



National Statistical Programme - BHUTAN

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Outline

- Introduction – Key National Data
- Institutional Arrangement (Statistics)
- Overall Energy Sector Scenario
- Current Power Generation & Transmission Systems Scenario
- Energy Generation and Demand Scenario
- Power Generation Expansion Plans
- Power Transmission & System Strengthening Plans
- Power Distribution and Rural Electrification
- Electricity Tariffs
- Issues & Challenges

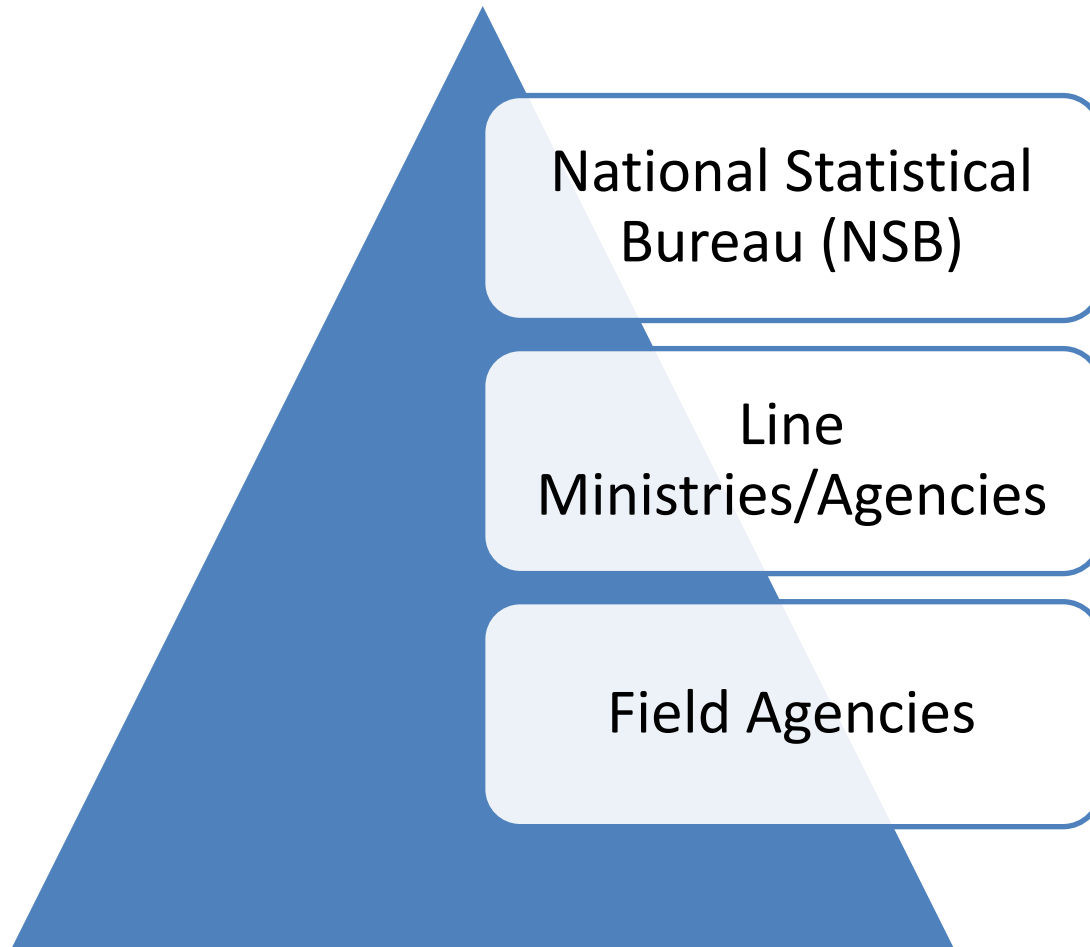
Key Country Information

- Area – 38,394 sq. km
- Population (2015 est.) ~ 768,000
- Forest Cover (2014) – 70.5%
- Literacy rate (2012) – 63%
- GDP growth (2014) – 5.46%
- GDP (2014 current prices) ~ \$ 2 billion
- Per Capita GDP (2014) – \$ 2,611.74
- Inflation (CPI 2014) – 8.27%
- Population Poverty rate (2012) – 12%

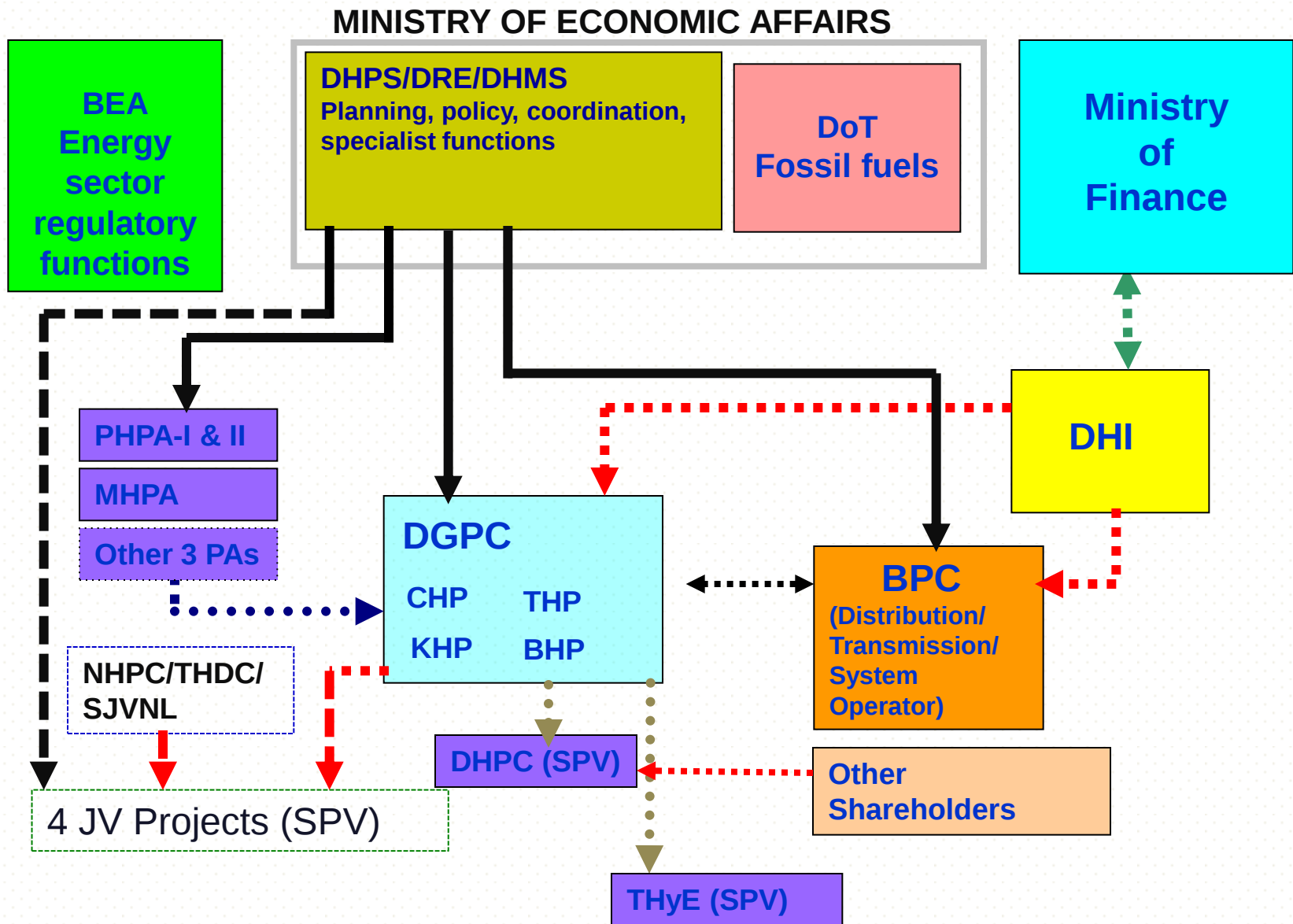
Contd.

