



Department of Renewable Energy

Ministry of Economic Affairs

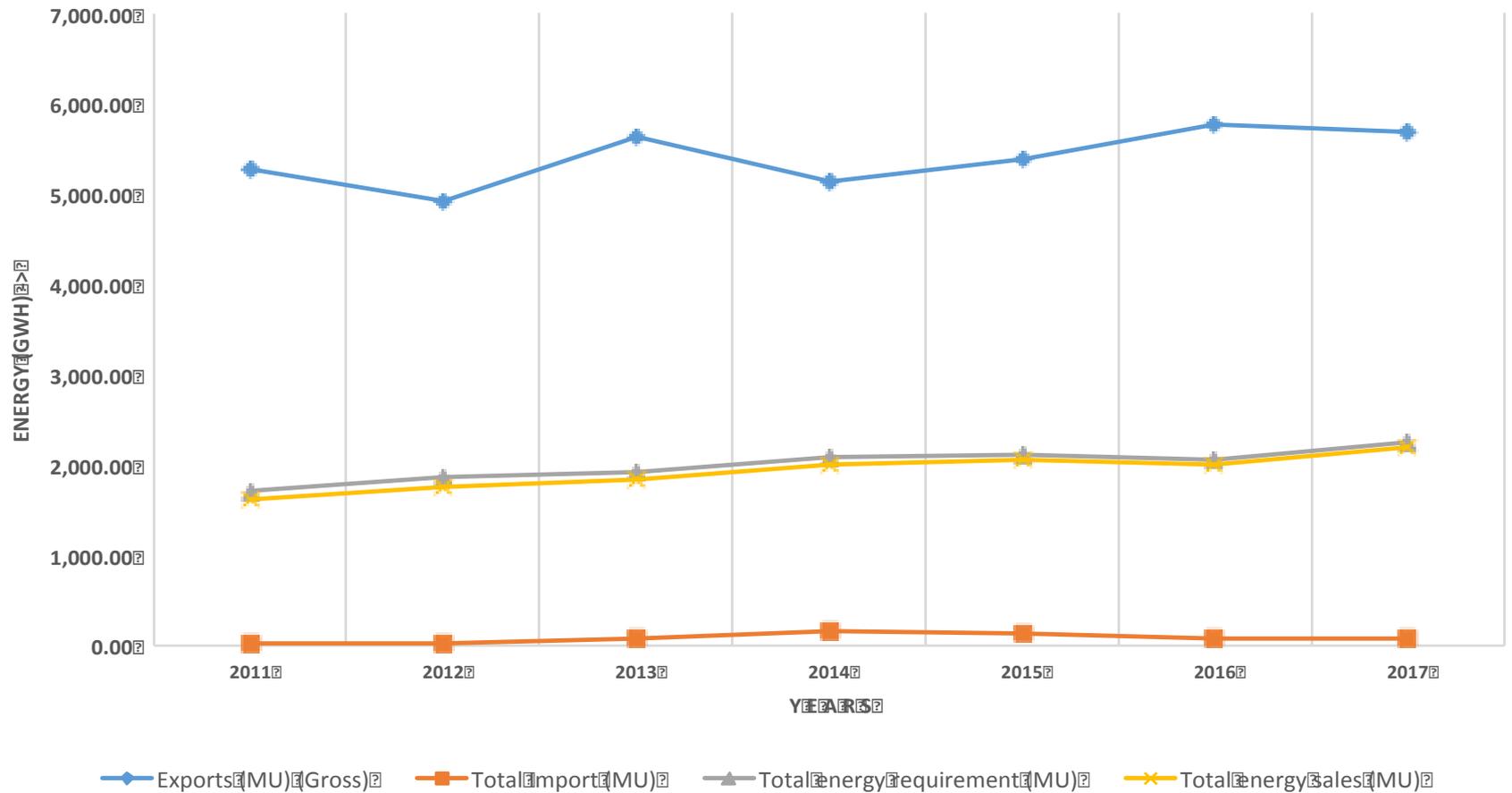
Presentation Outline

- Glimpse on Energy Sector
- Electricity supply and demand situation in country
- Current initiatives
- Challenges
- Opportunities for RE development

