



ENABLING THE BUSINESS ENVIRONMENT FOR PROMOTING INVESTMENT IN HYDRO FOR EXPORTS



Department of Energy
Ministry of Trade & Industry
(Bhutan)

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Outline of the Presentation

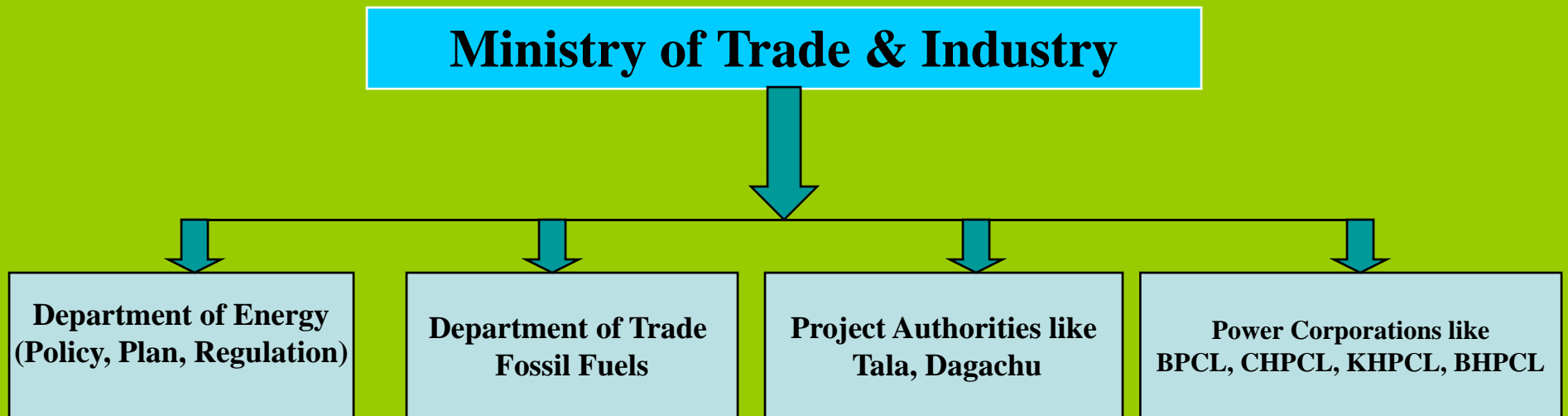
- Energy Sector Organization and Functions
- Hydropower Potential, Development Status/Usage
- Salient Features of Hydropower Sector
- Development Philosophy, Priorities & Policy Interventions
- Electricity Act 2001 and Regulatory Set Up
- GG+ Document
- Updated Power System Master Plan
- Umbrella Agreement with India
- Draft Energy Policy
- CDM Opportunities
- Conclusions

Bhutan – Salient Features

- Located in the Eastern Himalayas
- Area – 38,394 sq. km
- 72.5% under Forest cover
- Population – 6,34,982 (2005)
- Altitude range from 100 – 7500 m above mean sea level
- Stretch of 170 km north south and 300 km east west maximum distance
- Climate – generally four seasons



Energy Sector Organization



Functions of Dept of Energy

- ✓ Formulation of Macro-Level National Plans, Policies, Programmes & Projects and coordination of energy sector activities.
- ✓ Provide technical advice/support to RGoB on energy issues
- ✓ Monitoring & Evaluation of programmes and projects
- ✓ Techno-economic & budgetary clearance of large energy projects and technical sanction of small RGoB funded Projects.
- ✓ Electricity Regulations (Bhutan Electricity Authority)

Hydropower Potential and Demand/Supply Situation

- Primary energy – Bio-mass (1.2 million m³ per annum consumption, 1.8 m³ per capita) for lighting, cooking and heating
- Import of fossil fuels during 2006: Kerosene (14,370 kl), Diesel (50,807 kl), Petrol (17,323 kl), LPG (4,980.37 MT), Others (7,165.12 kl) – increasing demand ! RGoB spent = Nu 2,465.88 million (61.6 m US\$ equivalent)
- Total hydropower potential = 30,000 MW (120,000 GWh (Million Units))
- Techno-economically feasible > 10 MW, 76 sites = 23,760 MW (99,247 GWh (million Units))
- Developed so far (5 large projects) = 1480 MW (7416 GWh)
- Developed so far (23 mini/micro hydels) = 8.168 MW
- Total hydropower developed = 1488.168 MW (5% of potential)
- Hydropower Generation (2005-06) = 2645.847 GWh
- Hydropower energy consumed (2005-06) = 128 MW, 738 GWh and rest exported

