"Participation of Private Sector in Overcoming Energy Poverty in SAARC Member States“

Presentation on

“The Current Status of Energy Poverty and the Steps Taken by Government to Reduce Energy Poverty in Bhutan”

29-30 August 2019

Dambulla, Sri Lanka

Presentation Outline

- Introduction - Country Information
- Power Sector Reforms
- Institutional Arrangement
- Power Sector Policies
- Hydropower Development
- Transmission Development
- Energy Trade
- Energy Security (Supply-Demand Scenario)
- Challenges & Opportunities

Introduction - Country Information

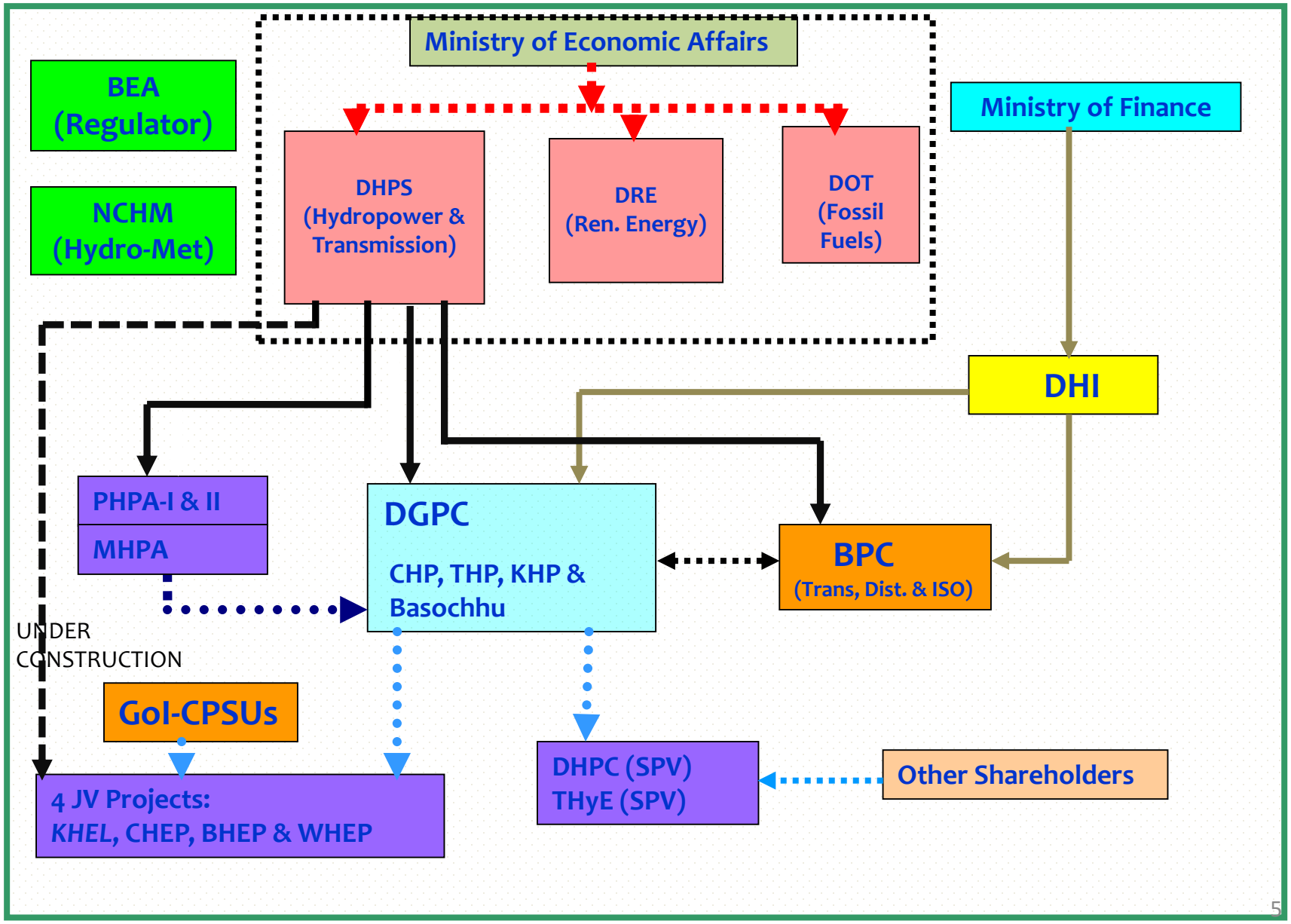
- Land Area : 38,394 Sq. km
- Democratic Constitutional Monarchy
- Forest Cover : 71%
- Population (2017) : 727,145
- Per Capita GDP (2016) : $2,879