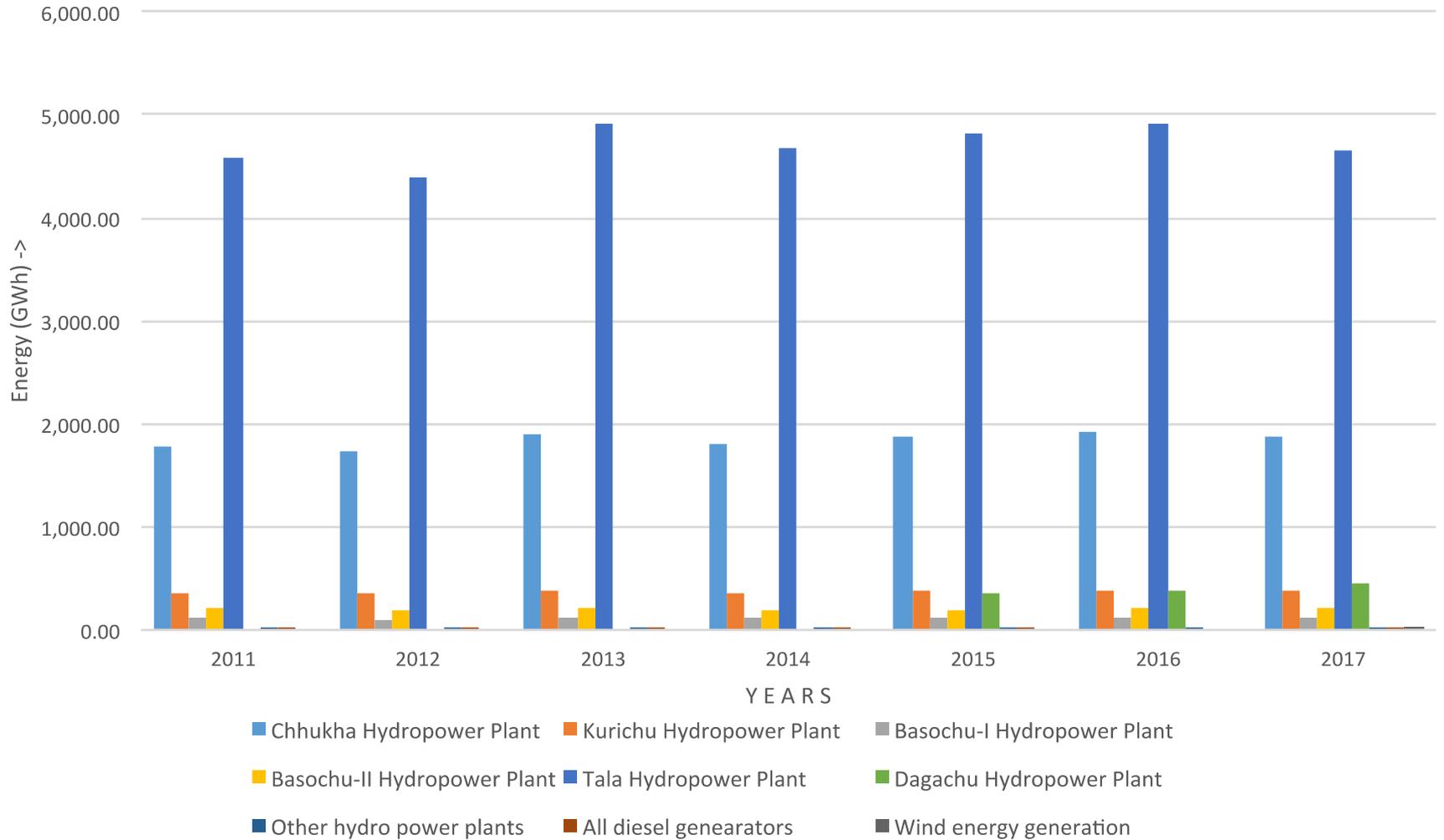
Glimpse on Energy Sector

- Hydropower potential: 30,000 MW
- Installed hydropower capacity: 1,614 MW
- Peak Demand: 356 MW (2017)
- Access to electricity: Urban 100%
- Rural electrification: 99.98%
- Energy supply mix (2014): 650,220 ToE

