



RENEWABLE ENERGY PROGRAMMES IN BHUTAN

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Presentation outline

- Introduction to Bhutan
- Overview of Energy Sector Institutional structure
- Development Philosophy
- Organogram of Department of Energy
- Importance of Energy Sector (Revenues)
- Drivers for HP and RE Program
- Pipeline mega projects
- Renewable Energy Resources and RE Program
- Challenges on RET deployment
- Enabling environments
- Budget outlay for next 5 years
- Conclude by taking few questions if any



Introduction of Bhutan

Demographics

Population (2007)	: 651,984
Population Density	: 16/km ²
Urban Population	: 30.9%
Rural Population	: 69.1%
Literacy rate	: 60%
Capita GDP (2007)	: U\$1400

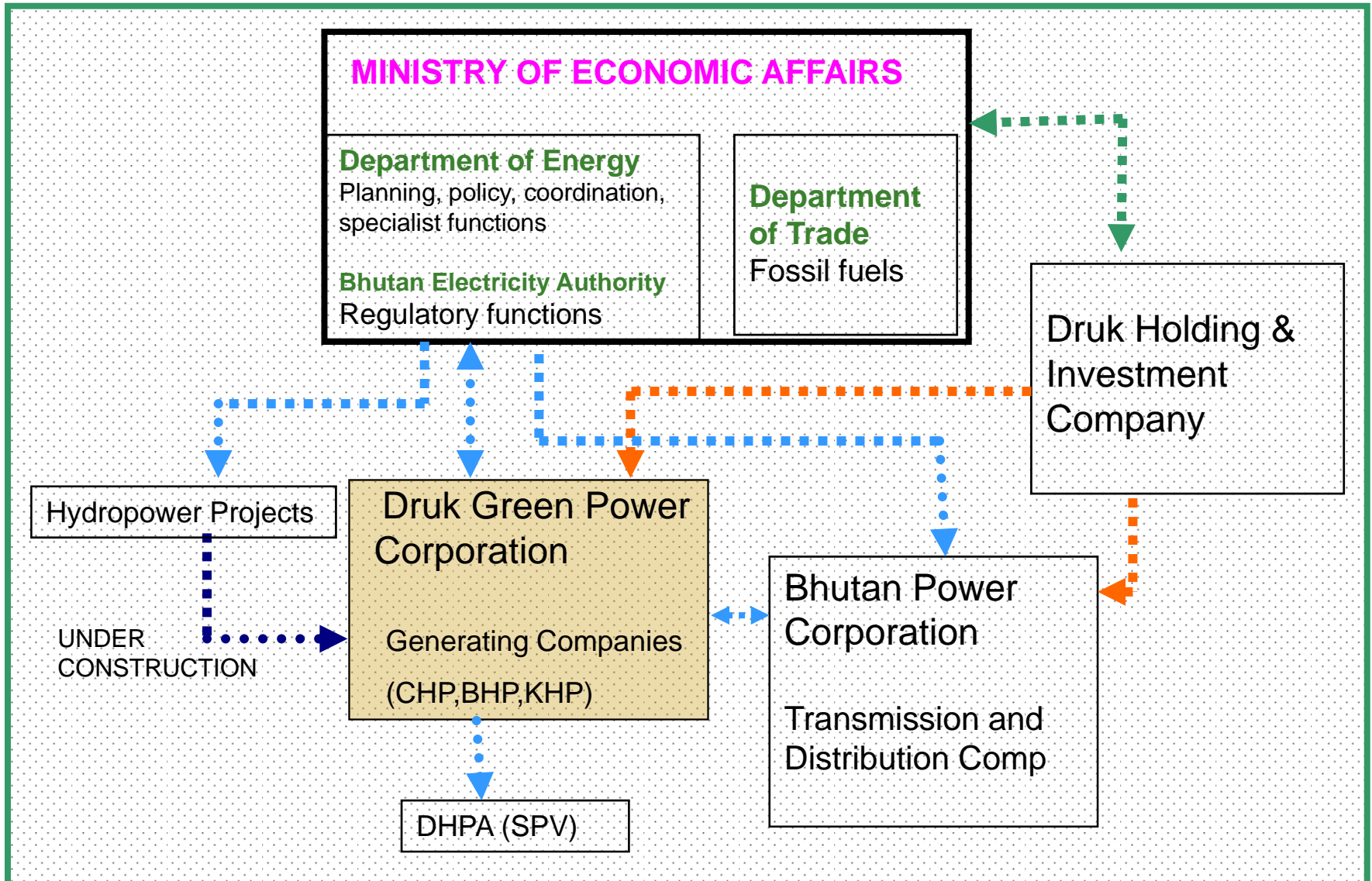
Energy Scenario

Forest cover (1995)	: 72.5%
Total Hydropower Potential	: 30,000MW
Total Installed Capacity (2007)	: 1488 MW

Total consumers (2007)	: 82,307
Rural consumer (2007)	: 44,167 (57%)
Urban consumer (2007)	: 38,140 (92%)



Current Energy Sector Set-Up



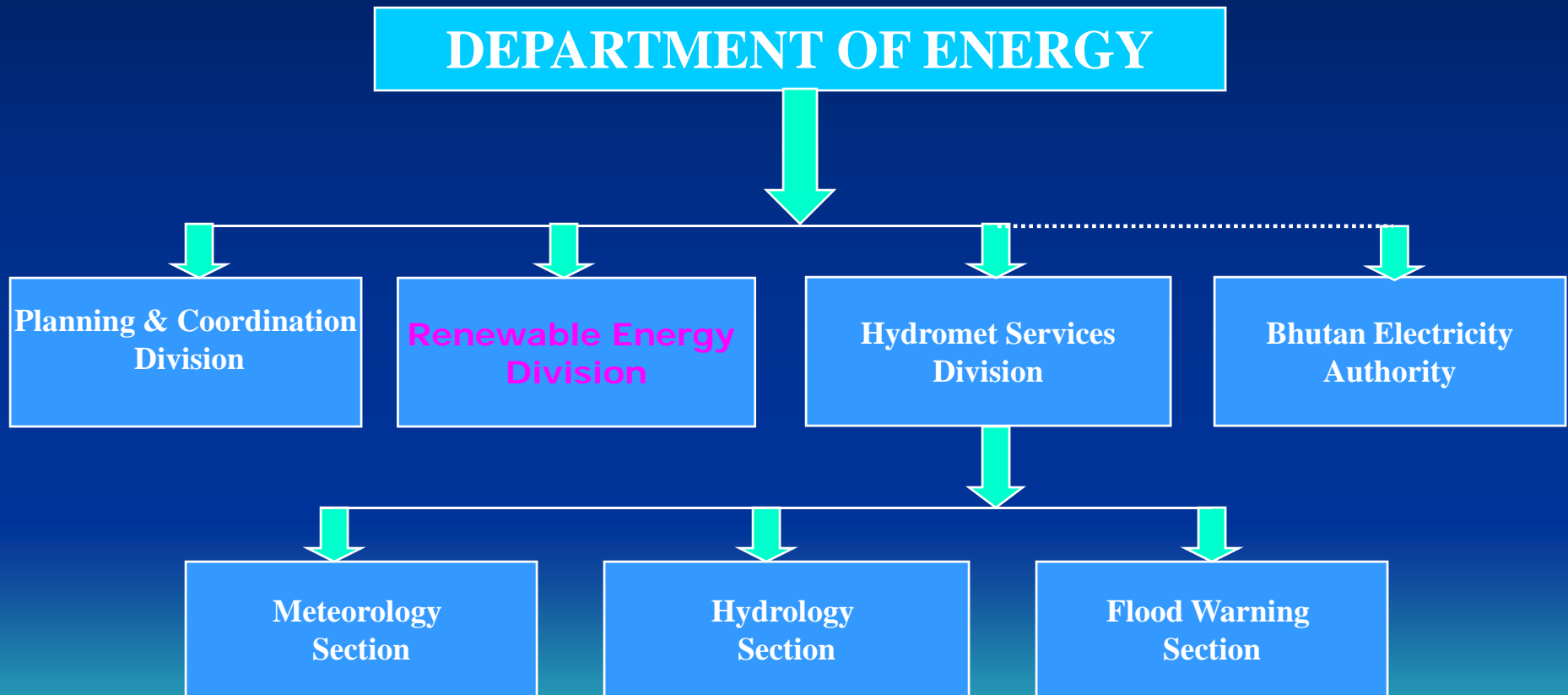
Development Philosophy

Maximization of Gross National Happiness (GNH)

