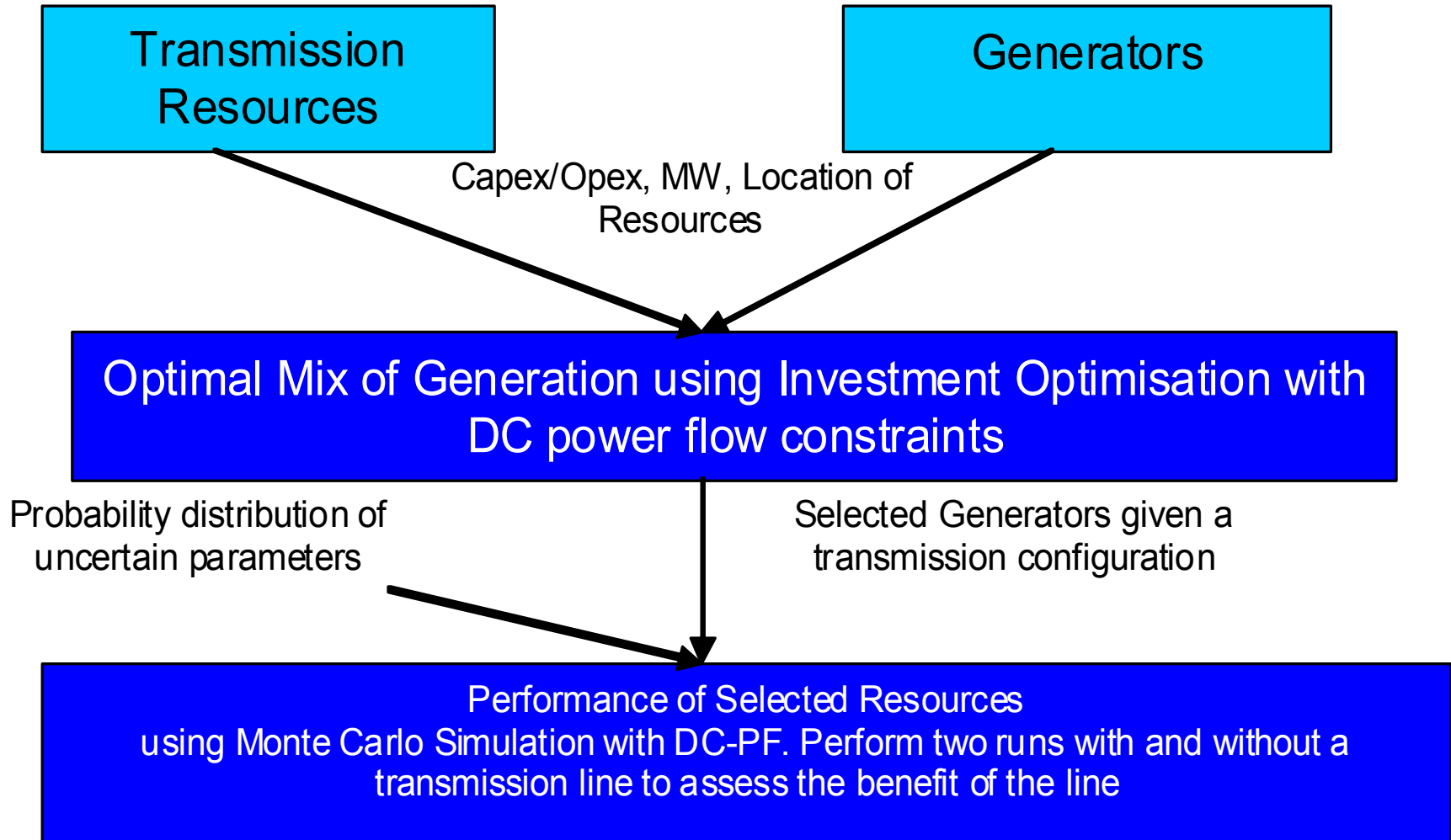
(Source-CEA)