- Annual Electricity Generation (2014) – 7,147.095 MU
- Electricity Exports (2014) – 72.5%
- Electricity Consumption (2014 per capita) – 2,600 kWh
- Electricity Contribution to Revenues (2014) – 20%
- Electricity Contribution to GDP (2014) – 14.15%
- Rural Electrification coverage (2014) – 95.35%

Statistical Institutional Arrangement



Energy Sector at Glance



Hydropower Sector Scenario

- Large Hydropower potential – 30,000 MW
- Techno-economically viable – 23,500 MW (Res. ~ 8,000 MW)
- Total installed capacity – 1,606 MW (~ 5.35% of potential)
- Hydropower under construction – 3,658MW (~ 12.2%)
{Punatsangchhu-I (1200MW), Punatsangchhu-II (1020MW), Mangdechhu (720MW), Tangsebjhi (118MW) & Kholongchhu (600MW)}
- Existing Transmission lines (66kV & above) - 1,015.3 km
- Peak load demand (2014) – 333.41MW

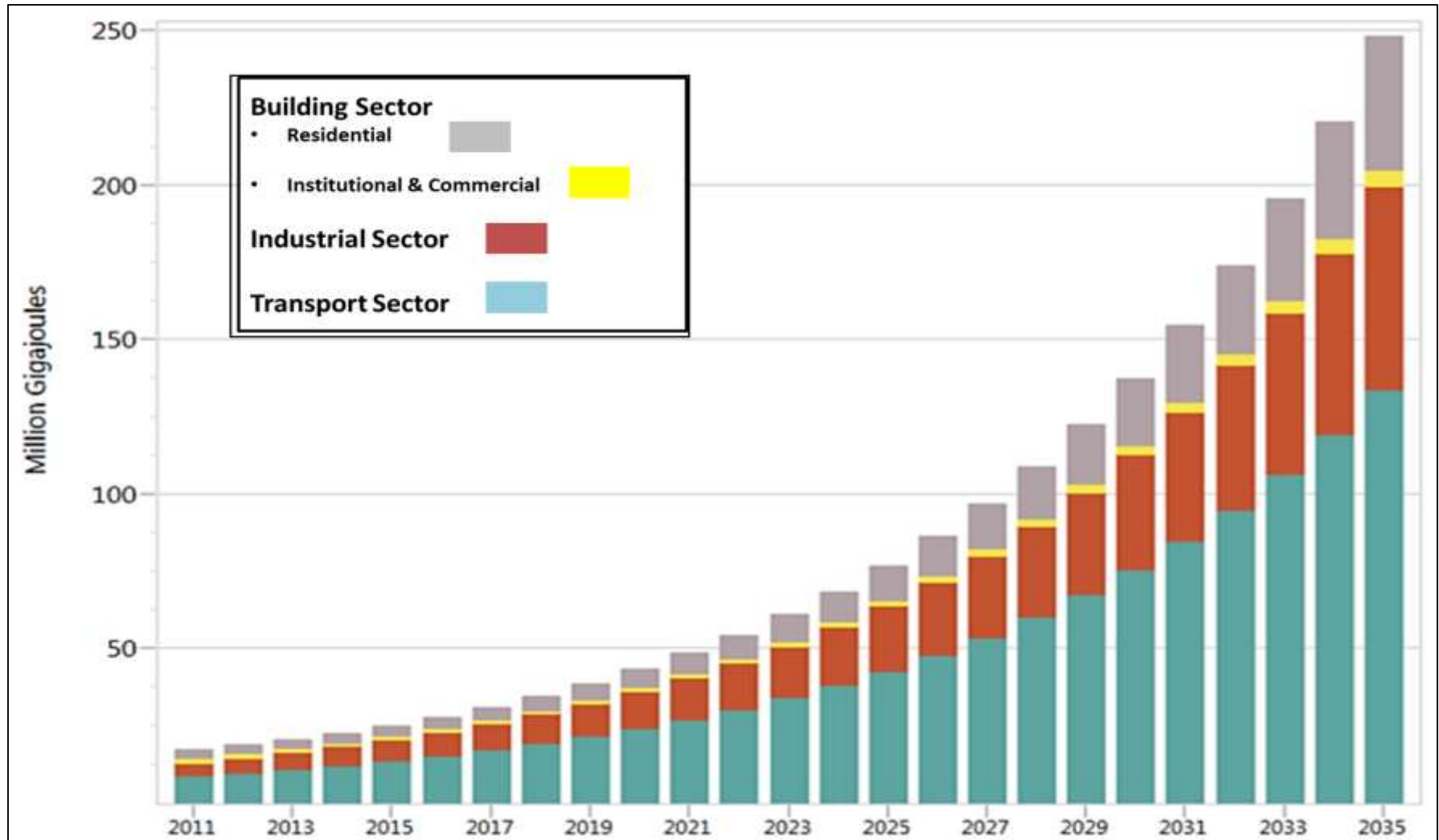
Sectoral Energy Consumptions (TJ)