ELECTRICITY EXPORT, IMPORT AND REQUIREMENT WITHIN THE COUNTRY



Total Electricity Generation

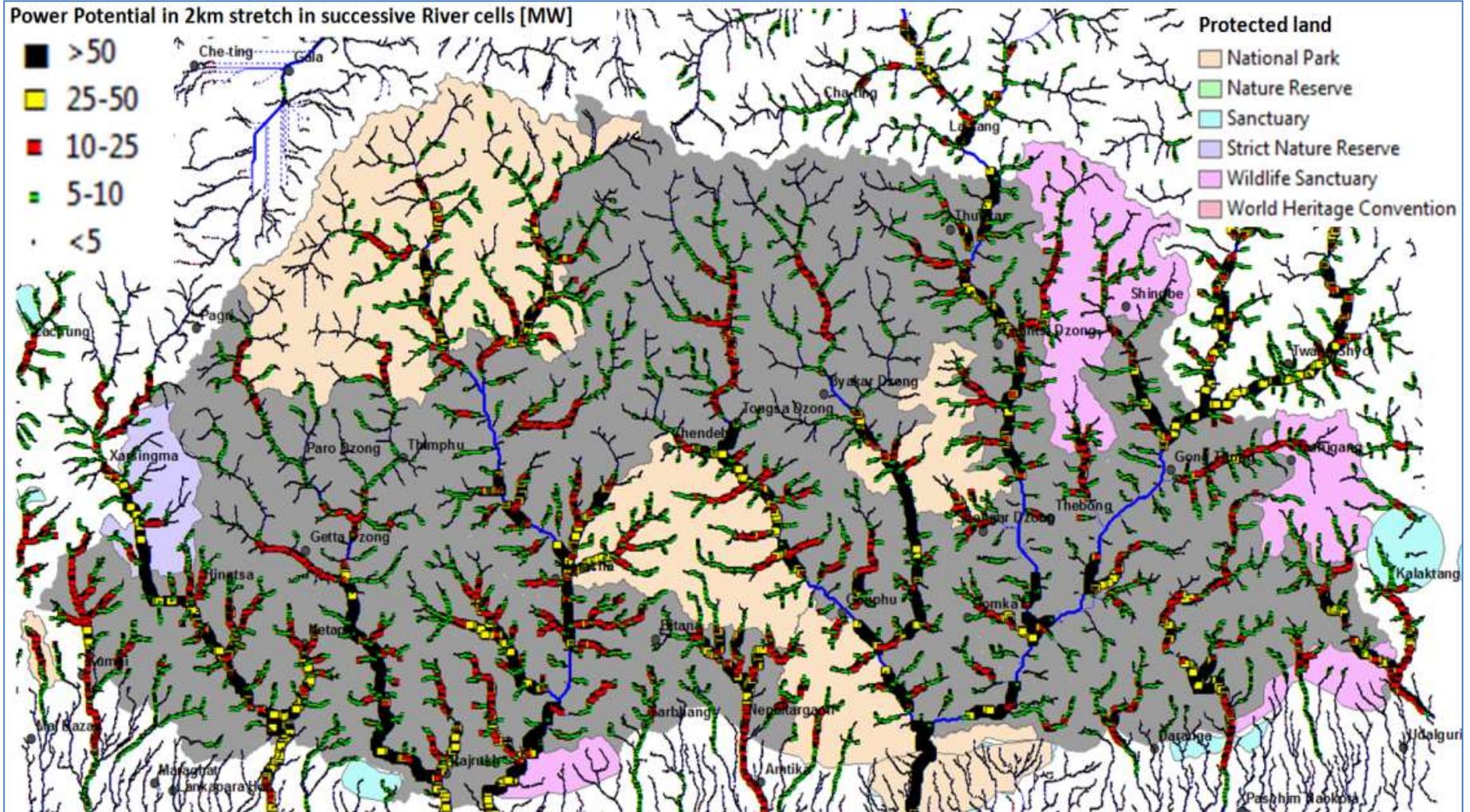


RE Resource Estimates

Power generation technology	Theoretical power generation potential		Restricted development power generation potential	
	Capacity in MW	Energy yield in GWh/a	Capacity in MW	Energy yield in GWh/a
Hydropower	41,088	197,060	22,419	117,836
<i>Hydropower ≤ 25 MW</i>	23,297	153,367	—	—
<i>Hydropower > 25 MW</i>	17,792	43,693	—	—
Wind power	63,895	34,881	761	308
Solar PV	5,977,948	10,712,034	12,018	20,025
	Energy content in GWh/a	Energy yield in GWh/a	Capacity in MW	Energy yield in GWh/a
Wood	11,938	4,178	1,985	595
Wood residues based	4,178	1,462	695	154

