

POWER SYSTEM SCENARIO – BHUTAN

SAARC TRAINING WORKSHOP ON POWER SYSTEM STUDIES FOR SYNCHRONIZATION OF MULTIPLE SYSTEMS



**Department of Hydropower & Power Systems
Ministry of Economic Affairs
Royal Government of Bhutan**

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Presentation Outline

 Overall Power Scenario

 Current Power Generation & Transmission Systems Scenario

 Existing Power Infrastructure (2014)

 Power Generation Expansion Plans (10,000MW by 2020)

 Challenges & Opportunities

Overall Power Sector Scenario

- ☞ Hydropower potential – 30,000 MW
- ☞ Techno-economically viable – 23,500 MW
- ☞ Total installed capacity – 1,480 MW (~5% of potential)
- ☞ Hydropower under construction (2940MW) –
Punatsangchhu-I (1200MW), Punatsangchhu-II (1020MW)
& Mangdechhu (720MW)
- ☞ Existing Transmission lines (66kV & above) - 1,015.3 km
- ☞ Peak load demand in 2013 – 313.94MW (26th Dec.'13 @ 19 hrs)

Current Generation & Transmission Scenario

Existing Hydroelectric Generating Stations

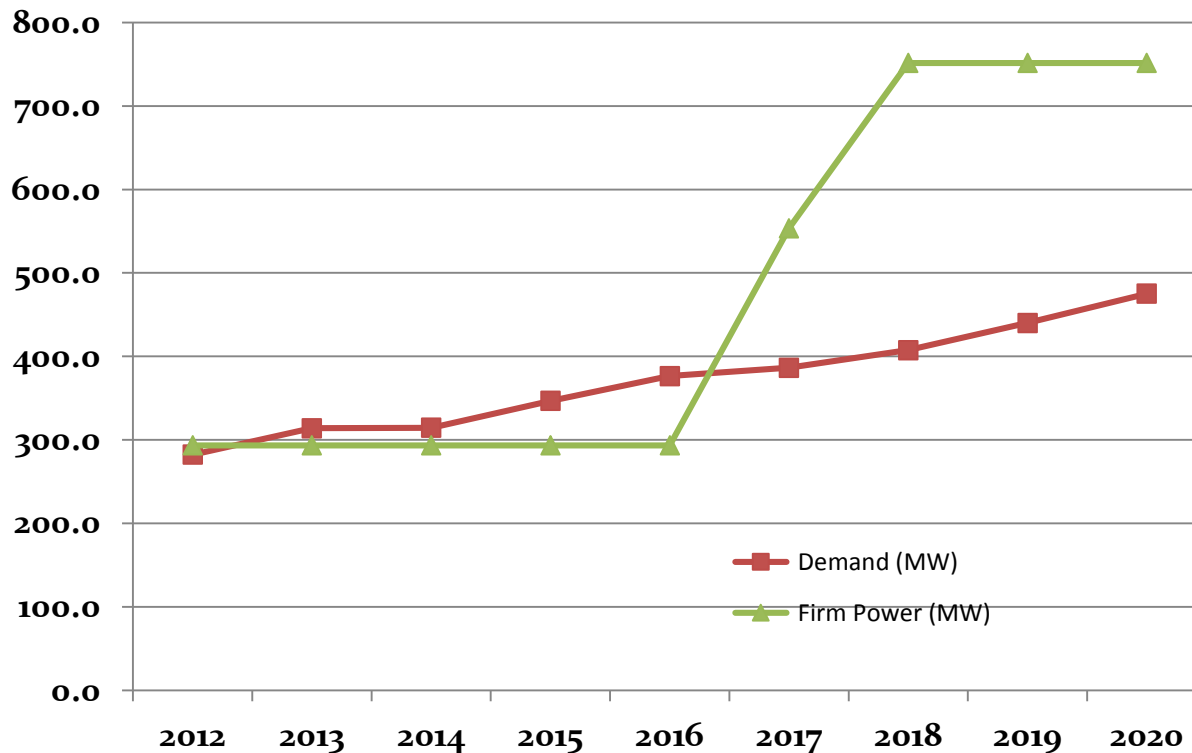
Name of Plant	Installed Capacity (No. x Unit size)	Transmission Voltage (kV)
Chhukha (CHP)	336 (4x84)	220kV, 66kV
Basochhu-I (BHP)	24 (2x12)	66kV
Basochhu-II (BHP)	40 (2x20)	220kV, 66kV
Kurichhu (KHP)	60 (4x15)	132kV
Tala (THP)	1,020 (6x170)	400kV
Mini/Micro	8 (17 nos)	6.6kV/415V
Total	1,488 MW	