Salient Features of the Bhutanese Hydro power sector

- Key to achieving economic self reliance
 - Prior to harnessing of hydropower, Bhutanese economy almost entirely dependent on foreign aid
 - Revenue from sale of electricity provided 45% of national revenue in 8FYP (1997-2002).
 - In the 9th (2002-2007) Plan about 46% dependent on external aid.
 - Earnings from this sector ploughed back into the social sector.
- Affordability
 - Domestic tariff kept low to stimulate economic growth.
 - Rural electrification given high priority.
 - 75% of generation exported.
- Environmentally benign
 - All major rivers in Bhutan flow through deep valleys.
 - No settlements affected.
 - Run of the river projects
 - Very rich forests, over 72% coverage; catchment well conserved.

Development Philosophy

- Sustainable Development (renewable, environment-friendly, techno-economic viability, adaptability)
- Economic self reliance (Hydropower resources development for meeting internal energy demand and export for revenue earnings – i.e. about 5000 MW for export by 2020.
- Equitable balanced development (Electricity for all by year 2020 (even earlier possible): Extensive Rural Electrification)
- Enhance efficiency and energy conservation (automation, demand side management)
- Reduce dependence on energy import (eg on fossil fuels).

Current Priorities

- 1) Reach reliable and adequate grid electricity to all District HQs**
- 2) Rural Electrification through grid extension, off-grid micro/mini hydel and PV supply**
- 2) Successful Completion of the on-going Mega Project (Tala) and start of the new Mega Projects (eg. Punatsangchu I, Dagachu) primarily for export**
- 3) Capacity Building {Institutional (including DPR/FSR/PFSR preparations), Legal, Policy, Master Plans, HRD, Private Sector Participation, Alternate/Renewable Energy Options}**

Planning/Policy Interventions to enhance Hydropower Development

- Vision 2020
 - 3000 MW Generation Capacity addition by 2017 (5000 MW for export by 2020)
 - Electricity for all by 2020
- Electricity Act 2001
- GG+ Document
- Updated Power System Master Plan (2003/4)
- Umbrella Agreement with India (2006)
- 6500 MW by 2020
- Energy Policy (2006 draft ready for adoption)
- Hydro Power Policy, FDI and IPP regulations being prepared under ADB funding

Electricity Act 2001

- Legal framework for re-structuring the power industry
- Provides mechanisms for licensing and regulating the operations of Power companies
- Defines the roles and responsibilities of suppliers and protect the interests of the general public.

Regulatory Set Up

- In accordance with the Act, BEA established with a Chairman, 3 members and 1 CEO with functions as per Act (Clause 11.1) as follows:
 1. Develop regulation, standard, codes, principles and procedures
 2. Tariff setting including generation tariff not regulated by PPA
 3. Process, issue, modify and revoke license
 4. Monitor performance of licensees and compliances with Act
 5. Determine and approve tariffs proposed by licensees
 6. Prescribe and collect fees, charges or royalties
 7. Impose fines, sanctions, penalties for any breach of provisions
 8. Establish dispute resolution process
 9. And other duties as delegated by the Minister
 10. Indirect responsibilities as listed in clause 11.2

EA 2001 & Private Sector Participation in Hydro

- Art 49 talks about Private Sector Participation in electricity supply industry but not specifically in hydropower
- Therefore, Electricity Act is being reviewed so that, if necessary, to be amended to allow private sector participation in Hydropower Sector

Good Governance Plus Document (2005)

- GG+ document requires us to provide greater focus to the power sector in order to accelerate the pace of harnessing Bhutan's hydro power potential
- Actions recommended under Item No. 96: Provide greater focus to the development of hydro-power potential
- Ongoing Initiatives:
 - Review of Current structure, mandate & Basic situation
 - Analysis of Resources gap and capacity constraints
 - Preparation of Investment Plan, New Organization structure and Mandate for accelerated development of hydropower potential
 - Establishment of Hydropower organization for accelerated development of the resource