source: Fichtner

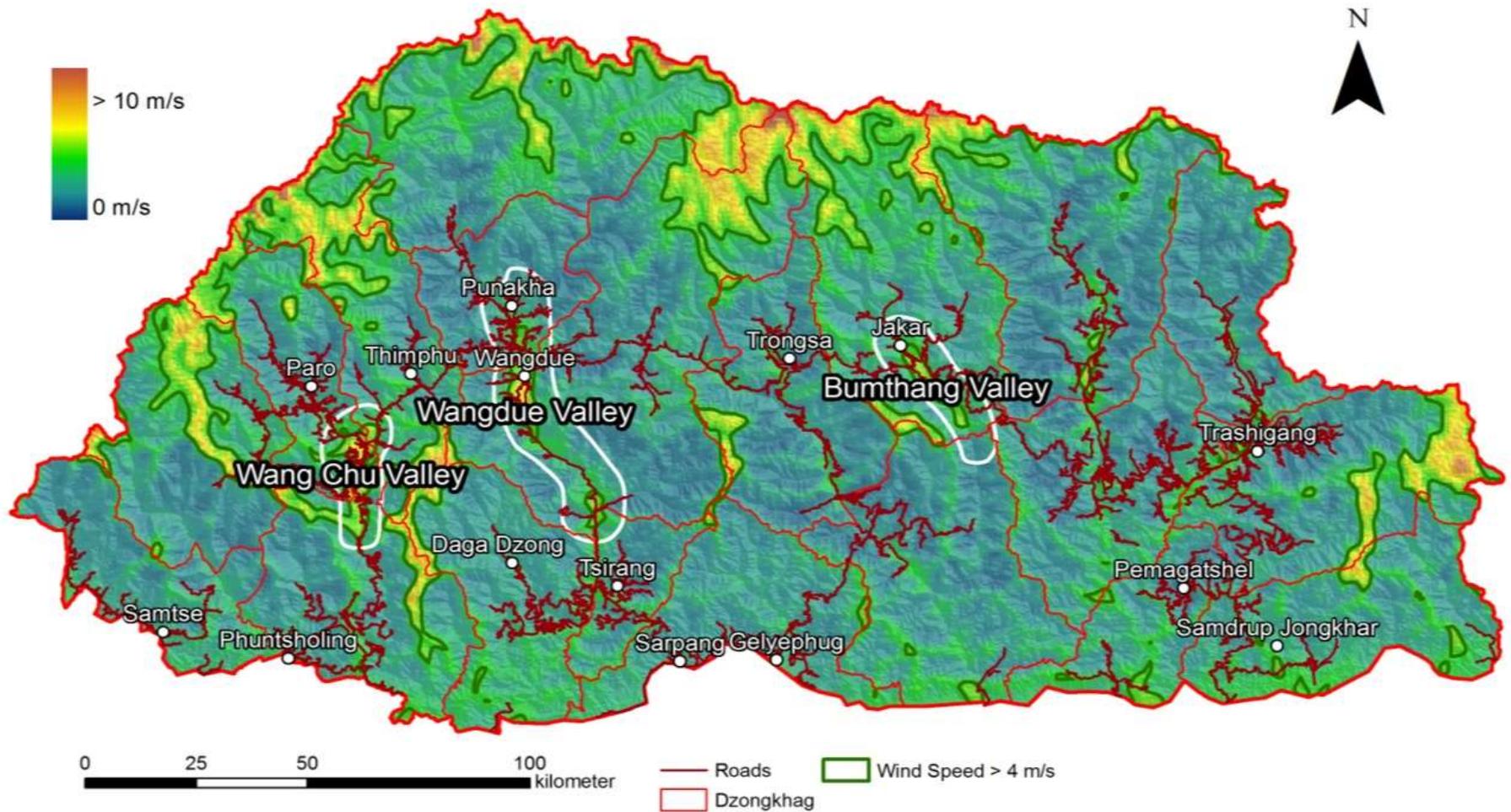
Hydropower Potential



Hydropower Potential

Power generation technology	Theoretical potential		Restricted development potential	
	Capacity in MW	Energy yield in GWh/a	Capacity in MW	Energy yield in GWh/a
Hydropower	41,088	215,959	26,683	140,246
<i>Hydropower ≤ 25 MW</i>	23,296	122,444	N/A	N/A
<i>Hydropower > 25 MW</i>	17,792	93,515	N/A	N/A

