Regional priority interconnection projects – South Asia/BIMSTEC. Priorities, Considerations…

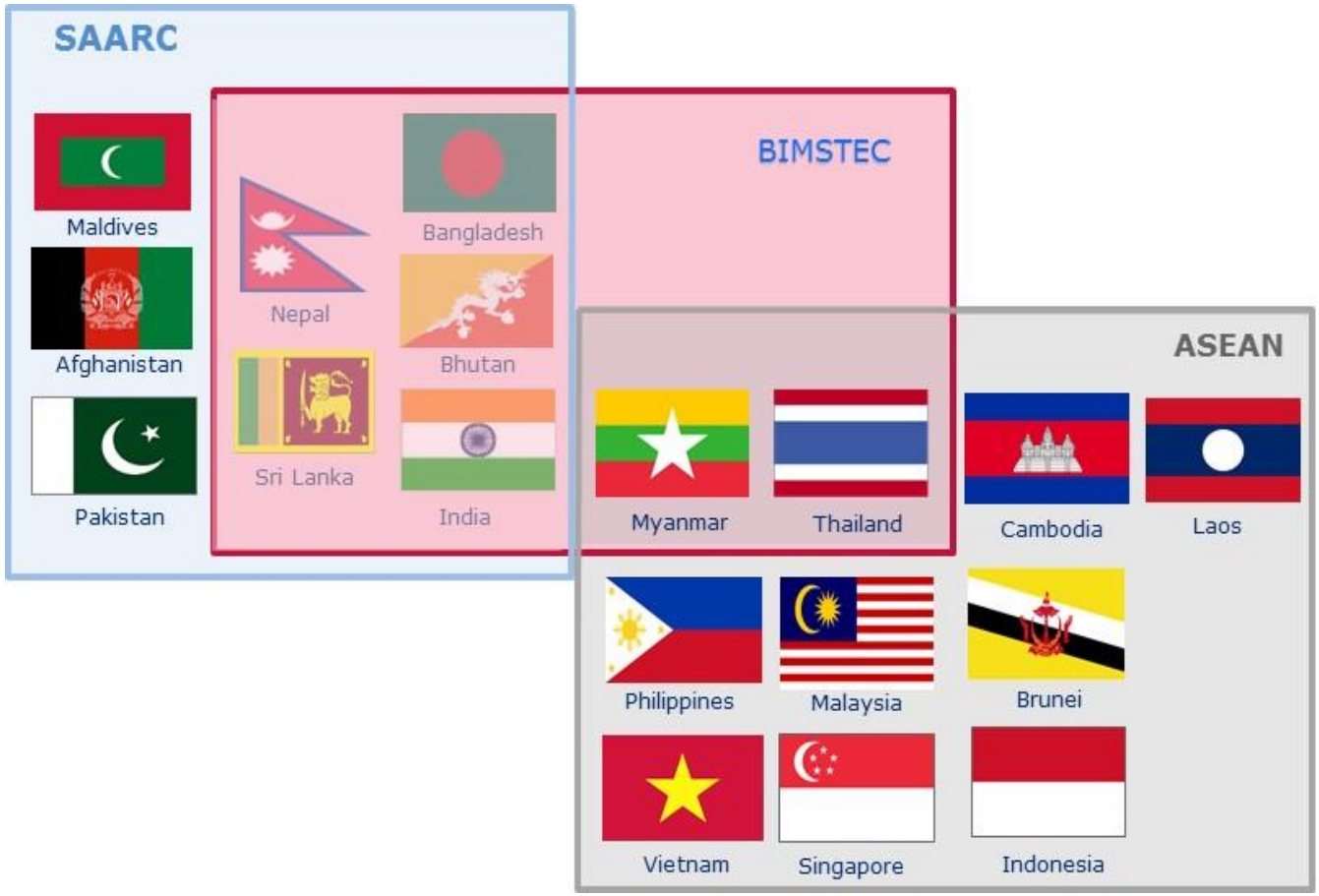
Pankaj Batra

Senior Advisor, IRADe

& Ex Chairperson, Central Electricity Authority,

Govt. of India

BIMSTEC- Confluence of two regions – therefore important for global interconnections