- Preservation of Culture and Values
- Preservation of Pristine Environment
- Balanced Economic Development
- Good Governance



Existing Organogram (DoE)



Revenue from Electricity Sector

FYP	% of National Revenue	Nu. in Million	US\$ (Million)
8FYP (1998-2002)	45.0%		
9FYP (2002-03)	35.3%	1702.532	42.56
9FYP (2003-04)	37.8%	1935.145	48.38
9FYP (2004-05)	31.9%	1952.564	48.80
9FYP (2005-06)	31.7%	2214.263	55.36
9FYP (2006-07)	45.4%	4603.57	115.10
9FYP (2007-08)	~60%	5000.00	125.00

Driving forces

1. Development of 6500 MW hydropower by 2020
2. Vision 2020, “Electricity for all”



Mega Projects (10th/11th FYPs)

S#	Project Name	Installed Capacity (MW)	Annual Generation (MU)	Construction Period Plan
1	Chamkharchhu – I	670	3207	2014-2020
2	Chamkharchhu - II	570	2714	2017-2022
3	Kholongchhu	485	2207	2014-2020
4	Rotpashong	400	1883	No firm dates
5	Sankosh Multipurpose Scheme	4060	6918	Update 1995 DPR
6	Nikhachhu	210	1042	2010-2018
7	Amochhu	500	2210	No firm dates
8	Khomachhu	325	1507	No firm dates
9	Kuri/Gongrichhu	1800	8459	No firm dates
	Total	9,020	22,547	

Renewable Energy Resources & Initiatives

1. Distributed Mini/Micro Hydropower Plants
 - 23 Plants (8.168 MW)
 - 2 plants (100 kW and 70 kW) are being managed by the village cooperatives
2. Solar PV systems
 - 3000 SHS (0.045 MWp)
3. Wind Power System
 - Assessment of wind resources is being initiated
4. Biomass Power System
 - Have the plans to set up biomass gasification plants