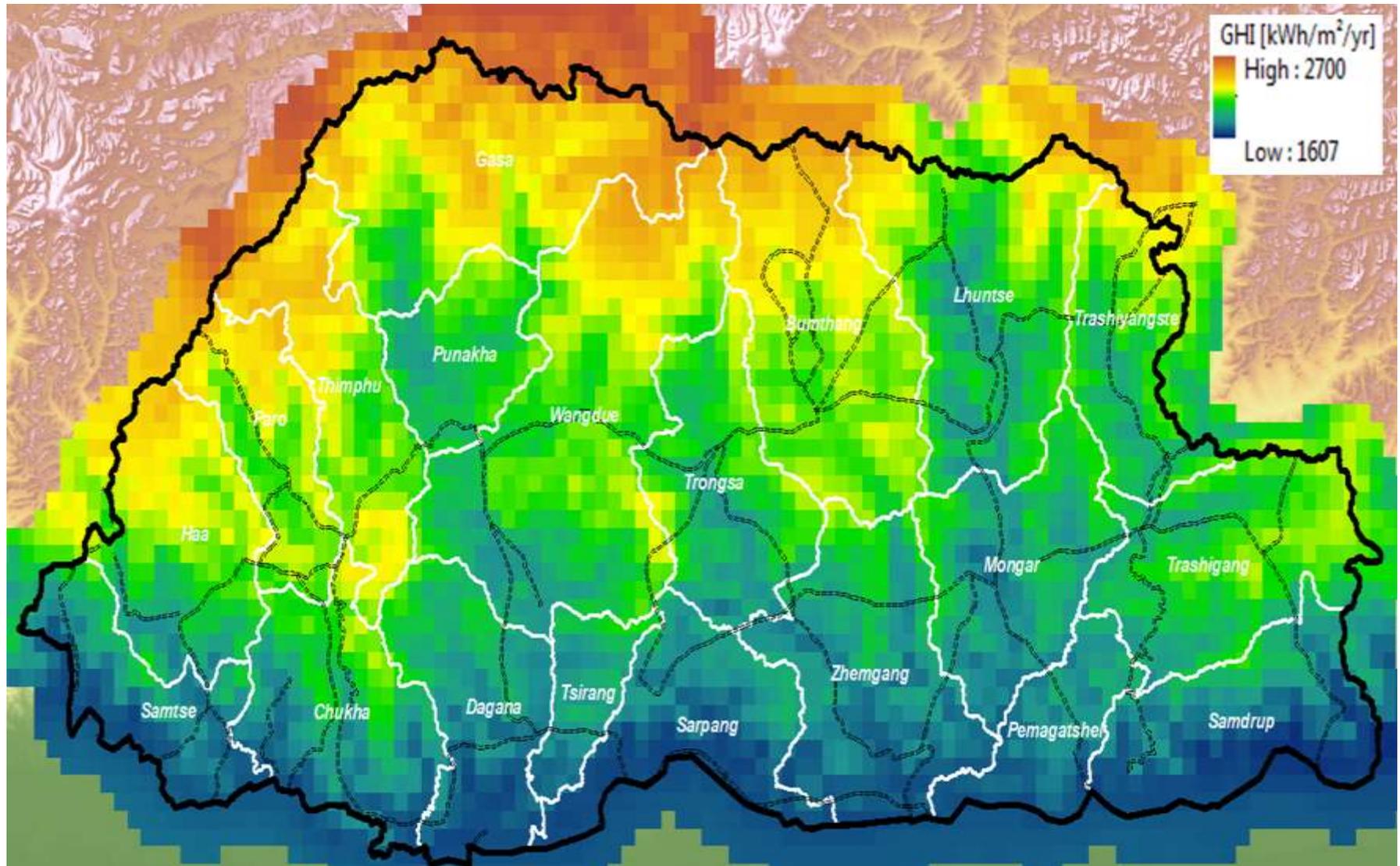
Wind Power Potential



Wind Power Potential

Power generation technology	Theoretical potential		Restricted development potential	
	Capacity in MW	Energy yield in GWh/a	Capacity in MW	Energy yield in GWh/a
Wind power	63,895	34,881	761	308

Solar PV Potential



Solar PV Potential

Power generation technology	Theoretical potential		Restricted development potential	
	Capacity in MW	Energy yield in GWh/a	Capacity in MW	Energy yield in GWh/a
Solar PV	5,977,948	10,712,034	12,018	20,025

Solar Thermal Potential

Heat production technology	Theoretical potential		Restricted development potential	
	Capacity in 1000 m ²	Energy yield in GWh/a	Capacity in 1000 m ²	Energy yield in GWh/a
Solar water heating	30,932,292	20,879,297	169	114

Biomass Potential

Power generation technology	Theoretical potential		Restricted development potential	
	Energy content in GWh/a	Energy yield in GWh/a	Capacity in MW	Energy yield in GWh/a
Wood	11,938	4,178	1,985	595
Wood residues based	4,178	1,462	695	154

The potential for bio-fuel has also been assessed, found not feasible as the technology for first generation bio-fuel contradicts with the food security

Legislative and Regulatory Framework

Bhutan Electricity Act 2001

- Adoption of Bhutan Electricity Act 2001, which enabled restructure of the power supply industry and participation by the private sector through licensing and regulation.
- The objectives were to provide safe, reliable, and affordable electricity services, enhance revenue generation through export of electricity and efficiency improvement in management of generation, transmission, distribution and supply system.
- The Act is currently being reviewed

Legislative and Regulatory Framework

Tariff Determination Regulation 2007

- To provide the basis for determining the electricity prices reflecting the policy objectives enshrined in the Electricity Act and to provide fairness to both the service providers and customers by reflecting the actual cost of efficient business operation.

Legislative and Regulatory Framework

Sustainable Hydropower Development Policy 2008

- SHDP 2008 was adopted in 2008 to attract investment for accelerated hydropower development
- Enhance revenue earning through export of surplus energy and to contribute to socio-economic development
- Ensure domestic electricity supply and reliability
- The Policy is currently being reviewed

Legislative and Regulatory Framework

Economic Development Policy 2016

- The EDP is the apex policy for economic development of the country and is the guiding document for all ministries and agencies to stimulate economic growth
- The policy also emphasizes the need to promote Alternative Renewable Energy to diversify the energy supply mix and enhance energy security.