CASA 1000 Project

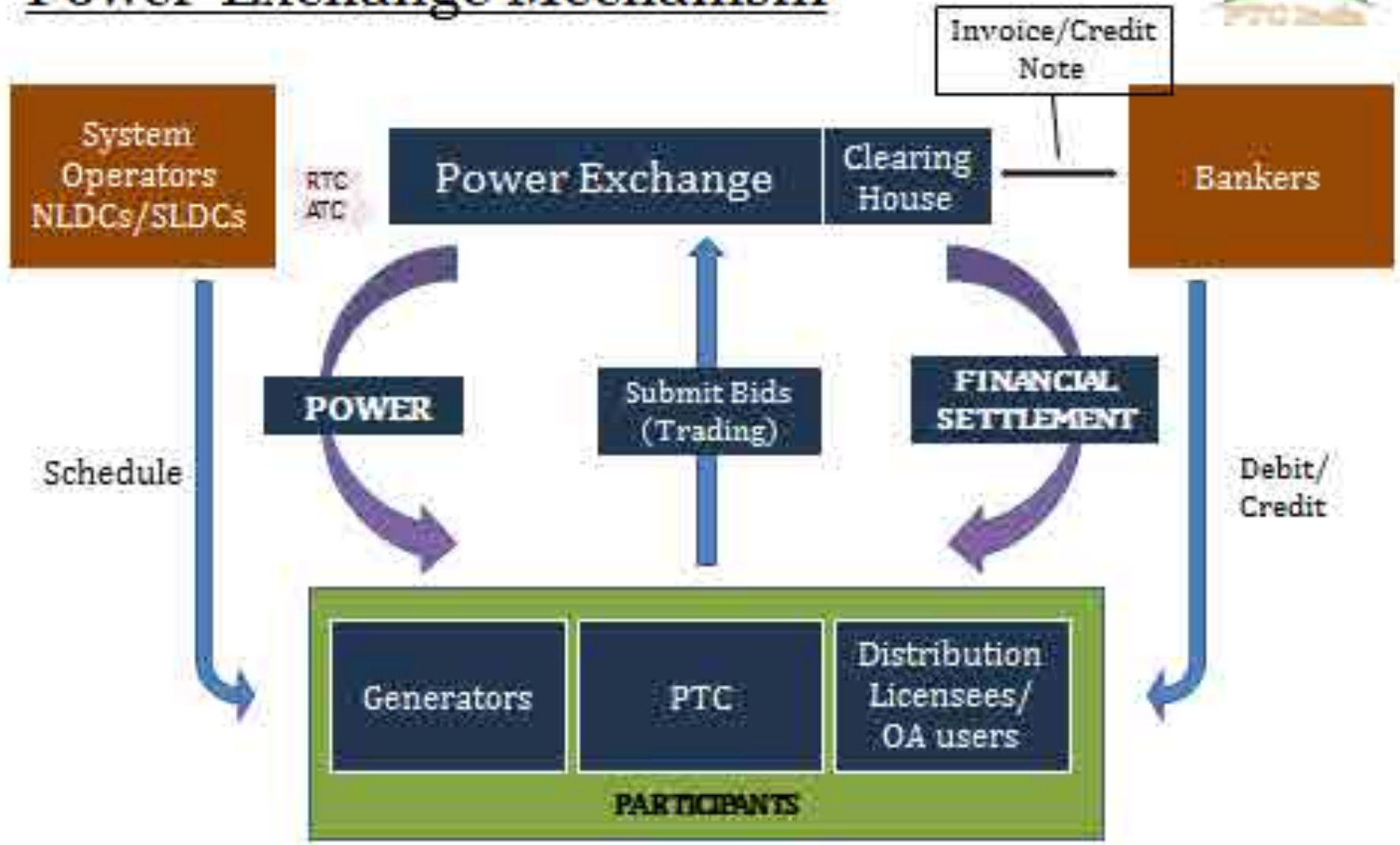


(Source - SEC)

