

Advancing Transmission System Interconnections and Development Plans - Bhutan

By

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Outline

- Overall Power Sector Scenario
- Current Power Generation & Transmission Systems Scenario
- Energy Generation and Demand Scenario
- Power Generation Expansion Plans
- Power Transmission Expansion & System Strengthening Plans
- Prospective Transmission Grid by 2030
- Power Transmission Grid by 2020
- Cross-Border Interconnection Links - Existing and Planned

Overall Power Sector Scenario

- Hydropower potential – 30,000 MW
- Techno-economically viable – 23,500 MW (Res. ~ 8,000 MW)
- Total installed capacity – 1614 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 2014 – 333.41MW (25th 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
Dagachhu (DHPC)	126 (2x56)	220kV
Mini/Micro	8 (17 nos)	6.6kV/415V
Total	1,614 MW	

Existing / Planned Transmission System in Bhutan

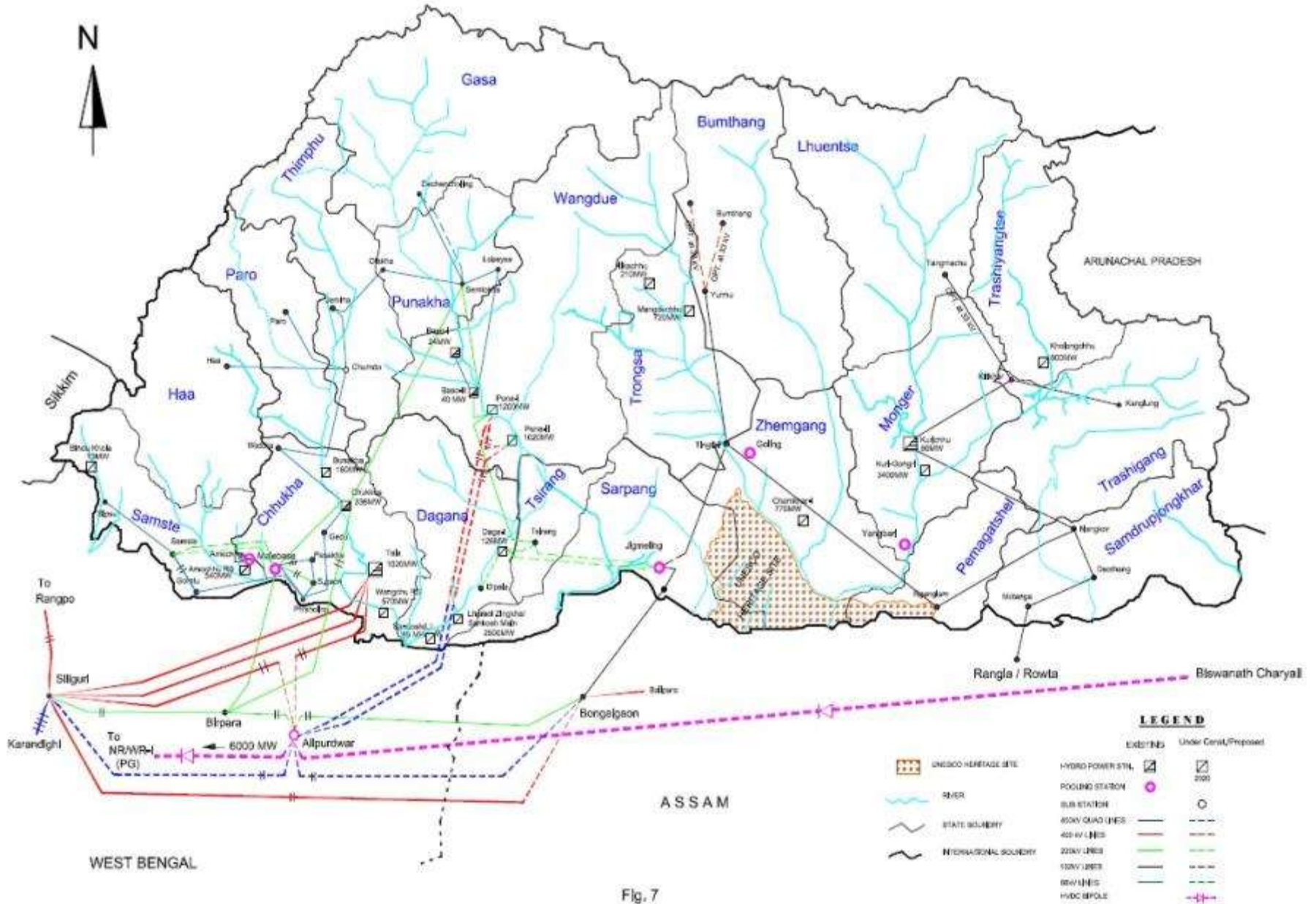
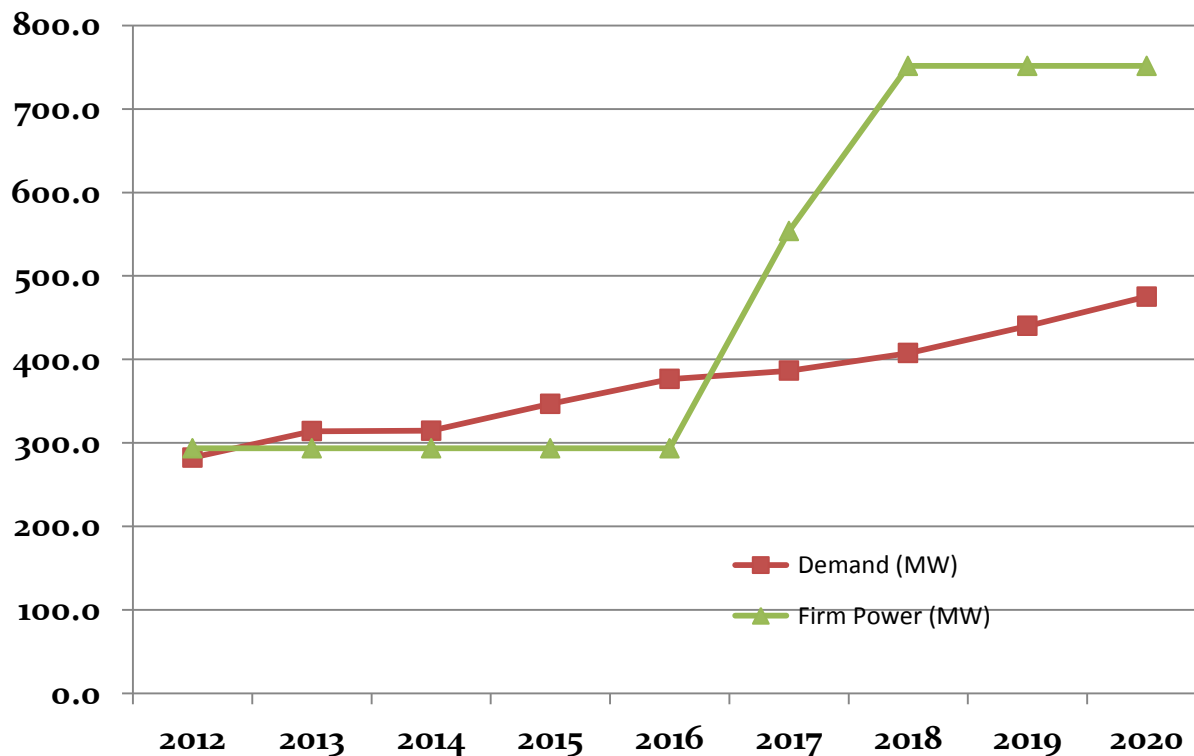


Fig. 7

Generation and Demand Scenario

Year	Actual/Forecasts								
	2012	2013	2014	2015	2016	2017	2018	2019	2020
Demand (MW)	282.4	313.9	333.41	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



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
	Total	10,918MW	37% new addition	

Transmission Expansion Plans

National Transmission Grid Master Plan-2012:

- Bhutan has embarked upon a target of developing a minimum of 10,000MW by 2020:
 - ✓ *Integrated and holistic road map for development of optimal transmission lines by optimizing RoWs and minimizing impacts on environment (Integrated Evacuation Systems for the 10,000MW HEPs)*
 - ✓ *However actual achievable target is 5000MW by 2020*
 - ✓ *Identification of major Pooling/Sub-pooling Stations within Bhutan*
 - ✓ *System strengthening within Bhutan to meet the load demand and load growth of the country and ensure Reliability of Supply & Long-Term Energy Security (400 kV integrated national grid with strong interconnection between Eastern & Western parts of Bhutan)*
 - ✓ *Grid reinforcement Studies/Plans in India for import of Power from Bhutan by 2020 & beyond*
 - ✓ *Cost Estimates*

National Transmission grid Master Plan for Bhutan by 2020

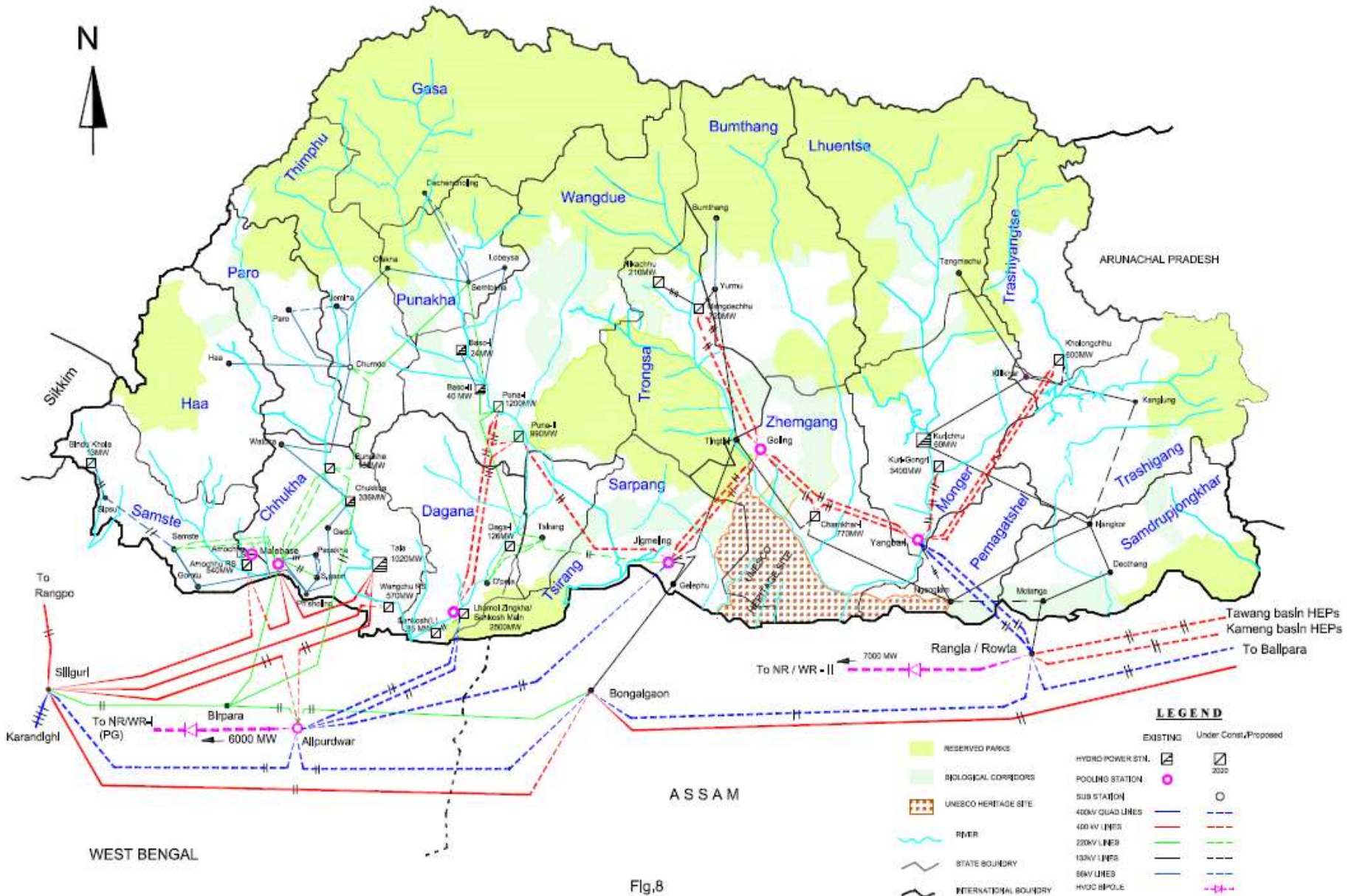


Fig.8

Prospective Bhutan Grid by 2030

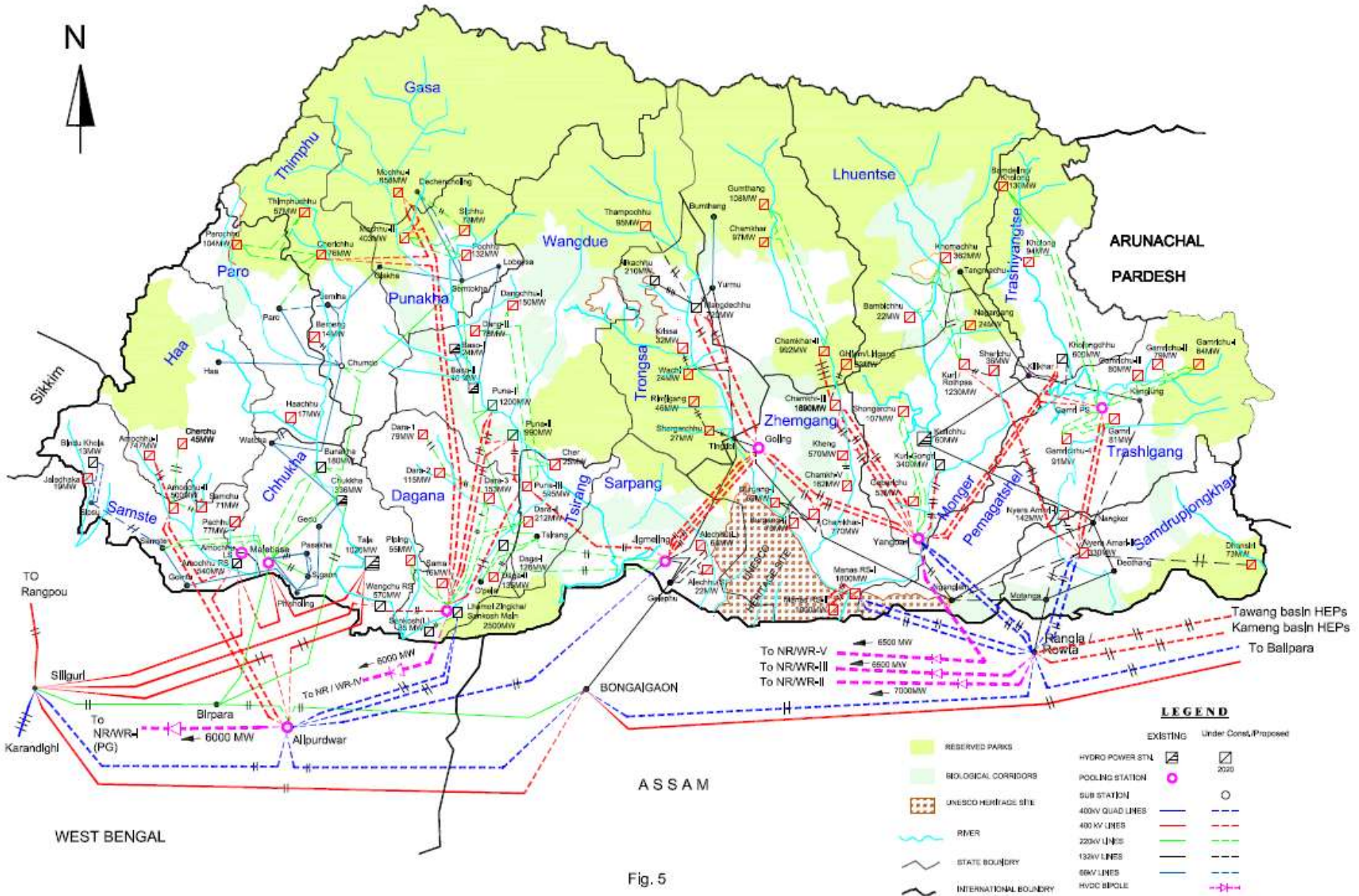
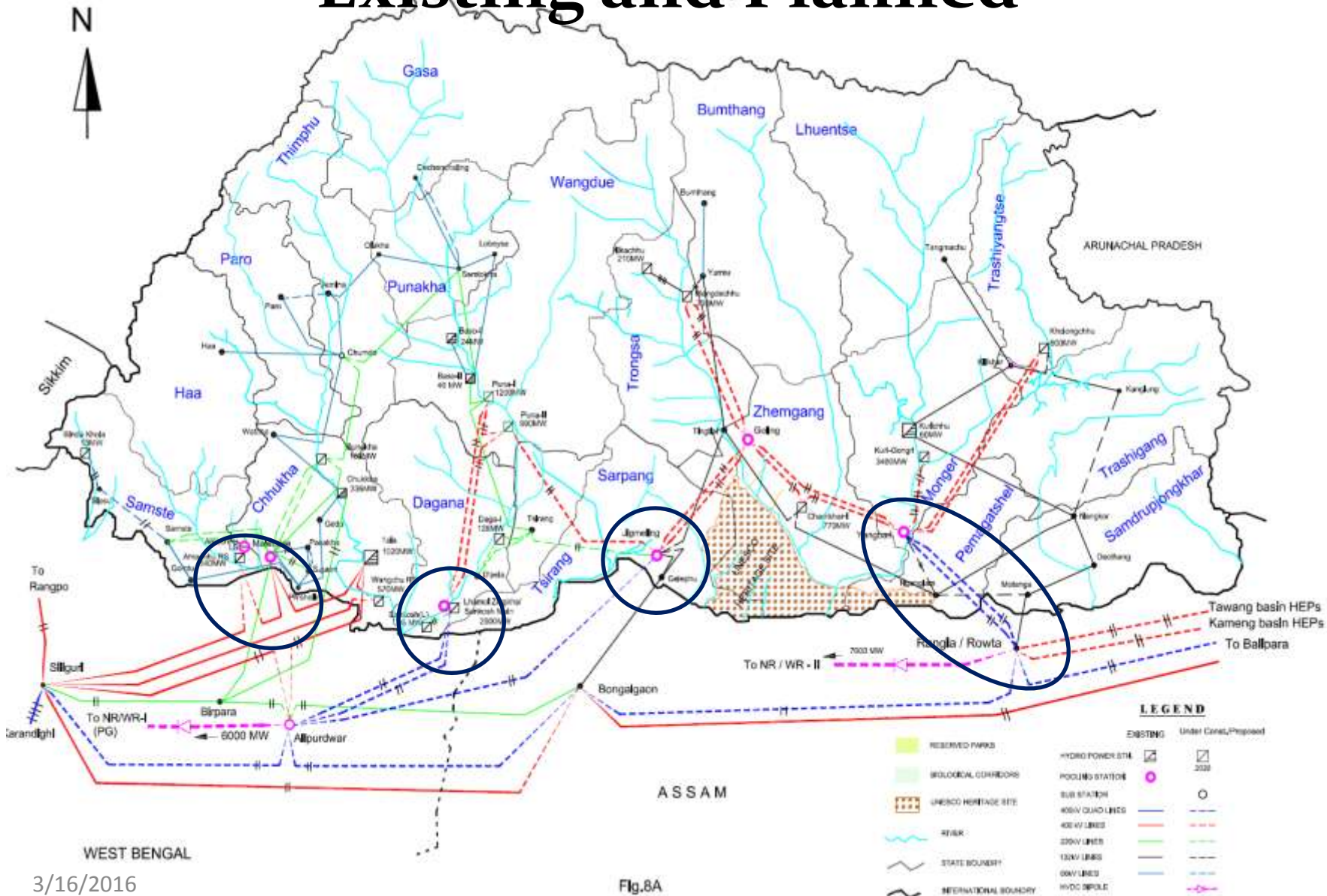


Fig. 5

Planned Power Transmission Lines

Line Voltage	Line Length (ckt. km)
400 kV	1,416
220 kV	112
132 Kv	275
66 kV	94
Total	1,897

Cross Border Interconnection links – Existing and Planned



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