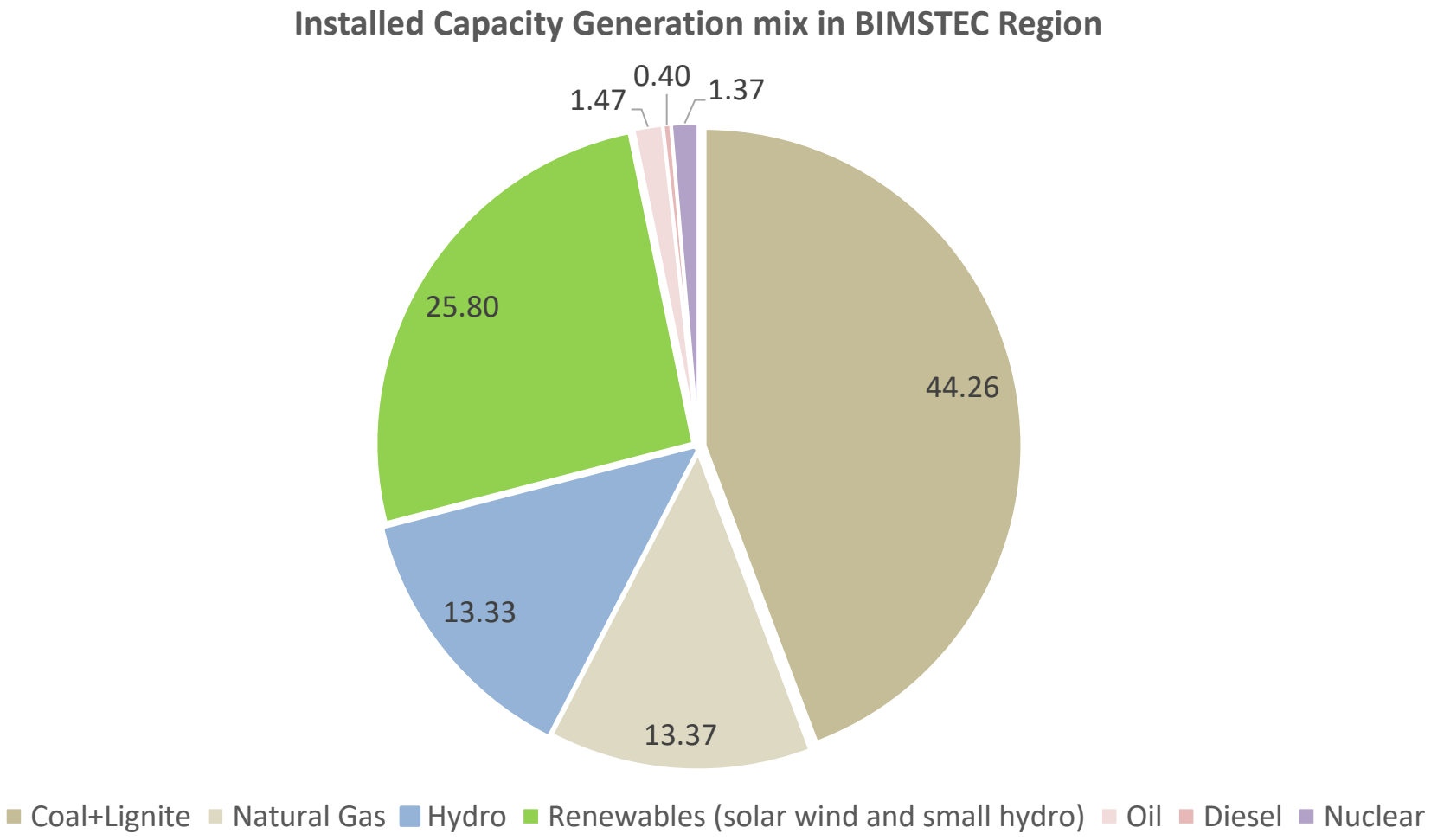
Objectives for South Asia/BIMSTEC Grid Interconnection

- A pathway to energy transition.
- Optimal utilization of the generation resources in the Region.
- Optimal integration of intermittent renewable energy sources to the grid.
- Optimal utilization of ROW of transmission lines.
- Faster and more economical energy access.
- Would lead to reduced carbon emissions.
- One step towards the One Sun One World One Grid Vision.