Brief of PSMP Update (2003)

- Projects included in 20 years Master Plan (1993):
 - Priority Ranking based on economic unit cost of energy generation !
- Ranking and Scheduling of Projects in the PSMP Update (2003):
 - Ranking:
 - Economic ranking criteria
 - MCA criteria (Environment, social and techno-economic aspects - matrix)
 - Political considerations and Buyer's preferences !
 - Projects scheduling criteria :
 - Capacity addition of 2000 MW by 2012 and 3000 MW by 2017 as per Vision 2020 document – i.e. addition of 1000 MW every 5 years ! But now capacity addition target is reset to 5000 MW by 2020

Project Ranking in PSMP Update – Multi-Criteria Analysis (MCA)

- **MCA - a transparent analytical technique**
- **Projects compared using a common yardstick based on set of identified objectives**
- **Objectives expressed in terms of following main criteria:**
 - **Technical**
 - **Economic**
 - **Social**
 - **Environmental**
- **Within each criteria, no. of indicators/impacts are selected to measure performance of project alternative w.r.t. national policy and project objective**
- **Impacts expressed in terms of scores and scores are weighted through extensive consultations**

Project Ranking in PSMP Update – Multi-Criteria Analysis (MCA)

BHUTAN WRMP & PSMP Criteria and Weights				
Criteria	Sub-criteria	Weights 1)	Weights	Weights
Social	Improved access	22%	50%	30%
	Rural electrification	17%		
	Employment benefits	10%		
	Fishery potential	3%		
	Tourism	8%		
	Balanced regional development	40%		
	Sub-total	100%		
Environmental	Intrusion into protected areas	35%	50%	30%
	Loss of primary forest	40%		
	Dewatering impacts	10%		
	Access road erosion	10%		
	Fish migration	5%		
	Sub-total	100%		
Total Social and Environmental			100%	30%
Technical	Hydrological quality	22%	40%	70%
	Geological risk	25%		
	Dam cost risk	15%		
	GLOF risk	6%		
	Site accessibility	10%		
	Transmission line risk	18%		
	Reservoir sedimentation	4%		
	Sub-total	100%		
Economic	Size of project	0%	60%	70%
	Economic merit	80%		
	Financability	20%		
	Sub-total	100%		
Total Technical and Economic			100%	70%
Total Overall				100%

1) Weights to add up to 100% for all the sub-criteria within a (main) criterion

Final Scores and Ranking through MCA

BHUTAN WRMP & PSMP							
Ranked Order of Preference							
Criteria:	Tech./Econ	Soc/Env't	Overall				
Weights	70 %	30 %	100 %				
Name	Status as of 2003	Project ID			MW	GWh	
Punatsangchhu	Feasibility, 2000	13.120	52	15	66	1095	5385
Amochhu	Desk Study	11.030	40	25	65	499	2210
Chamkharchhu	Reconnaissance, 1992	15.110	44	18	62	671	3207
Punatsangchhu	Pre-feasibility, 1993	13.230B	40	15	55	992	4667
Kholongchhu	Pre-feasibility, 1993	17.150B	36	18	54	486	2207
Chamkharchhu	Reconnaissance, 1992	15.150B	35	18	53	568	2714
Mangdechhu	Feasibility, 1999	14.020	38	14	52	670	2909
Khomachhu	Reconnaissance, 2003	16.010	29	19	49	92	340
Chendebjichhu	Reconnaissance, 1992	14.010	34	12	46	139	550
Kurichhu	Reconnaissance, 1992	16.030	25	14	40	308	1360
Bunakha Dam on Wangchhu	DPR, 1995	12.082	27	10	38	180	789

Further initiatives taken by govt to enable the environment

- **Pre-Feasibility/Feasibility studies undertaken for number of large hydro sites**
- **DPR completed for 1 large run-of-river site (Puna-I) and 3 storage sites (Bunakha-180MW, Wangchu-900MW & Sankosh-4060MW)**
- **DPRs being undertaken for 2 large sites (Puna-II & Mangdechu)**
- **Preparation of DPR planned for 8 large techno-economically feasible top ranking sites during 10th Plan (2008-2013)**
- **Survey and investigations (further assessments) of balance 58 techno-economically feasible sites planned during the 10th Plan**
- **Therefore, there are feasible sites for interested investors with less risks/surprises and many more are planned for further assessment to minimize risks to the investors**