Table 1: Energy consumption across sectors in Terajoules		
Sector	2005	2015
Building Sector	7082.2	4011.1
▪ Residential	5607.4	2796.5
▪ Institutional & commercial	1474.8	1214.6
Industry Sector	4160.0	8931.9
Transport Sector	2312.0	8279.3
Others	194.5	458.1
Estimated Total Energy consumption	13748.8	21680.5

(Source: EY Analysis)



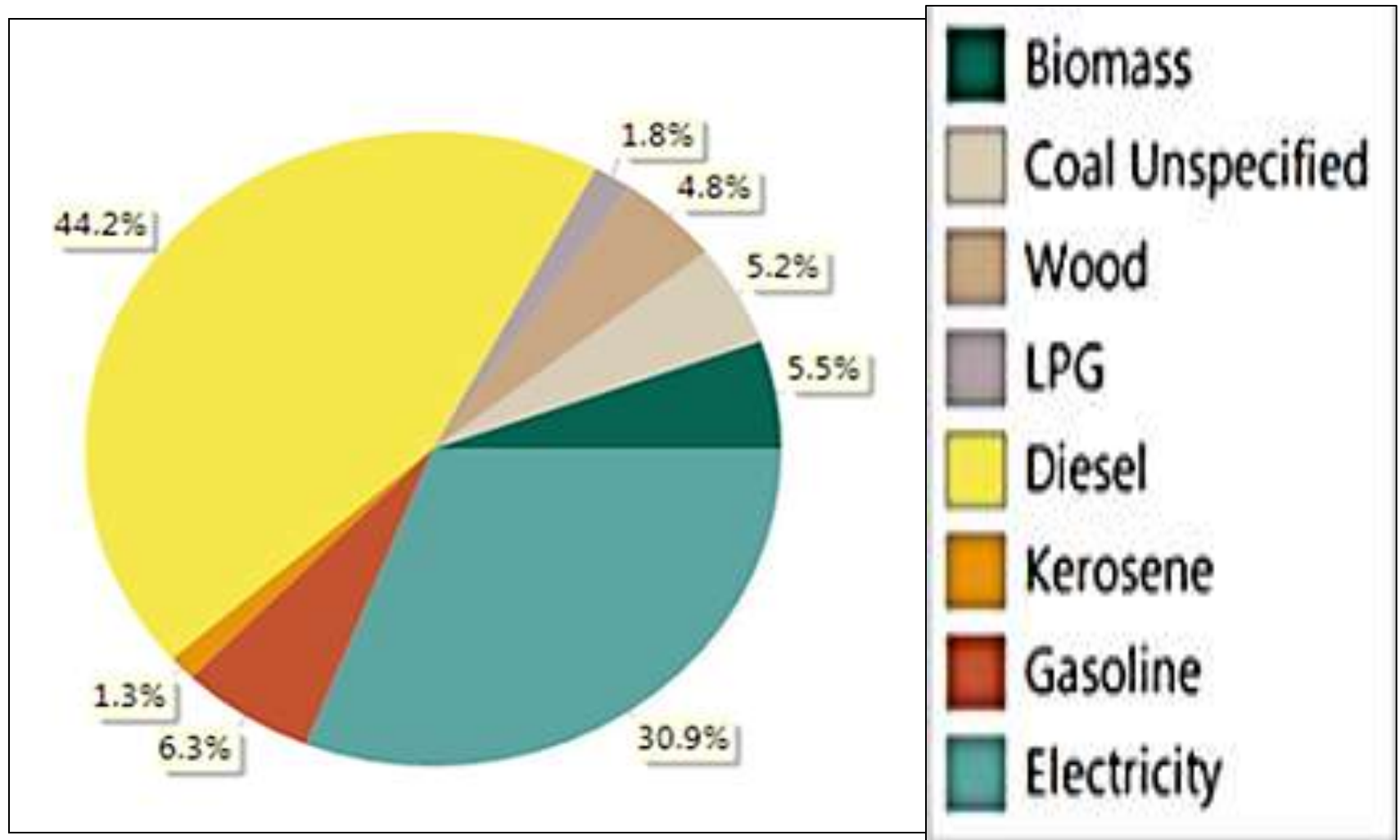
Projected Energy Demand (2011-2013): LEAP Result