Complementarities in Supply Resources

	Coal + Lignite	Natural Gas	Hydro	Renewables (solar wind and small hydro)	Oil	Diesel	Nuclear	Total
Bangladesh	1768	11476	230	229	6329	1290	0	21322
Bhutan	0	0	2326	9	0	8	0	2343
India	210606	24824	46850	119093	0	562	6780	408715
Myanmar	120	2496	3262	40	0	116	0	6034
Nepal	39	0	2082	55	0	14	0	2190
Sri Lanka	900	0	1413	1572	924	0	0	4809
Thailand	6383	27603	10024	7147	30	0	0	51187
Total BIMSTEC	219816	66399	66187	128145	7283	1990	6780	496600
%age break-up of BIMSTEC source-wise	**44.26**	**13.37**	**13.33**	**25.80**	**1.47**	**0.40**	**1.37**	100.00

Complementarities in Supply Resources



Demand side Complementarities

Seasonal and Daily demand diversity in BIMSTEC Region			
	Peak demand months	**Hourly peak demand_local time**	**Hourly peak demand_India reference time**
Bangladesh	March to October	20.00 hrs to 23.00 hrs.	19.30 hrs to 22.30 hrs
Bhutan	November to January	18.00 hrs to 22.00 hrs	17.30 hrs to 21.30 hrs
India	June to September	11.00 hrs to 15.00 hrs	11.00 hrs to 15.00 hrs
Myanmar	May and October	18.00 hrs to 21.00 hrs	17.00 to 20.00 hrs
Nepal	July and August	19.00 to 21.00 hrs	18.45 to 20.45 hrs
Sri Lanka	April	18.00 to 22.00 hrs	18.00 to 22.00 hrs
Thailand	March to June	10.00 hrs to 17.30 hrs	7.30 hrs to 15.00 hrs

Import/Export in BIMSTEC Region

Import/Export by India (MUs)							
	BHUTAN		NEPAL		BANGLADESH	MYANMAR	Total Trade in 2021-22
	Import	Export	Import	Export	Export	Export	
APR'21	171.19	20.74		485.45	667.19	0.6	
MAY'21	603.31	14.61		278.29	725.98	0.69	
JUN'21	1173.43		0.98	195.14	721.58	0.8	
JUL'21	1282.18	0.05		163.3	665.82	0.8	
AUG'21	1415.24	0.07	4.54	15.92	598.18	0.84	
SEP'21	1334.11	0.02	23.18		605.36	0.8	
OCT'21	1032.22		70.04		622.82	0.8	
NOV'21	540.62	36.03	43.08		541.96	0.69	
DEC'21	216.42	13.33	0.9	97.03	454.37	0.69	
JAN'22	25.07	96.71		267.83	540.48	0.68	
FEB'22	20.78	92.89		291.28	533.85	0.63	
MAR'22	181.01	46.62		296.74	649.45	0.78	
Total	**7995.58**	**321.07**	**142.72**	**2090.98**	**7327.04**	**8.8**	**17886.19**

Existing legal and regulatory structure for cross border trade in electricity

- Laws/policies in the BIMSTEC countries for import/export of electricity, in **India, Bhutan and Nepal**.
- In **Myanmar**, this is mentioned in the draft Electricity Law of 2013, which has not yet been finalized.
- In **Bangladesh and Thailand**, there is no provision under law. However, in the Bangladesh Master Plan 2016, imports from other countries are shown, limiting these to 15% of the installed capacity. In the Energy Industry Act 2007 of Thailand, there is no specific provision detailing trade of power, but it is mentioned that the dependency on imported energy should be reduced.
- In the **Sri Lanka** Electricity Act there is no mention of import/export of power. However, the Long Term Generation Expansion Plan 2023-2042, released in May 2023, mentions interconnections with the BIMSTEC nations, as one of the options.

Existing transmission interconnections

- **India – Bangladesh**
  - Baharampur (India) – Bheramara (Bangladesh) 400kV D/C lines along with 2x500 MW HVDC back-to-back terminal at Bheramara.
  - Surajmaninagar (Tripura) - Comilla (Bangladesh) 400kV (operated at 132KV) interconnection.

Existing transmission interconnections

- **India – Bhutan**
- Presently the Cross Border connections are as below (132 KV and above).
- **Connected to Eastern Region (ER) of India**
  - 400kV, 2xD/C Twin Moose line, Tala-Siliguri with LILO of one circuit at Malbase S/S;
  - 220kV, 1xD/C line, Chukha- Birpara
  - 220kV, 1xS/C line, Chukha- Malbase-Birpara
  - 400kV, 1xD/C Quad Moose, Jigmeling to Alipurduar.
  - 400kV, 1xD/C Quad Moose line Punatsangchu II - Lhamoizingkha – Alipurduar

  400kV, 1xD/C Quad Moose line Punatsangchu I - Lhamoizingkha – Alipurduar

- **Connected to North Eastern Region (NER) in India**
- 132 kV, 1xS/C line, Motanga-Rangia
- 132kV, 1xS/C line, Gelephu-Salakati