- Per Capita Electricity Consumption (2017): ~3,000 kWh
- Electricity Contribution to GDP (2017): 12%
- Electricity Contribution to Revenues (2017): 10%

Power Sector Reforms

- Electricity Act of Bhutan 2001
- Power Sector unbundled in 2002
  i. DHPS – Apex Agency for Hydropower Dev.
  ii. DRE & NCHM – Nodal Agency for Renewable Energy Dev. and Weather & Climate
  iii. BEA –Regulator, made autonomous in January 2010
  iv. DGPC (Jan 2008) – O&M of all existing hydropower plants
  v. BPC – Transmission & Distribution

Institutional Arrangement



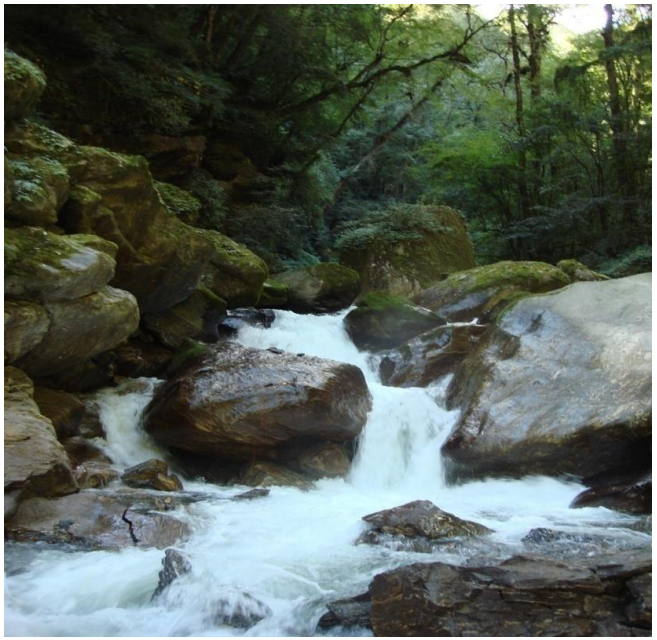
Power Sector Policies

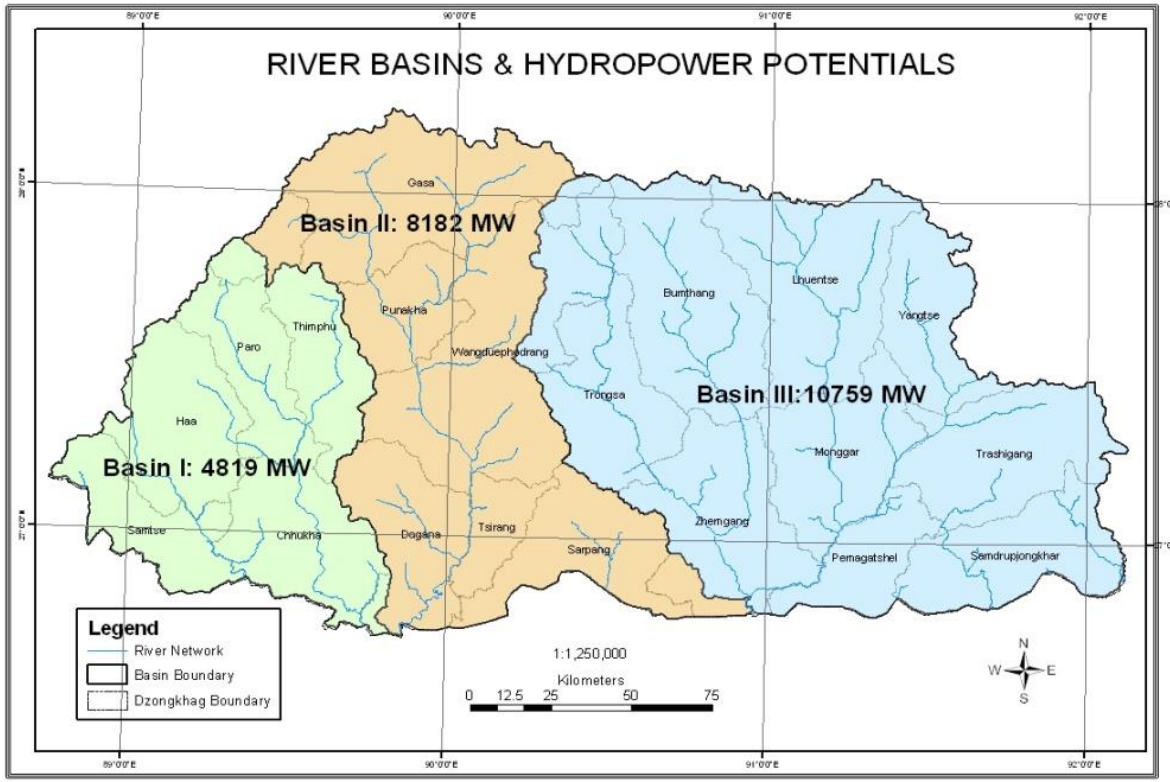
i. Sustainable Hydropower Development Policy 2008 (under revision)
ii. Alternate Renewable Energy Policy 2013
iii. National Energy Efficiency & Conservation Policy 2017 (Under finalization)
iv. Domestic Electricity Tariff Policy 2016
v. Economic Development Policy 2017