17-19 Nov. 2015

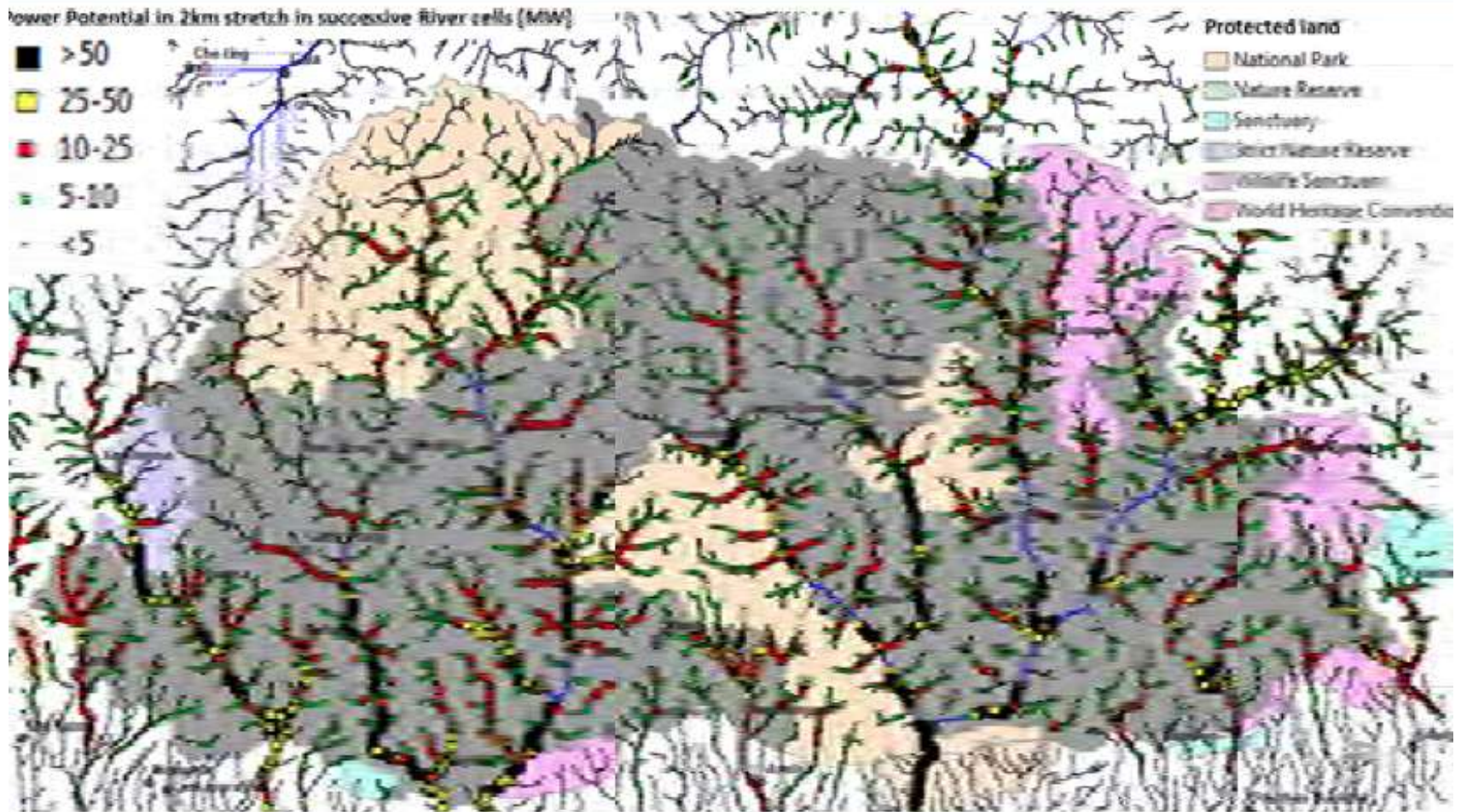
Source: EY Report

FUEL Mix in Bhutan (2015)