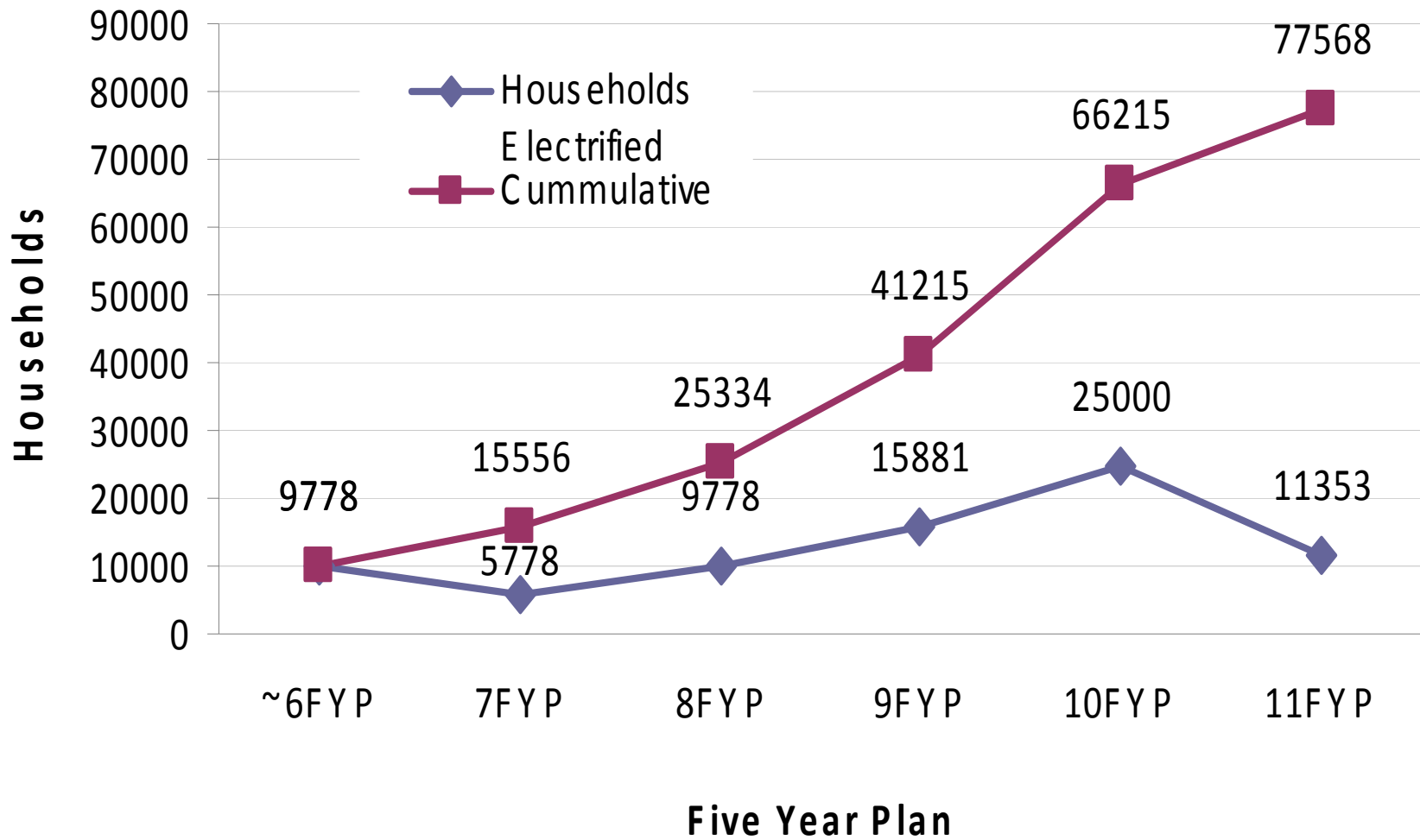
Rural Electrification Programme

Rural Electrification Master Plan 2005

- To achieve 100% electrification by 2020
 - 88% (31,990 hh) of the rural households can served through grid extension
 - 12% (4,360 hh) by off-grid options



Status of Rural Electrification Programme




Layer of challenges on RET deployment

1. Technical and Economic fronts

- High capital cost
- Lack of access to credit facilities
- High transaction costs due to limited supply, sales outlets, financing infrastructures
- Difficulty to differentiate product as “green”
- Economics of scale and cost per unit energy
- Lack of institutional capacity, competent designers and technicians

3. Social and Physical fronts

- Lack of consumer awareness on potentials and limitation of renewable energy systems
 - Small size of the market
 - Limited access to international markets
 - Limited involvement of the private sector
 - Poor quality of products in the markets
 - Remoteness and low density of the consumers
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Enabling Environments

1. Hydropower Development Policy
 1. Classification of projects
 2. Investment and development models
 3. Bidding and selection criteria
 4. Off-take and transmission arrangements
 5. Incentives
 6. Licensing, environment, social requirements and obligations.



Enabling environment contd.

2. Rural Electrification Policy

1. Clear direction for realization of 100% electrification by 2020
2. Maximize the economic, social, environmental benefits of RE
3. Stimulate innovations within suppliers.

3. Comprehensive National Renewable Energy Policy

1. Provides long term direction
2. Ensures energy security both through
 - diversification of supply mix and demand side management.
4. Promotes Public Private Partnership



10th Plan Budget Outlay

S#	Programme	Million Nu	Million US\$
MEA/08	Transmission Programme	660.00	16.50
MEA/09	Rural Electrification Programme	3,162.00	79.00
MEA/10	Accelerated HP Development Programme	400.97	10.00
MEA/11	Institutional Strengthening of the Energy Sector	538.12	13.50
MEA/12	Development of Renewable Energy	308.12	7.70
MEA/13	Strengthening of National Hydrological and Meteorological Services	145.99	3.70
MEA/14	Electricity Regulation	15.00	0.40
MEA/15	Private Sector Participation	38.50	0.96
	Total Budget Outlay	5,268.70	131.70
MEA/16	Major Hydropower Projects (Outside 10FYP)	183,548.10	4,588.70
	Grand Total Outlay	188,508.68	4,720.42



Questions ?