Energy Sources

- Major Hydropower Plants: **2326 MW**
- Mini Hydropower Plants: **8.065 MW**
- Wind Power Plants: **0.6 MW**
- Solar Power Plants: **0 MW**
- DG Power Plants: **0.366 MW**

Hydropower Development

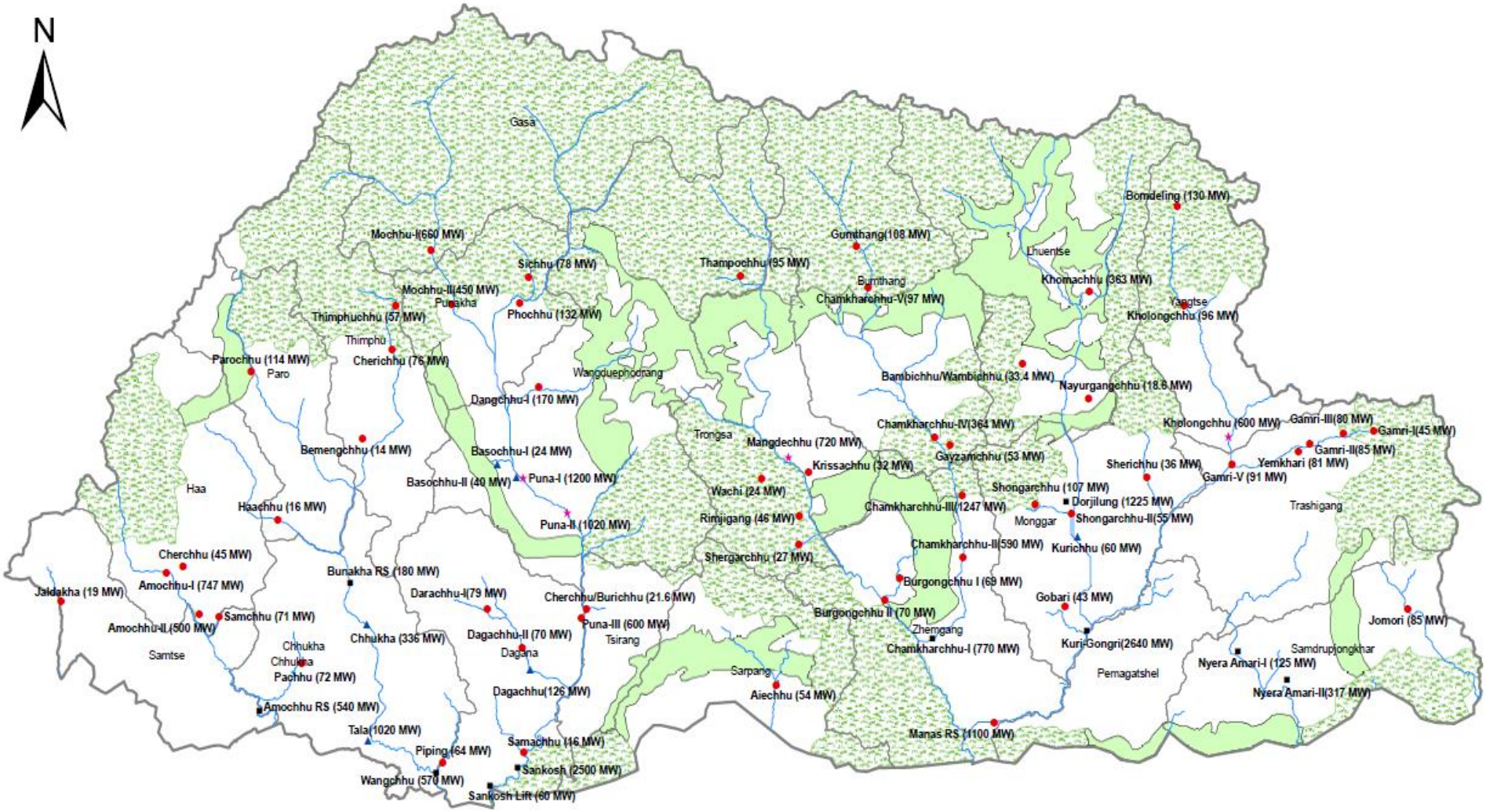




Hydropower Development

- Total Hydropower potential (PSMP 2003) 30,000MW (35000 MW).
- Techno-economically viable ~23,000MW
- Installed Capacity: 2,326MW (6 projects)
- Under construction: 2,338MW (3 projects)
- DPR study completed: 5,770 MW (6 projects)
- PFR study completed: 3,011MW (10 projects)
- Reconnaissance study completed: 3,991MW (15 projects)

Hydro Project Sites



Investment Mechanisms

- Hydropower is a strategic national resource
- Maximum projects through bilateral investment window
- Joint Ventures
- PPP model