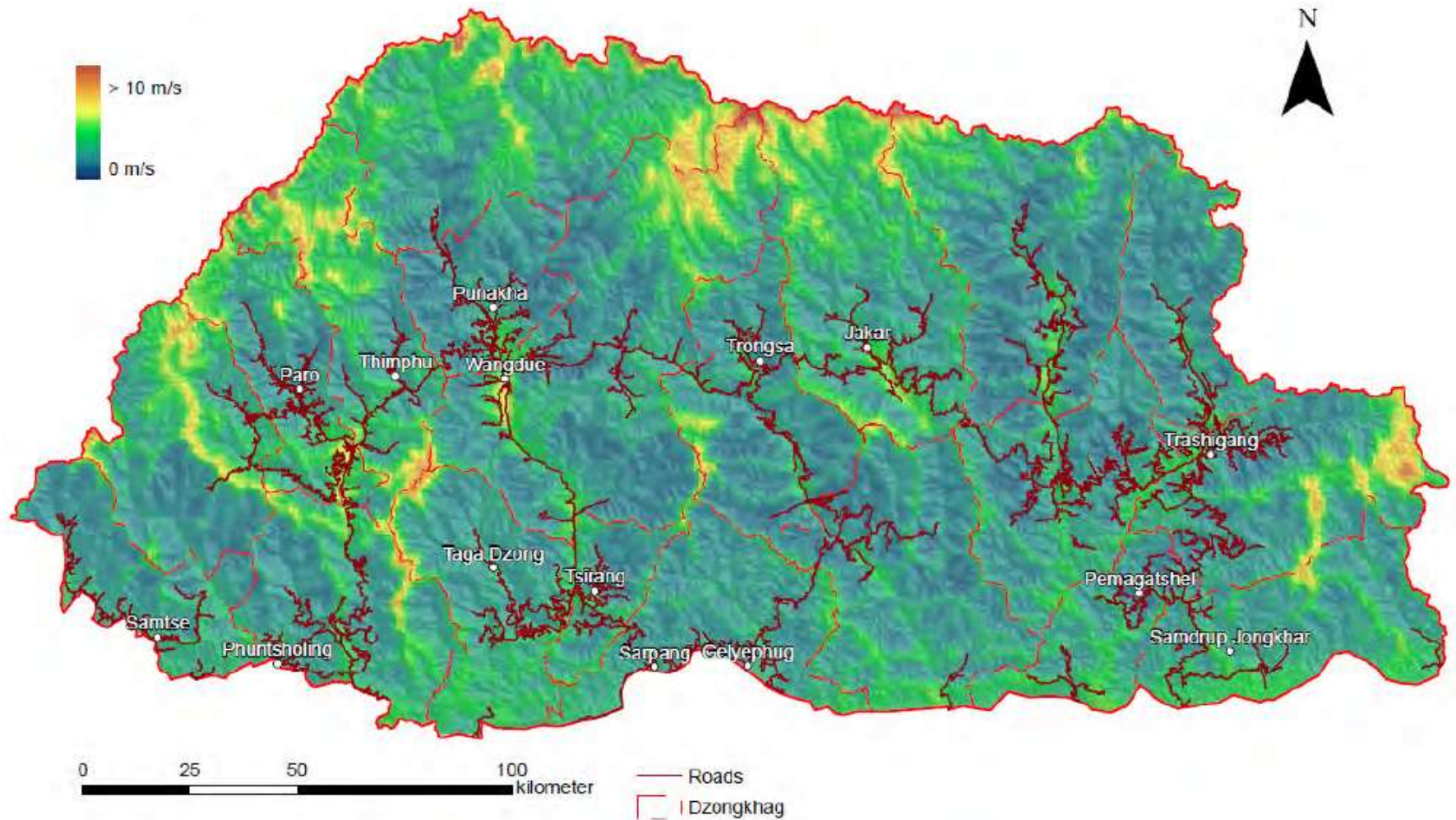
Source: EY Report
17-19 Nov. 2015

Preliminary Small Hydropower Resource: 33,000 MW



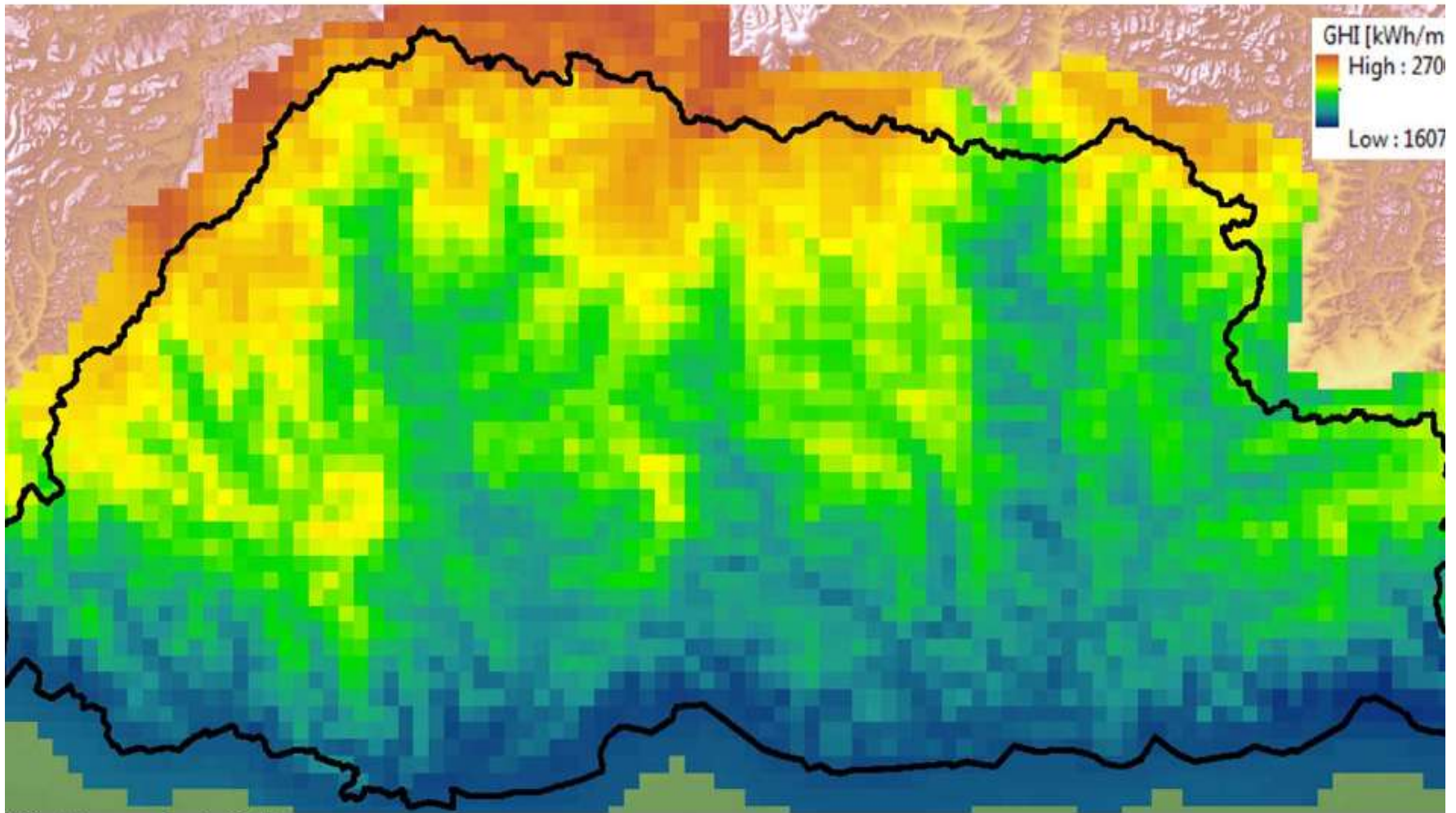
Source: Fichtner Report

Wind Energy Resource: 323 MW



(Source: Fichtner)