Existing power transmission line

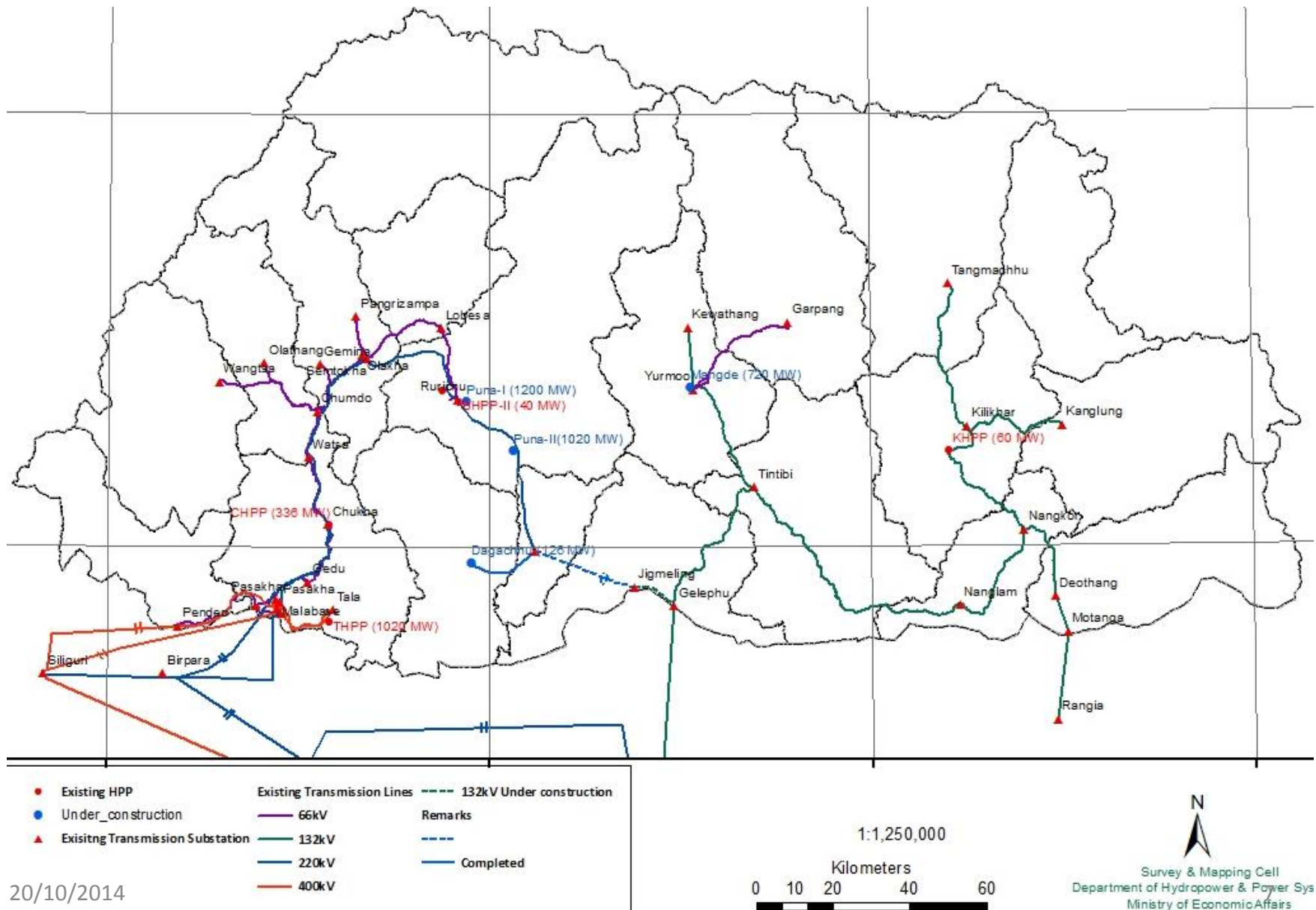
Line voltage	Line length (ckt km.)
400 kV	74.1
220 kV	285.1
132 kV	344.4
66 kV	311.5
Total	1015.1