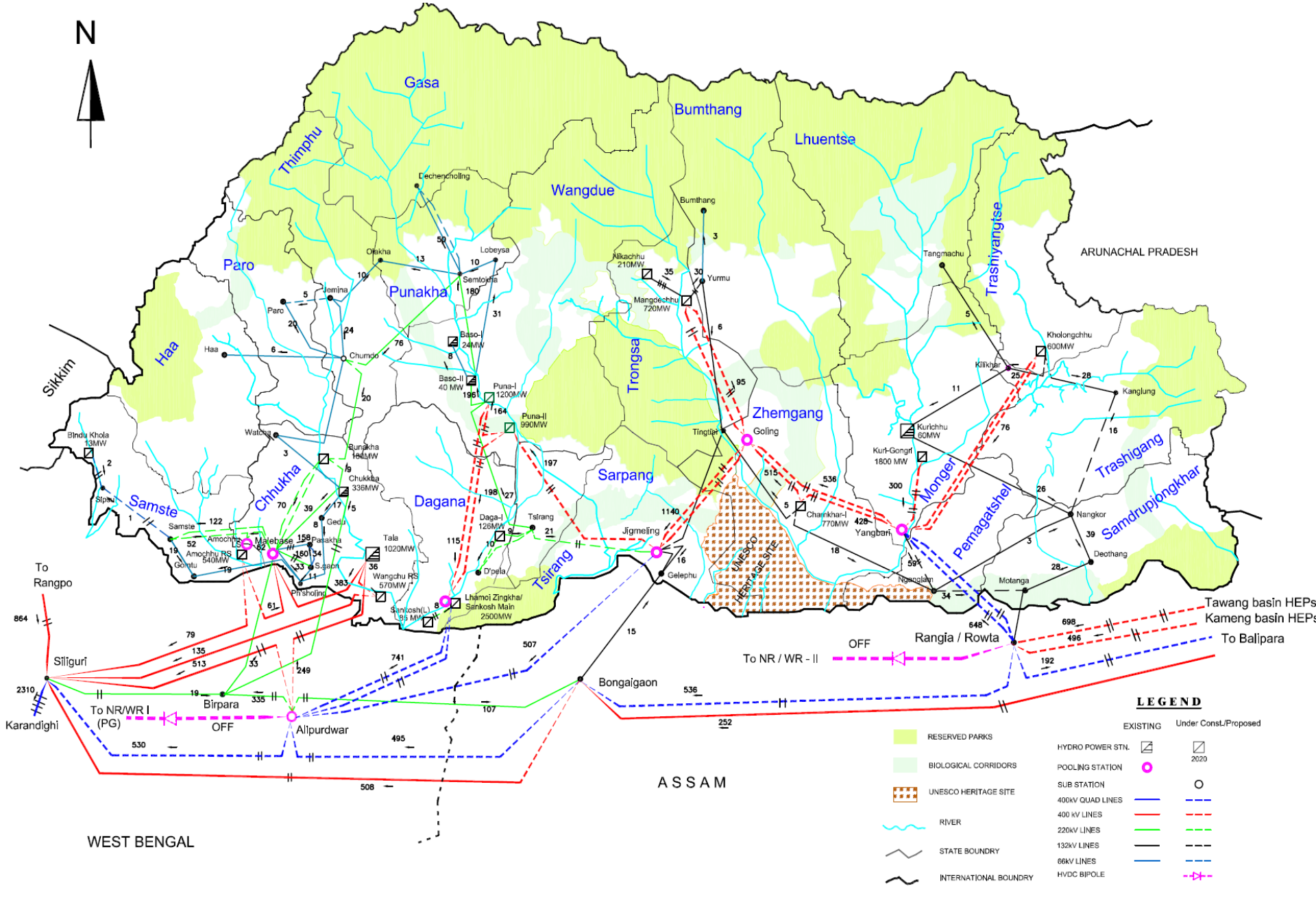
Transmission Development

- National Transmission Grid Master Plan 2012 (Updated 2018)

Voltage level (kV)	Route length (km)
400	74.143
220	325.038
132	366.54
66	357.344

Energy Trade

- Hydropower Export – 70%
- LT PPAs
- Market access – a challenge


N
Gasa
Thimphu
Bumthang
Lhuentse
Wangdue
Paro
Punakha
Haa
Trongsa
Trashiyangtse
Zhemgang
Sarpang
Dagana
Chhukha
Samste
Trashigang
Monger
Pemagatshel
Samdrupjongkhar
Tsirang
Sikkim
ARUNACHAL PRADESH
ASSAM
WEST BENGAL
Lechencholing
Olakha
Lobeysa
Semtokha
Jemina
Paro
Haa
Chumdo
Basochhu-I 24MW
Basochhu-II 40 MW
Punatsangchhu-I 1200MW
Punatsangchhu-II 990MW
Watsa
Bunakha 180MW
Chukkha 336MW
Geduchhu
Tala 1020MW
Wangchu RS 570MW
Lhamoi Zingkha/ Sankosh Main 2500MW
Sankosh(L) 65 MW
D'pela
Daga-I 126MW
Tsirang
Jigmeling
Gelephu
Bindu Khola 13MW
Sipsu
Samste
Amochhu
Amochhu RS 540MW
Malebase
Pasakha
Gomtu
S.gaon
Ph'sholing
Bumthang
Nikachhu 210MW
Yurmu
Mangdechhu 720MW
Tingtibi
Goling
Tangmachu
Kholongchhu 600MW
Kilikhar
Kanglung
Kurichhu 60MW
Kuri-Gongri 1800 MW
Chamkhar-I 770MW
Yangbari
Nangkor
Deothang
Ngenglam
Motanga
UNESCO HERITAGE SITE
To Rangpo
Siliguri
Karandighi
To NR/WR I (PG)
OFF
Birpara
Alipurdwar
Bongaigaon
To NR / WR - II
OFF
Rangia / Rowta
Tawang basin HEPs
Kameng basin HEPs
To Balipara
LEGEND
EXISTING
Under Const./Proposed