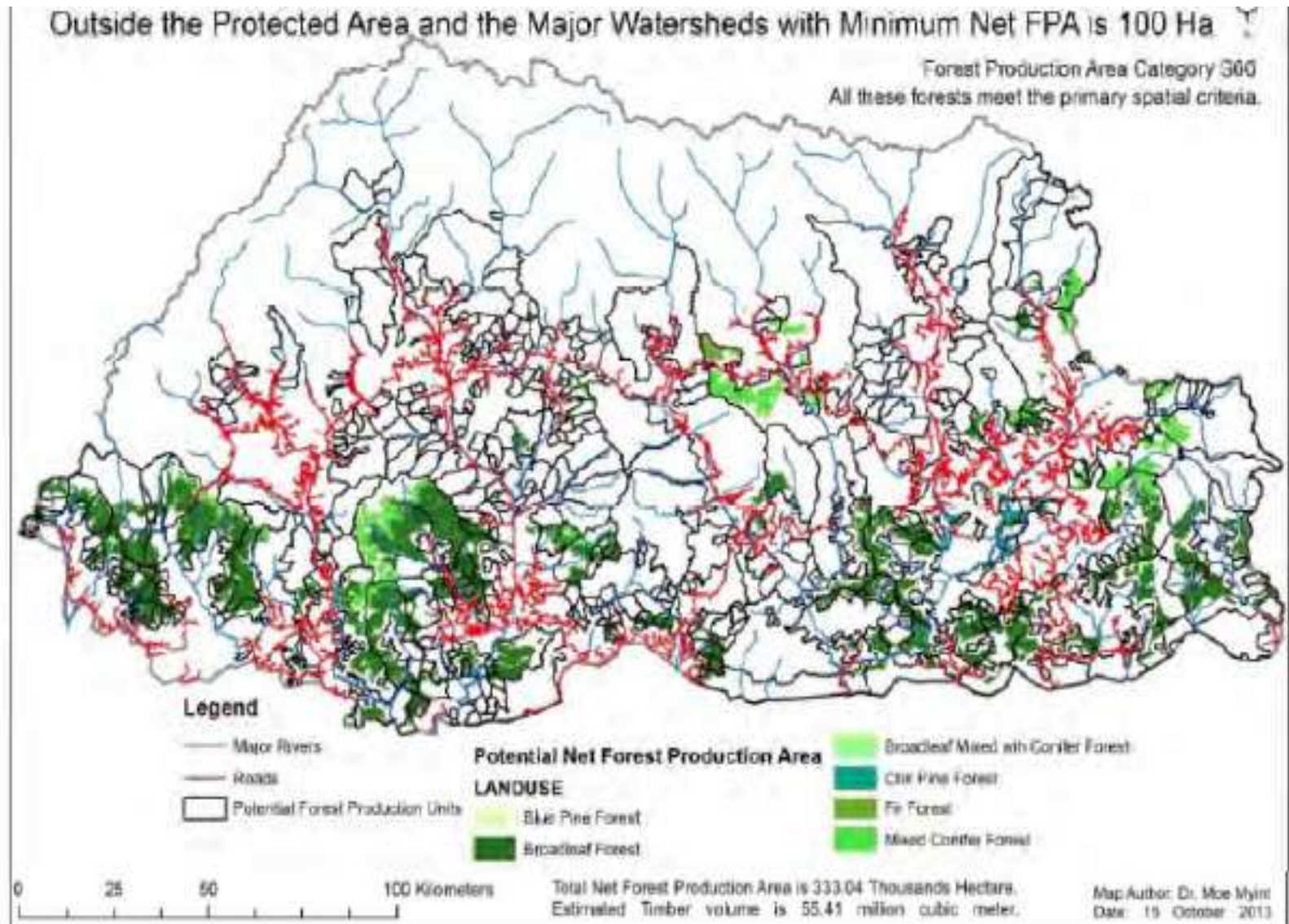
Solar Energy Resource: Under Study



3Tier data, processing by Fichtner

Source: Fichtner Report

Biomass Energy Resource: Under Study



Current Power 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	126 (2x63)	220kV
Mini/Micro	8 (17 nos)	6.6kV/415V
Total	1,606 MW	

The map illustrates the proposed 6000 MW Allpurdwār project and its transmission lines. The project area is located in the Eastern Himalayan region, spanning parts of India (Assam, West Bengal, Sikkim) and China (Arunachal Pradesh). The map shows various river basins, towns, and power infrastructure. A legend explains the symbols for existing and proposed infrastructure, including a 6000 MW transmission line from Allpurdwār to Siliguri.

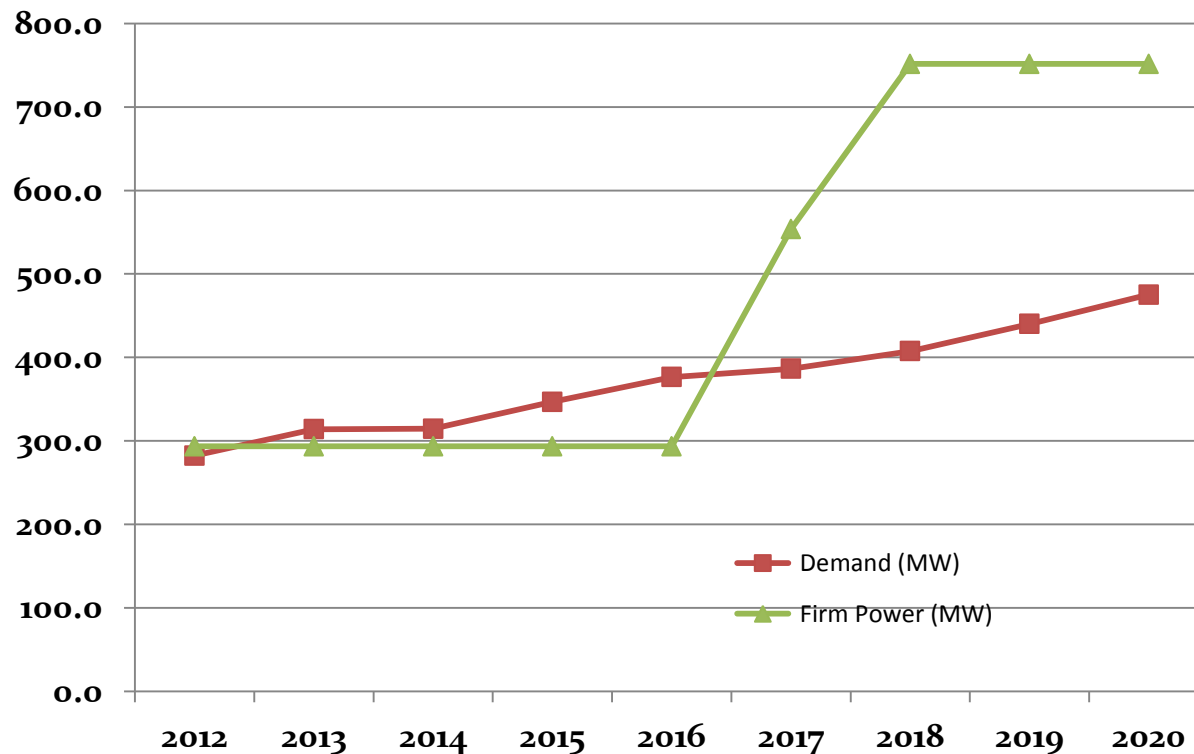
LEGEND

EXISTING	Under Const./Proposed
UNESCO HERITAGE SITE	2020
HYDRO POWER STN.	
POOLING STATION	
SUB STATION	
400kV GRID LINES	
400 kV LINES	
220kV LINES	
132kV LINES	
66kV LINES	
HYDC BIPOLE	