Interconnection Evaluation Methodology - Overview

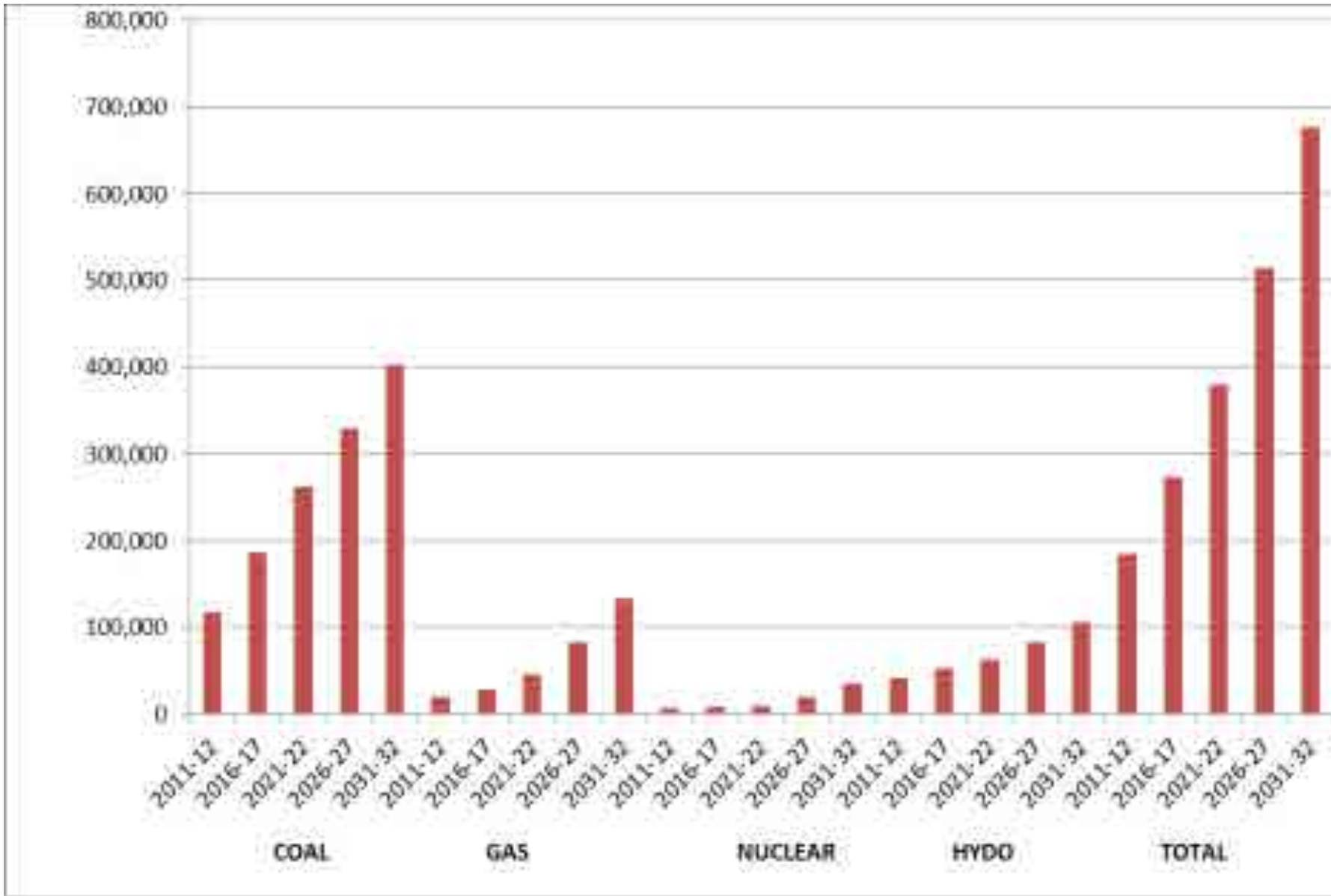


Power Exchange Mechanism



INDIA – Expected Generating Capacity (MW)