RESERVED PARKS
BIOLOGICAL CORRIDORS
UNESCO HERITAGE SITE
RIVER
STATE BOUNDRY
INTERNATIONAL BOUNDRY
HYDRO POWER STN.
POOLING STATION
SUB STATION
400kV QUAD LINES
400 kV LINES
220kV LINES
132kV LINES
66kV LINES
HVDC BIPOLE
2020

Energy Security: Supply-Demand Scenario

- Excess supply in summer
- Winter (December -March) Firm Power supply – 320MW (FP from UC projects – 589MW)
- Peak Demand – 375MW Feb' 2018 (~7%)
- Hotter temperatures have melted as much as a quarter of Himalayan glacial ice in the past 40 years, reveals a study of declassified spy satellite photos from the 1970s.
- Run-off schemes

Energy Security: Supply-Demand Scenario

- ✓ Import mechanisms (during lean months) - Energy Banking
- ✓ Enhance firm power capacity through reservoir projects (timely implementation)
- ✓ Promote Renewable energy technologies (600kW wind & solar farms)

Hydro Development

Opportunities	Challenges
• Renewable, Clean form of Energy • CDM & Substitution to fossil fuels/reduction in GHG emission • Growing demand in India and South Asia (peaking energy) •Opportunities from huge RE growth	• Resources constraints (capital intensive & skills & technology !) • Strict Environment laws ! • Risks (geology, long gestation, weather – floods, GLOF) • Market (pricing, competition) • Transport cost (land locked !)

Kadrinche La
(Thank you)