Fig. 7

Generation and Demand Scenario

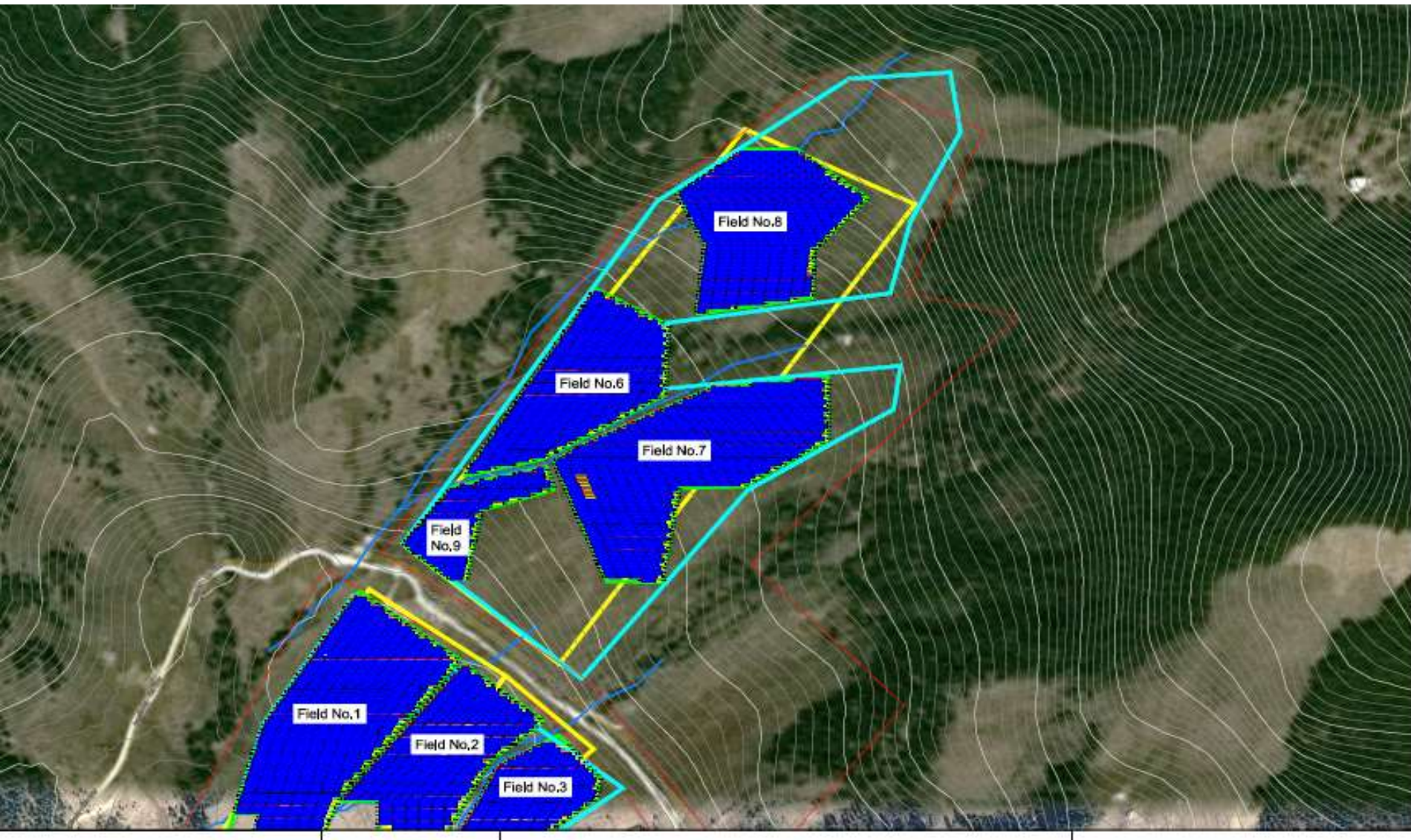
Year	Actual			Forecasts					
	2012	2013	2014	2015	2016	2017	2018	2019	2020
Demand (MW)	282.4	313.9	333.14	346.7	376.4	386.5	407.4	440.0	475.2
Firm Power (MW)	293.5	293.5	293.5	293.5	293.5	553.5	751.5	751.5	751.5
Shortage/ Excess (MW)	11.1	-20.4	-21	-53.2	-82.9	167	344	311.5	276