PSMP Updated Map

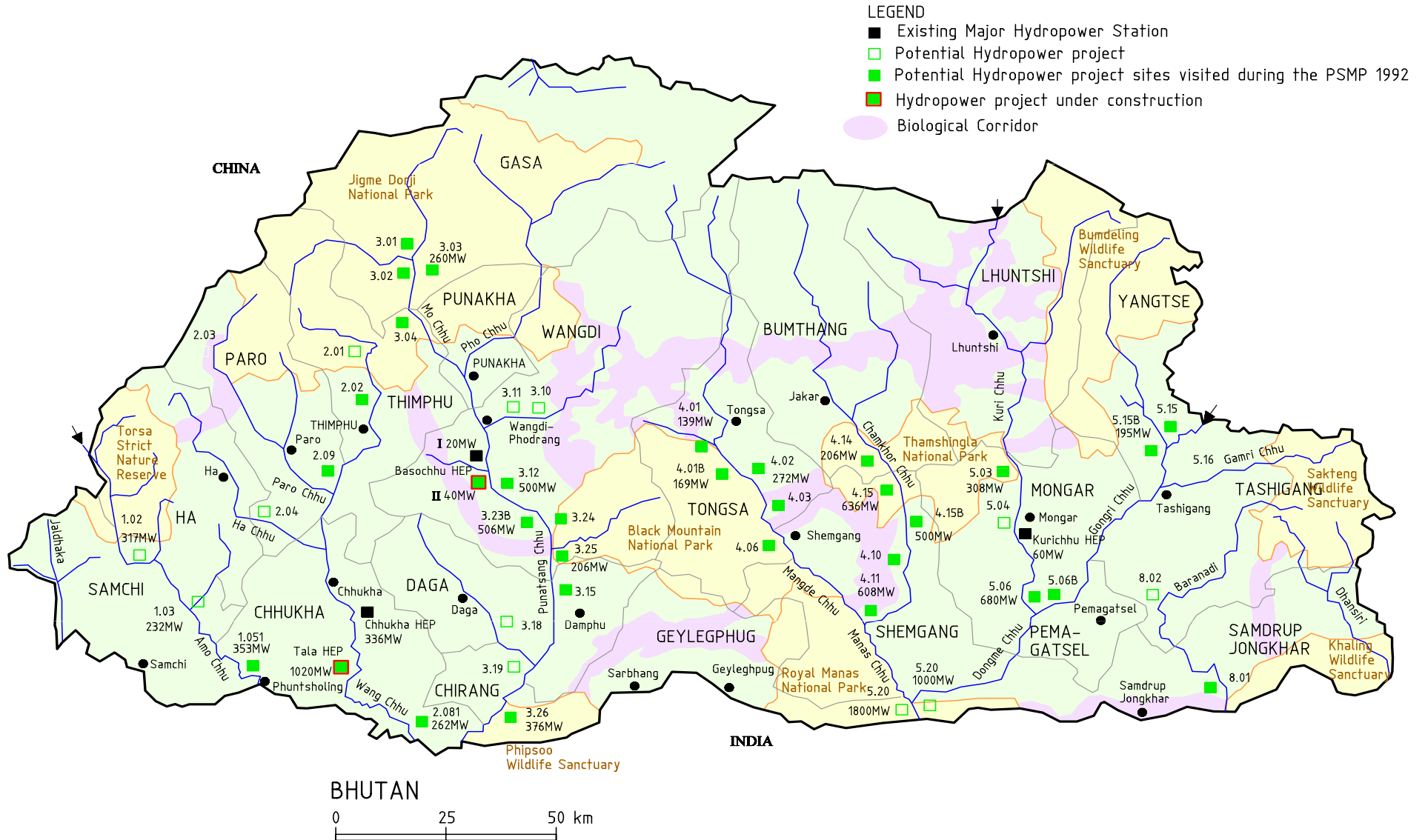