Generation and Demand Scenario

Year	Actual		Forecasts						
	2012	2013	2014	2015	2016	2017	2018	2019	2020
Demand (MW)	282.4	313.9	314.5	346.7	376.4	386.5	407.4	440.0	475.2
Firm Power (MW)	293.5	293.5	293.5	293.5	293.5	553.5	751.5	751.5	751.5
Shortage/ Excess (MW)	11.1	-20.4	-21	-53.2	-82.9	167	344	311.5	276



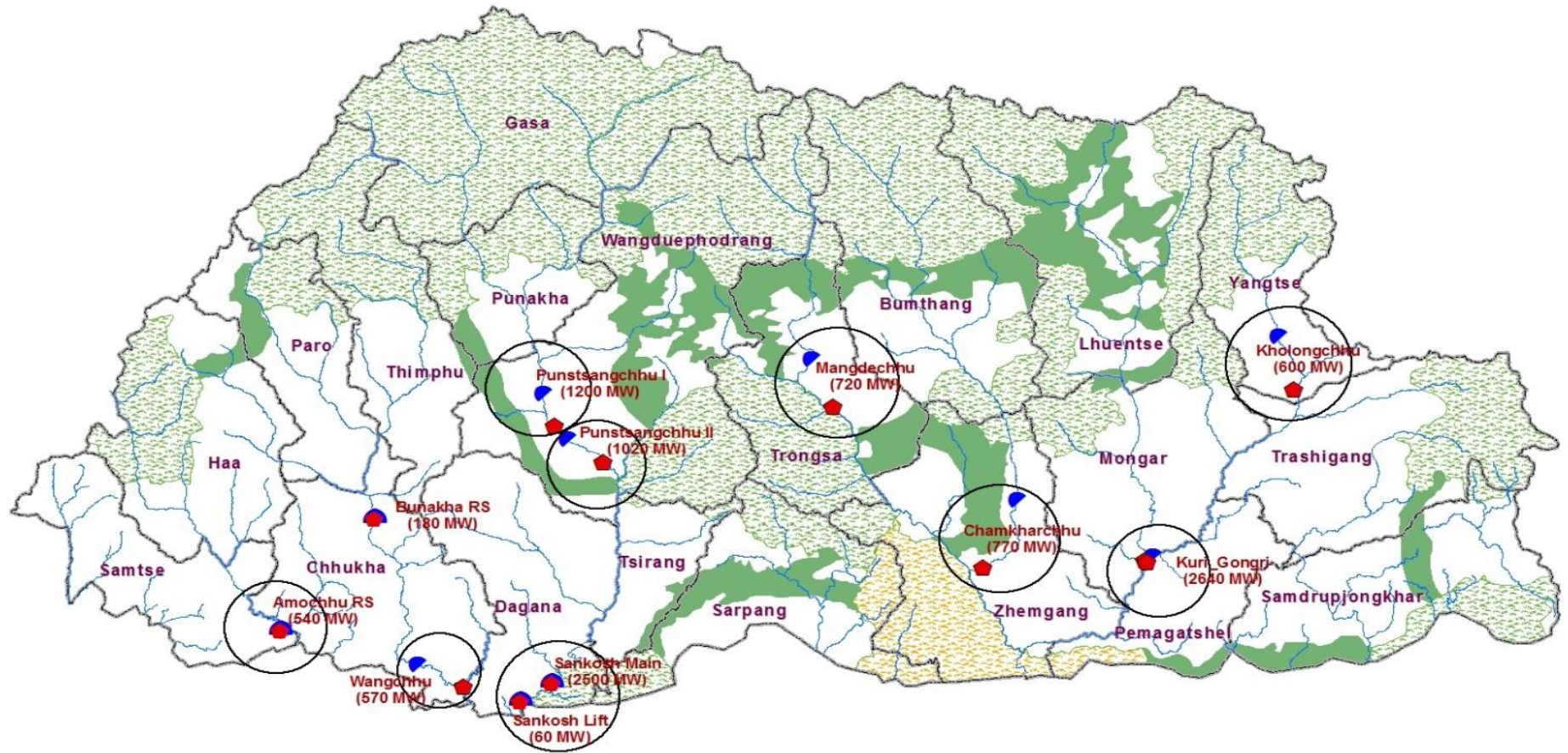
Existing Power Infrastructure (2014)