Legislative and Regulatory Framework

Alternative Renewable Energy Policy 2013

- Diversify the energy supply mix
- Reduce GNG Emission and contribute to climate change mitigation
- Promote green growth and enhance sustainable development
- Build up national resilience against adverse affects of climate change.

Legislative and Regulatory Framework

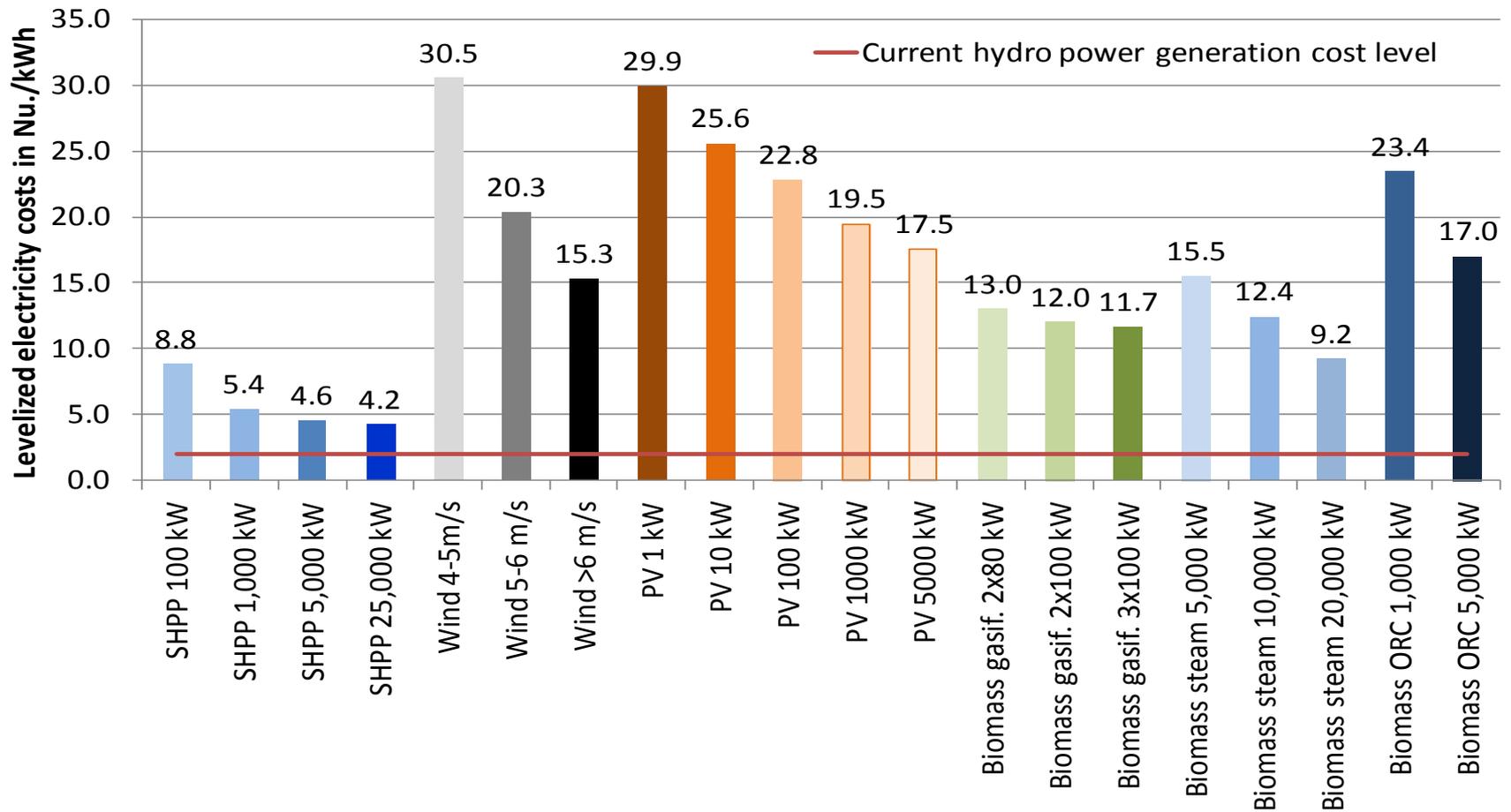
Domestic Electricity Tariff Policy 2016

- Ensure fairness to both customers and service providers
- Ensure recovery of actual cost of efficient business operation of electric utilities and to enable investments in expansion and up-gradation
- Provide affordable tariff to improve quality of life of the people through rationalised and targeted subsidy mechanism