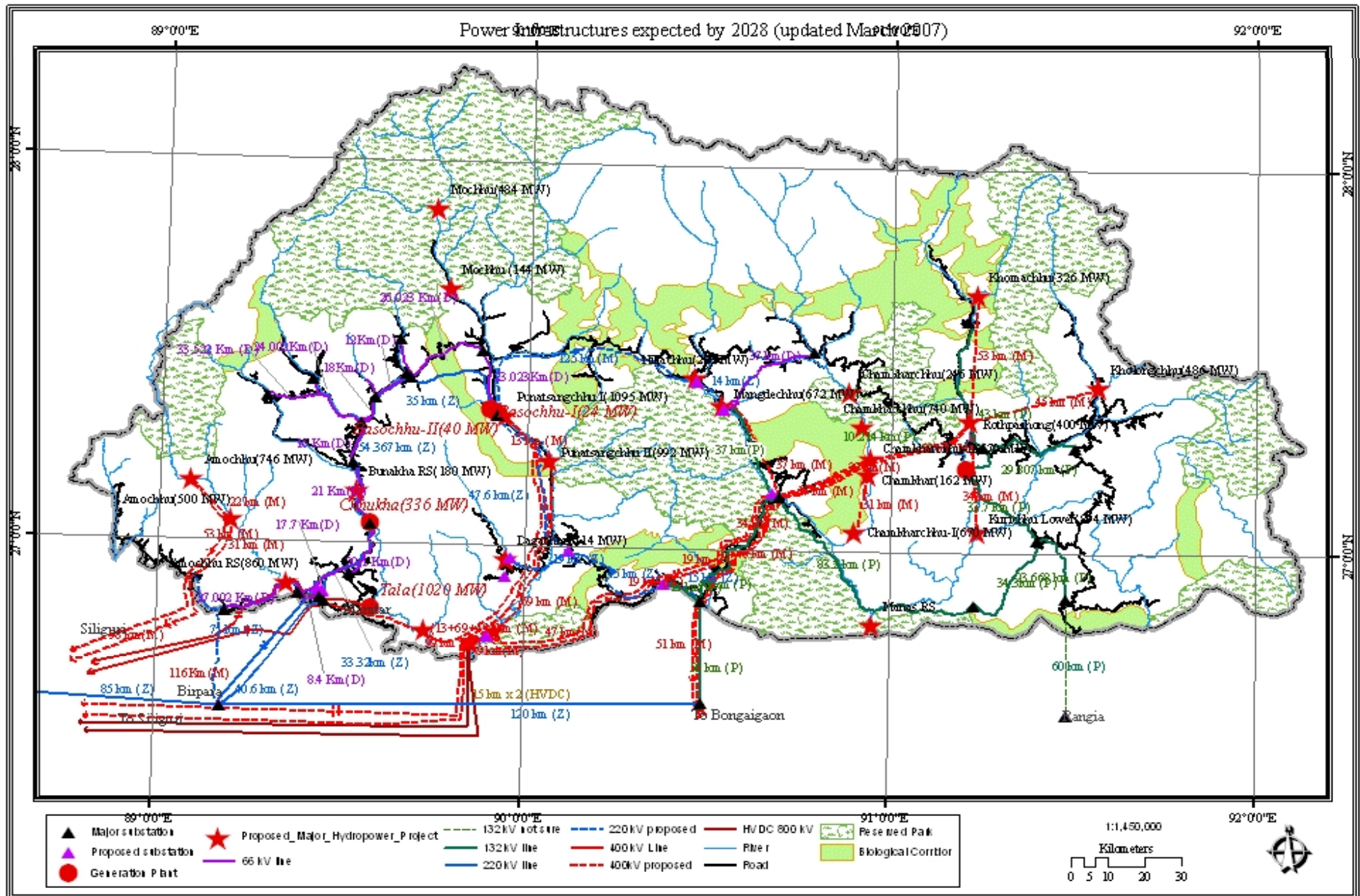