Generation Expansion Plan

Sl. No.	Name of HEP	Installed Cap. (MW)	Year of Commissioning	Implementation Mode/Remarks
1.	Punatsangchhu-I	1200	2016/17	IG/Under construction
2.	Punatsangchhu-II	1020	2017	-do-
3.	Mangdechhu	720	2017	-do-
4.	Sankosh	2560	2023	IG/DPR under review
5.	Kuri-Gongri	2640	2025	IG/DPR to begin soon
6.	Wangchhu	570	2022	JV/DPR under review
7.	Bunakha	180	2020	JV/DPR cleared
8.	Kholongchhu	600	2021	-do-
9.	Chamkharchhu-I	770	2024	JV/DPR under review
10.	Amochhu	540	2022	IG/DPR cleared
11.	Nikachhu	118	2019	PPP/DPR cleared
12	Dagachhu	126	2014	PPP/Under commissioning stage
20/10/2014	Total	11,044 MW	37% new addition	

Generation expansion plans (10,000MW by 2020)



National Transmission Grid Master Plan 2020

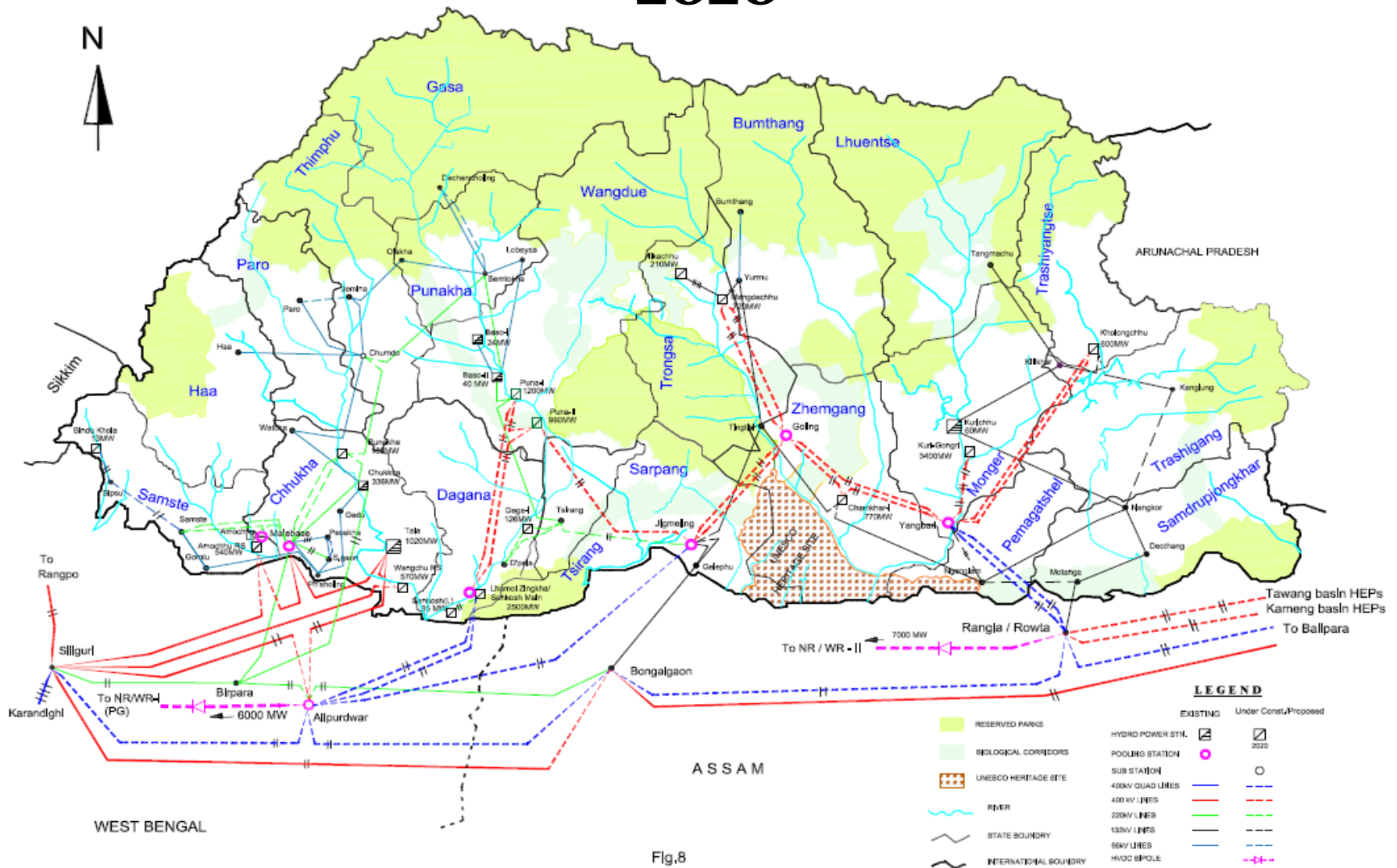


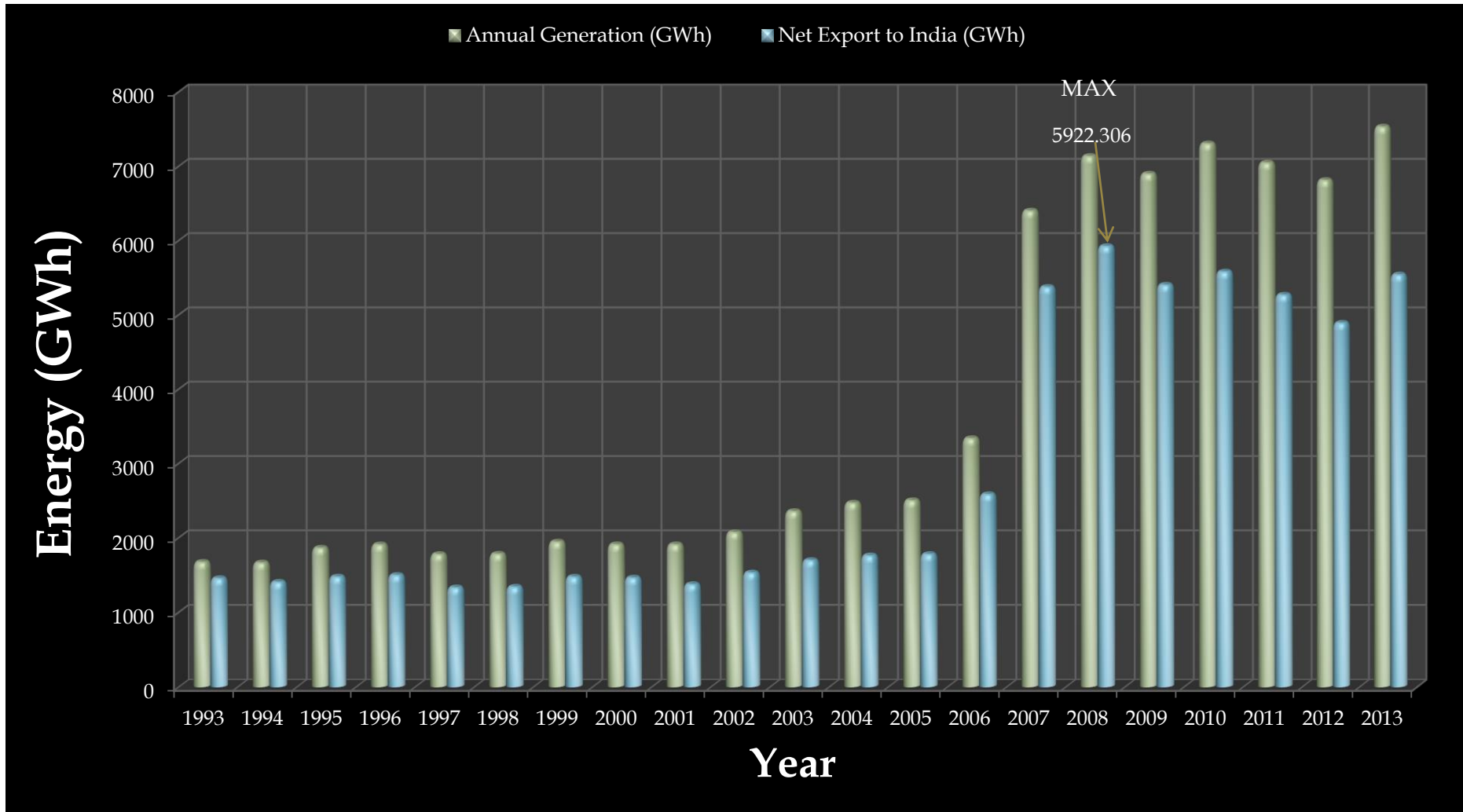
Fig.8

Cross Border Interconnection links – Existing

For the Export of power from different generating stations in Bhutan

Sl. No.	Power Plant	Install Capacity	Line	Voltage Level
1	Chhukha Hydropower Plant	336MW (4x84)	Chhukha-Birpara	220kV (1 D/C and 1 S/C)
2	Kurichhu Hydropower Plant	60MW (4x15)	Kurichhu-Gelephu (Bhutan)- Salakati (NER) Kurichhu-Motanga (Bhutan) – Rangia	132kV S/C 132kV S/C
3	Tala Hydropower Plant	1020MW (6x170)	Tala -Siliguri	400kV 2xD/C