Other Initiatives

- Implemented biogas projects in partnership with Department of Livestock, MoAF
- Implemented improved cook and heating stoves
- Desktop, reconnaissance, feasibility studies of SHP
- Feasibility study of mega solar plant carried out
- Installed and commissioned pilot wind power plant in partnership with BPC
- Installed RE data acquisition instrument in some locations

Challenge on Supply Side



Challenge on Demand Side

Total Energy Supply in Bhutan and the Fuel Mix (2014)

Total Domestic Energy Supply: 650,220 TOE

Thermal: 72% (470,128 TOE)

Electrical: 28% (180,092 TOE)

Coal and Derivatives: 15% (97,567 TOE)

Petroleum Products: 21% (138,192 TOE)

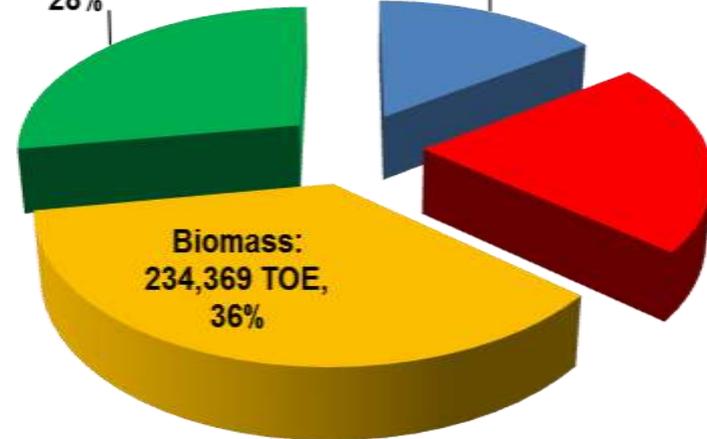
Biomass: 36% (234,369 TOE)

Electricity:
180,092 TOE,
28%

Coal: 97,567
TOE, 15%

Petroleum
Products:
138,192, TOE
21%

Biomass:
234,369 TOE,
36%

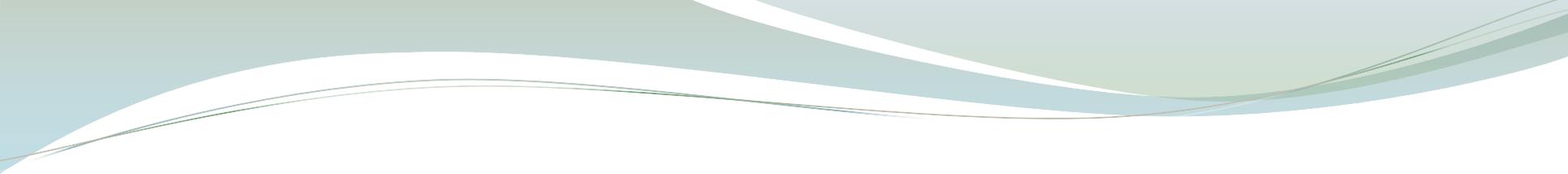


Challenges for RE Development

- No legal framework
- Technology very expensive compared to large hydropower
- Lack of institutional capacity
- Lack of private sector capacity
- Limited access to funds
- Difficult geographical terrains and access

Opportunities for RE Development

- We need unique solutions, creativity and innovativeness to overcome the challenges
- Strengthen institutional capacity
- Create regulatory framework for RE
- Create dedicated fund for RE



Thank You