A 2 x 300kW Wind Power Plant - under construction



30MW Shingkhar Solar Power Project



National Transmission grid Master Plan for Bhutan by 2020

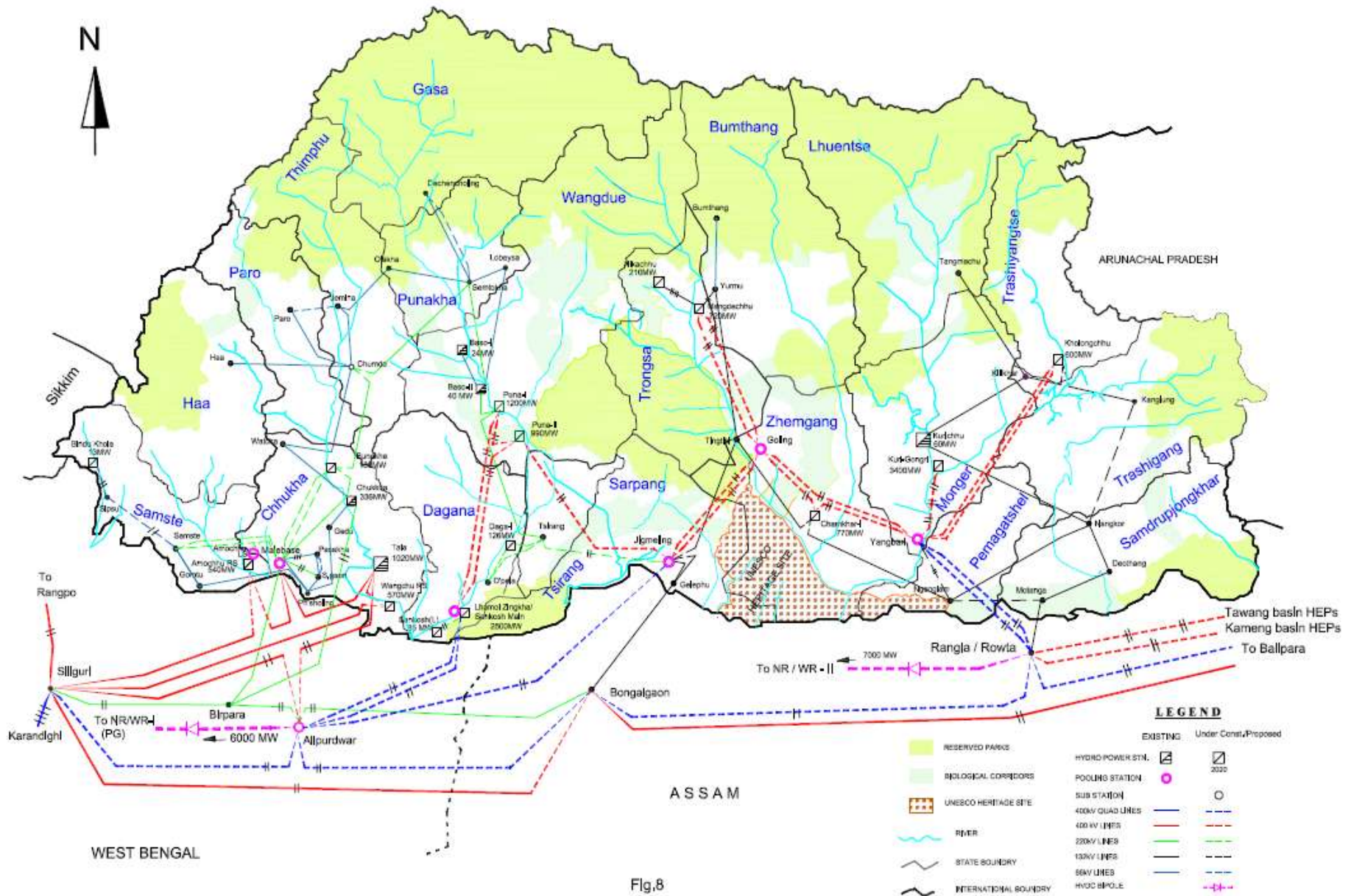
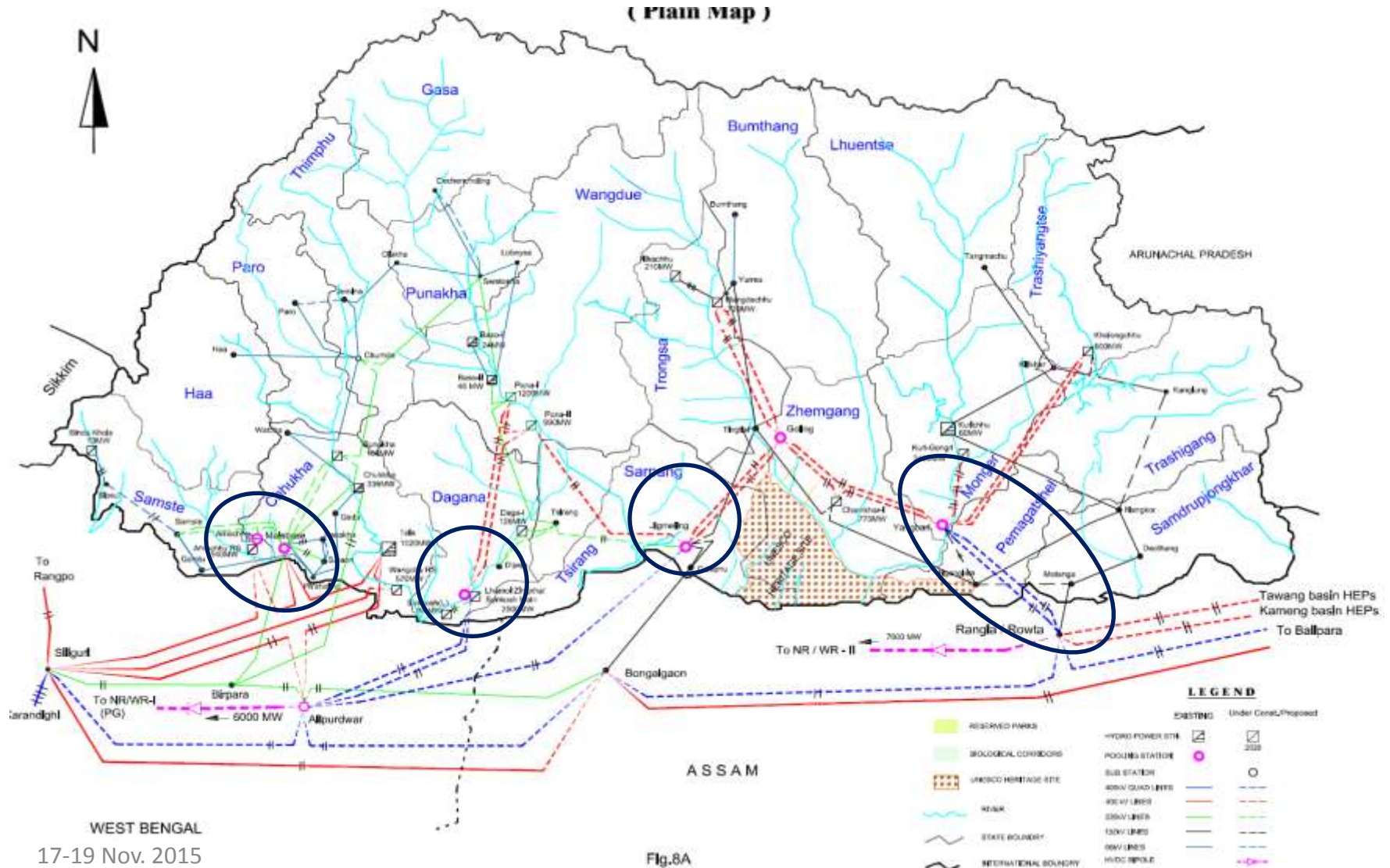


Fig.8

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



Power Distribution and Rural Electrification

- Length of 33kV lines – 3,154 km
- Length of 11kV lines – 2,524 km
- Length of 6.6kV lines – 104 km
- Length of LV lines – 7,438 km
- Total Distribution line length – 13,219 km
- Total distribution transformers – 4605
- Total distribution transformer capacity – 677MVA
- No. of customers – 160,000
- Customer growth (2013) – 9.1%

Contd.

- Global System losses – 3.87%
- Transmission losses – 0.51%
- Distribution losses (excluding HV) – 8.75%
- T&D Utility Performance (overall SAIFI/SAIDI) – 4.92 / 6.31

(Source: Power Data Book-2014)

- No. of Rural HHs – 88,642
- On-grid Rural Electrification – 92%
- Off-grid Rural Electrification – 3.35%
- Current Achievement – 95.35%

Avg. Electricity Tariffs

Category	Nu./kWh	US \$/kWh
High Voltage	2.16	0.03
Medium Voltage	3.09	0.05
Low Voltage	2.49	0.04
Exports	2.115	0.032
Imports with Wheeling (+12% losses)	2.19	0.034

Energy Access & affordability ensured by the Govt. while the Utilities ensure for Supply, Availability and Reliability as enforced by the Govt. agencies.

Issues & Challenges

- Enhance productive use of energy access for transformative impacts
- Requires other supplementary inputs for transformation
- Data Collections (field collection methods not robust)
- Data Format (not Dynamic)
- Consistency & Verifiability (lot of human errors)
- Energy Data Analysis (Demand forecasting!)
- Energy Sector Database development (EDD-2005 & EMIS-web based)
- Energy Sector Data sharing with Outside Agencies (varied requirements, needs harmonized approach)

Thank You

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