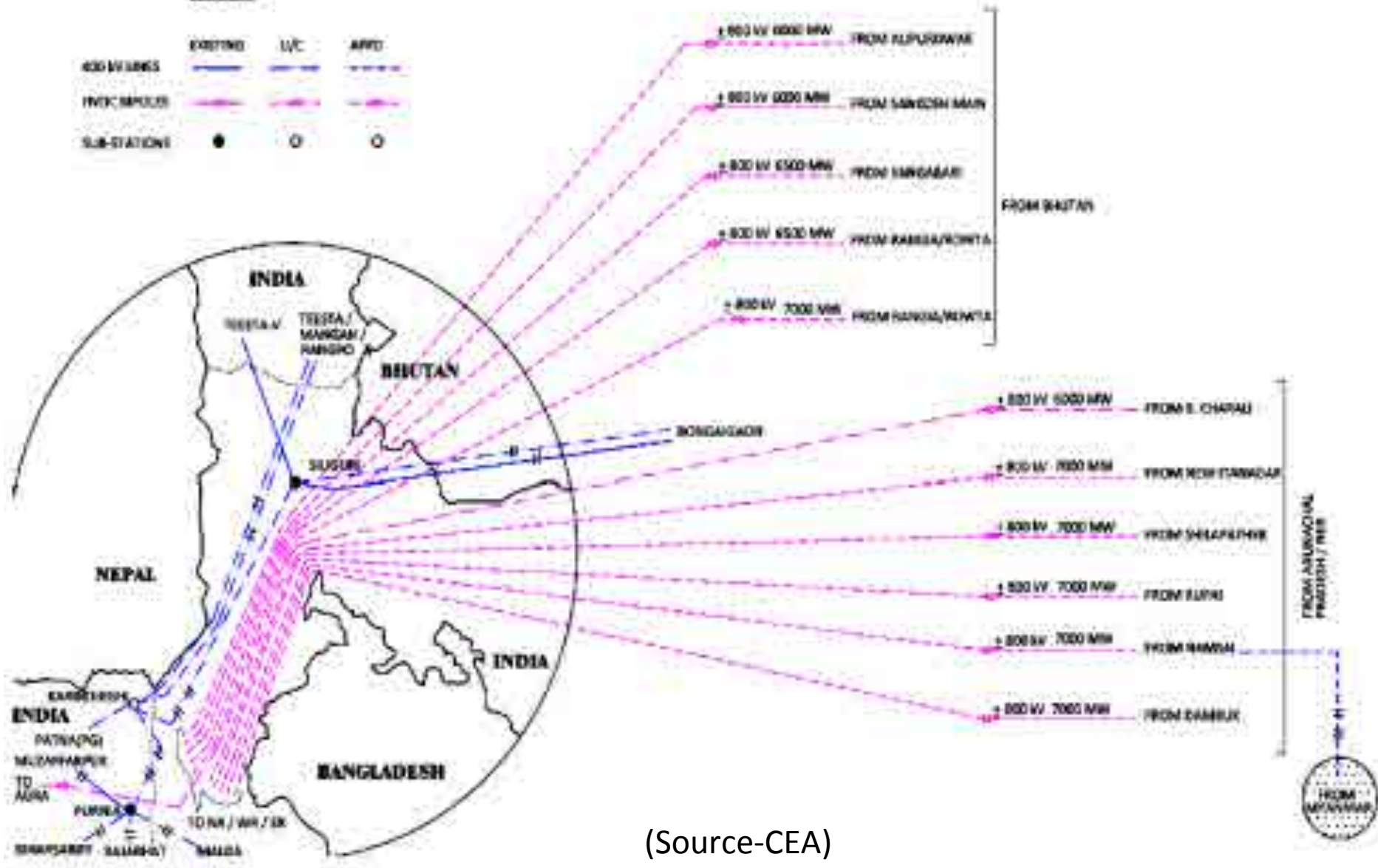
(Integrated Strategy: Bulk Transport of Energy and Related Commodities)



Envisaged 2030 Power Transfer

LEGEND

	EXISTING	LVC	APFD
500 KV LINES			
INVC. SPACES			
SUB-STATIONS			



(Source-CEA)

Interconnections Options Across Bangladesh

(Source: Powergrid/PGCB)



Ingredients for Development of a Regional Power Market

- Trading License and Generation De-licensing
- Open Access of Transmission Network
- Coordinated System Operation and Treatment of System Imbalances
- Regulatory Framework and Transmission Planning
- Energy Accounting, Clearing and Settlement
- Policy for Regional Electricity Trade
- Import Duty, Export Tax and Transit Tax
- Dispute Resolution

**THANK YOU
VERY MUCH!**