Existing transmission interconnections

- **India – Nepal**
- Presently the Cross Border connections are as below (132 KV and above).
- **Connected to ER (Eastern Region) in India** : Muzaffarpur (India) - Dhalkebar (Nepal) - 400kV D/C transmission line.
- **Connected to NR (Northern Region) in India** : Tanakpur (India)- Mahendranagar (Nepal) 132KV Line
- Kataiya (ER of India) - Kusaha I – 132 kV
- Kataiya (ER of India) - Kusaha II– 132 kV
- Ramnagar (ER of India) – Gandak– 132 kV
- Raxual – Parwanipur (ER of India) – 132 kV

- **India-Myanmar**
- Moreh (NER) -Tamu 11 kV

Transmission interconnections under execution or under consideration

- **India-Nepal**
- Arun 3 (900 MW)-Dhalkebar (Nepal) –Sitamarhi (India) 400 kV D/C line
- New Butwal (Nepal) – Gorakhpur New (India) 400 kV D/C line.
- Dododhara (Nepal) – Bareilly (India) 400 kV D/C line.
- New Attariya – Bareilly 400 kV D/C line.

- **India-Bangladesh**
- Katihar (India) – Parbotipur (Bangladesh) – Bornagar (India-NER) 765 kV D/C line

- **India – Sri Lanka**
- Madurai (India) – Mannar (Sri Lanka) 1000 MW HVDC interconnection

- **India - Myanmar**
- Imphal (India-NER) – Tamu (Myanmar) 400 kV D/C line with HVDC back-to-back link at Tamu.

Interconnection Considerations

- Most countries interconnections start with planning of bilateral transaction of power, which then expands to regional interconnections.
- The first interconnections are through HVDC links or through radial interconnections, until the connectivity standards and the grid codes are harmonized.

Considerations for cross border interconnection

- The major interconnection between India and Nepal, the Dhalkebar-Muzaffarpur AC connection line, is the first 400 kV interconnection between the two countries. The line transmission capacity is 2000 MW, but the transfer capability is only 800 MW at present, since the onward transmission system in Nepal is not yet enough to carry more power.
- It requires transmission, sub-transmission and distribution system to be developed in Nepal, which is happening quickly now.
- In an AC interconnection, it is not easy to check if the transfer capability will reach the transmission capacity, as it is also to be seen from the angular stability point of view.
- Also the transmission system is a lumped parameter, which will always be loaded to a lesser extent in the beginning, and the load would gradually keep increasing.

Discussion on India Myanmar interconnection

- The present interconnection between India and Myanmar is a radial 11 kV connection, exporting about 3 MW power from India to the neighbouring town of Tamu.
- There is not much scope of increasing power flow on this line. For bulk power transmission, an Extra High Voltage line of 220 kV and above would be required.
- Since the grid codes of the two adjacent countries are not harmonized, it would have to be an HVDC interconnection, so that cross border transactions take place without affecting the security and stability of the grid.

Benefits of interconnection

- It is difficult to predict what is going to happen in the next 20 years, how situations are going to change, both geopolitical and from the climate change point of view, whether some path breaking technology is going to come up.
- Transmission charge being about one tenth of the energy charge, it would be better to transport the energy from renewable hotspots to other areas. This being the case, transmission system interconnecting countries is the cheapest method of increasing energy access to areas in need of it.
- It would also help in optimal utilization of generation resources and help in reduced or zero curtailment of free power from solar, wind and hydro sources of energy

Benefits of interconnection

- India would gain from the flexible hydro in Nepal and Bhutan for balancing the intermittency of solar and wind generation in India.
- Myanmar will gain immensely, from savings in costly diesel, which is used for areas not electrified, replaced by the much cheaper hydro power or import of power, which is much quicker to access. This would also lead to more jobs being created in Myanmar, which would result into further progress. This would help the GDP growth to reach a phenomenal 13.7% CAGR, besides universal access of electricity to the citizens of the country.
- Sri Lanka can gain as much as 32% to 38% savings in cost of electricity supply, by interconnecting with the South Asia grid, by replacement of the power from their imported Heavy Fuel oil and diesel based generation.
- Thailand will gain in the increased integration of renewables to the grid, which the country is transitioning to. It plans to reduce the percentage of generation from natural gas, which is its mainstay, both due to reduction in availability and reduction of carbon emissions.

Thank You