Figure 6.4: Protected Areas and Biological Corridors. Major Hydropower Project Sites

Power System expected by 2028



Thrust Areas of Draft Energy Policy related to enabling environment

- 1.4 A minimum export of 5000 MW by 2020.
- 1.5 A Hydro Power Policy by 2007 that will lay down the basis for investment in this sector. Forward looking and shall facilitate private sector participation and should open the sector to FDI.
- 1.6 The Govt shall form DHPC by July 2007 – one major initiative:
 - The govt will combine all large state owned power plants into a single Company.
 - This will allow optimal utilization of resources, capacity building for construction of future hydropower projects and to have an investment arm on behalf of the govt to invest in future hydropower projects with strong balance sheet.
 - In the past, all major hydro plants constructed with bilateral grants and soft loans.
 - Time to develop other means and modes of financing the hydro projects.
 - Investment promotion inclu loan mobilization and financial closure of hydro projects take considerable time thereby loosing or delaying opportunity to explore and develop the potential projects.
 - A Hydropower Development Fund to be created with options to raise public financing through shares and bonds

Thrust Areas of Draft Energy Policy related to enabling environment

- 1.8 Total domestic capacity allocation shall normally be limited to 25%. Storage hydro power projects shall also be initiated and encouraged to meet peak demand.
- 1.9 A System Operator shall be established by 2009 to manage export/import of power and regulate generation.
- 1.12 For hydropower projects built on JV or under IPP model, the allocation of power for domestic use shall be addressed in the HPP.
- 1.13 The Govt shall encourage development of hydropower and other RE projects through CDM to the extent possible.

CDM Opportunities for investment

- CDM is one of the agreements approved within the Kyoto Protocol.
- CDM - only and most relevant.
- CDM will result in SD of Bhutan and GHG emissions reduction.
- Bhutan has a DNA for CDM.
- Bhutan is a NA I party to UNFCCC (ratified on August 25, 1995) and Kyoto Protocol (party since 26 August 2002).
- Almost all techno-economically feasible hydropower projects of PSMP eligible for CDM
- Bhutan has opportunity to use baseline emission from India for CDM projects (Umbrella Agreement with India and in accordance with the decision of the 28th CDM EB Meeting (12-15 Dec 2006) which clarified that transnational electricity systems (international grid) are eligible under CDM)
- Business entities can invest in Bhutan for CDM hydropower projects

Hydro Power Policy, FDI & IPP regulations

- Being prepared under ADB TA
 - Will prepare sector's road map to accelerate hydropower development
 - Will establish a policy and institutional framework for private participation such as PPPs and IPPs in hydropower sector
 - Will develop strategy to leverage public and private investments as govt's fiscal capacity is limited
 - Will prepare optimal financing plans and/or guaranteeing scheme with public and private investors and lenders, inclu. bilateral and multilateral banks and/or export credit agencies to ensure that the borrowings are financially sustainable
 - Will assess debt sustainability
 - Will prepare a model project under the policy to be piloted with financing plan through PPPs
 - Given an export market opportunity in India where there is critical power shortage, hydropower development in Bhutan for export should attract good investment
 - Bhutan's run-of-the-river projects have small environmental and social impacts but large economic benefits
 - Govt's notification of Hydro Power Policy is expected by 2008²⁵

Conclusions

- Hydropower has already brought about immense development benefits all geared towards achieving economic self-reliance and overall socio-economic development (Backbone of Bhutan's economy).
- There is tremendous potential in Bhutan for harnessing more hydropower projects - techno-economically feasible and environmentally sound run-of-the-river schemes with minimum or no displacement /resettlement of people required. Over 72% forest coverage and excellent record of catchments protections are plus points.
- While the EA provides legal framework for re-structuring the power industry, does not address PP in Hydro. Hence EA is being reviewed and will propose for amendment to allow PP in Hydro.
- GG+ document mandates us to focus greater attention on accelerating the pace of Bhutan's hydro power development
- PSMP updated recently with more reliable data and information and no big surprises expected

Conclusions

- Other initiatives are undertaken to minimize risks to prospective investors
- India and Bhutan already have excellent and model relationship in the field of hydro and the signing of the Umbrella Agreement has further enhanced this cooperation to new heights esp. for PPPs and IPPs
- A forward looking Draft Energy Policy is ready and it is only a matter of adoption and application at appropriate times
- DHPC with strong balance sheet will be created by July 2007 who will act as an investment arm of the govt
- CDM opportunities in hydro in Bhutan is large and real
- Govt is already preparing Hydro Power Policy, FDI & IPP regulations on top priority to enable the PPPs and IPPs to invest in Hydro sector in Bhutan
- At the same time, the demand in India is increasing due to rapid economic growth and hence provides natural opportunity for Bhutan to export its power to India



THANK YOU FOR YOUR KIND ATTENTION !