Annual energy generation and Export to India



Cross Border Interconnection links – Planned

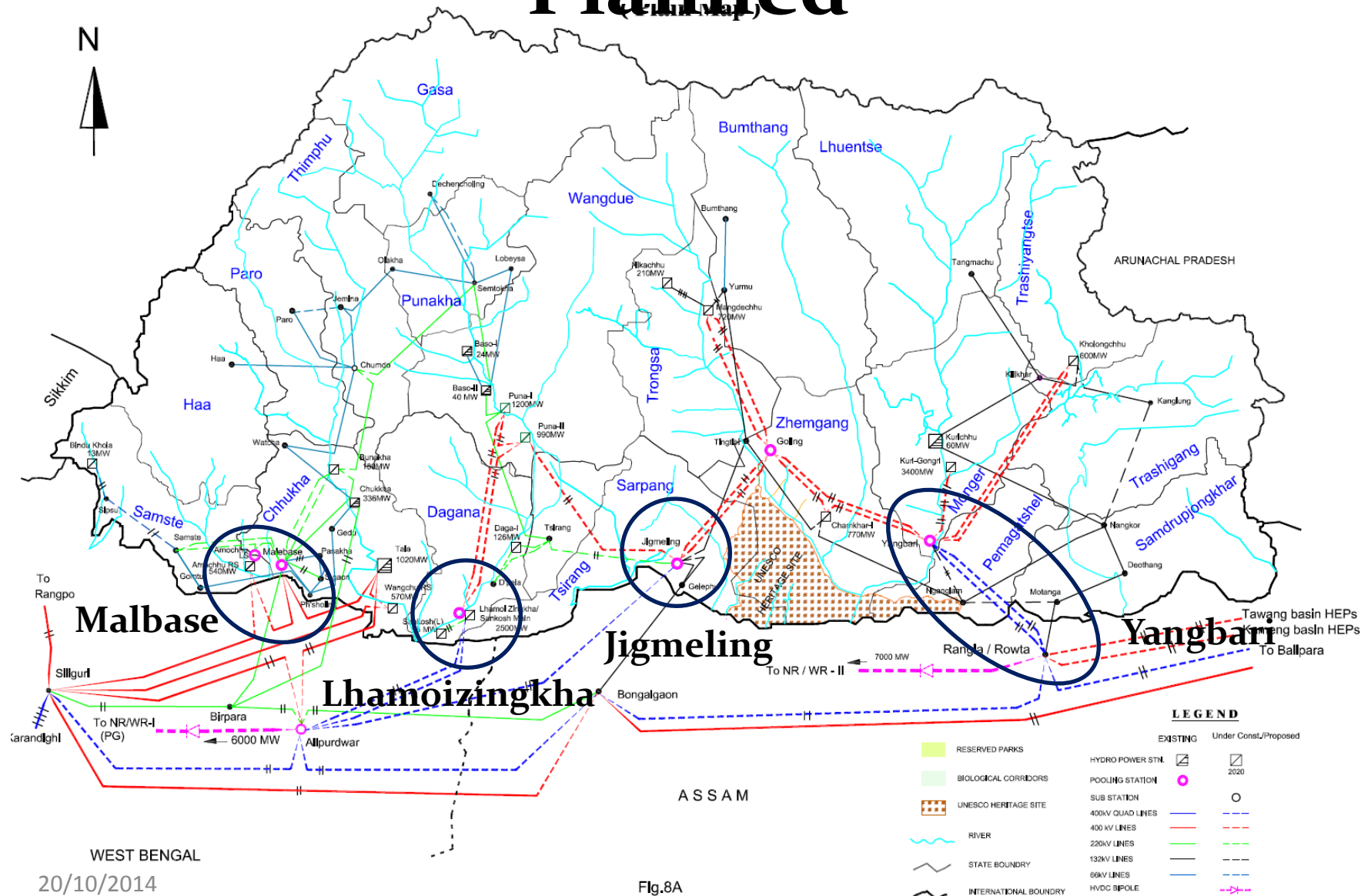


Fig.8A

Challenges

- ✂ Huge Investment
- ✂ Constraints in transmission corridor (chicken neck).
- ✂ Highly seasonal nature of power generation from RoR schemes (~70% of generation in four months).
- ✂ Limited institutional and manpower capacity

Opportunities

- 🌐 Huge hydropower potentials with techno-economically viable sites, competitive generation cost, peaking capacity.
- 🌐 - huge market (energy deficit ~10.8%, peak demand deficit ~12.2%) with aggressive economic growth (8%-9%) and increasing cost of energy options mainly fossil fuel based.
- 🌐 Good relation with India.
- 🌐 Availability of Umbrella Agreement for cooperation in hydropower development and power export/trading valid for 60 years and extendable with mutual consent.
- 🌐 GHG reduction in India by export of renewable energy from Bhutan. Opportunity to earn CER revenue thru. use of Indian baseline.
- 🌐 Main source of rupee (major export item ~39.2% in 2010 and ~80% by 2020).
- 🌐 Possible regional electricity market thru. SAARC and BIMSTEC initiatives.
- 🌐 Bhutanese transmission system well integrated with Indian for evacuation of surplus power.

Thank You



Bhutan

Happiness is a place

Any Questions???