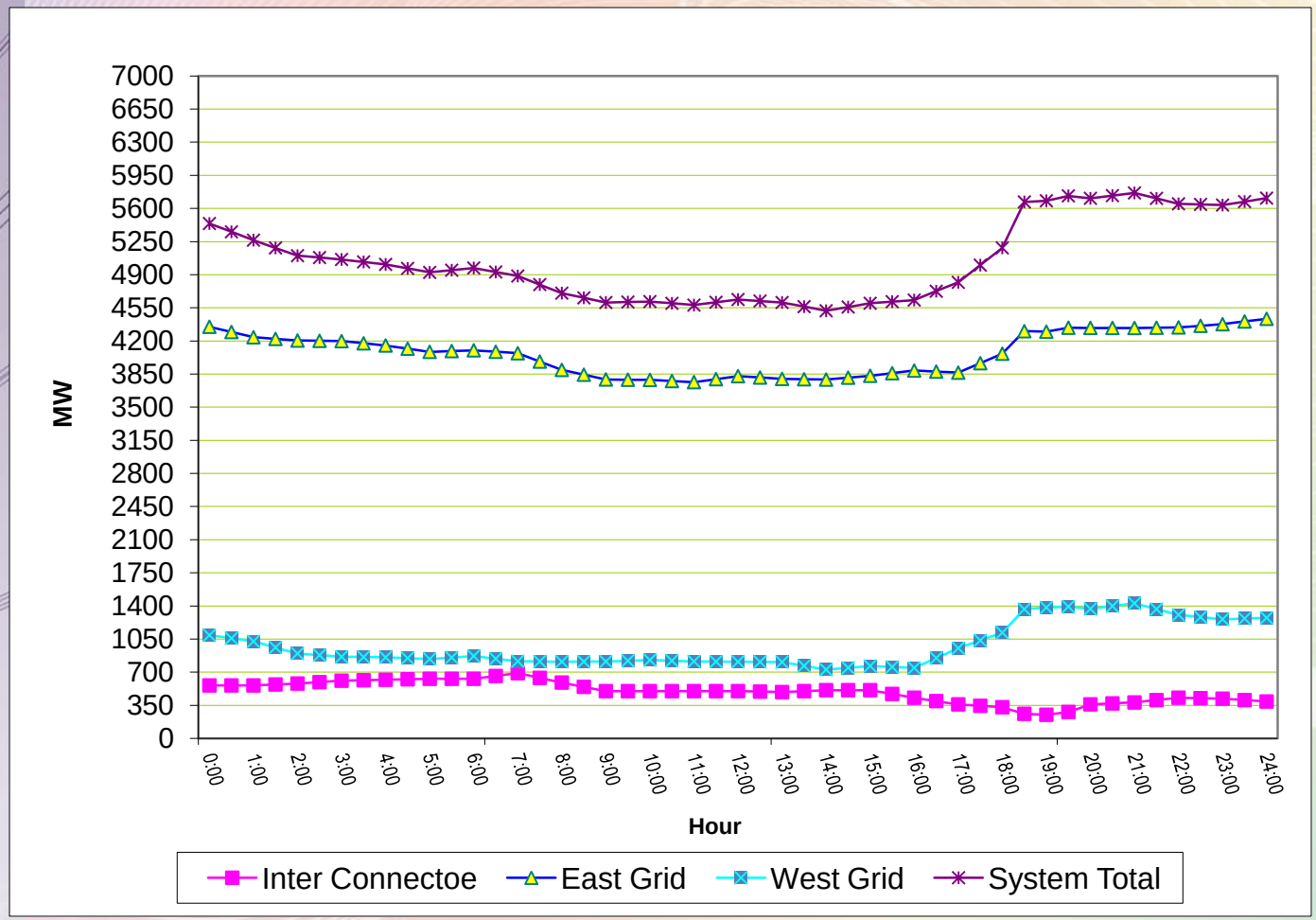
OVERALL POWER SECTOR SCENARIO IN THE COUNTRY

Current power sector scenario that also includes:

- Percentage of growth in generation: 6% (Energy)
- Percentage of growth in load demand: 10%
- Plant Load Factor: 50%
- Outage rate to assess the reliability of the existing system: 2-3 hours per day in summer. Negligible in winter.

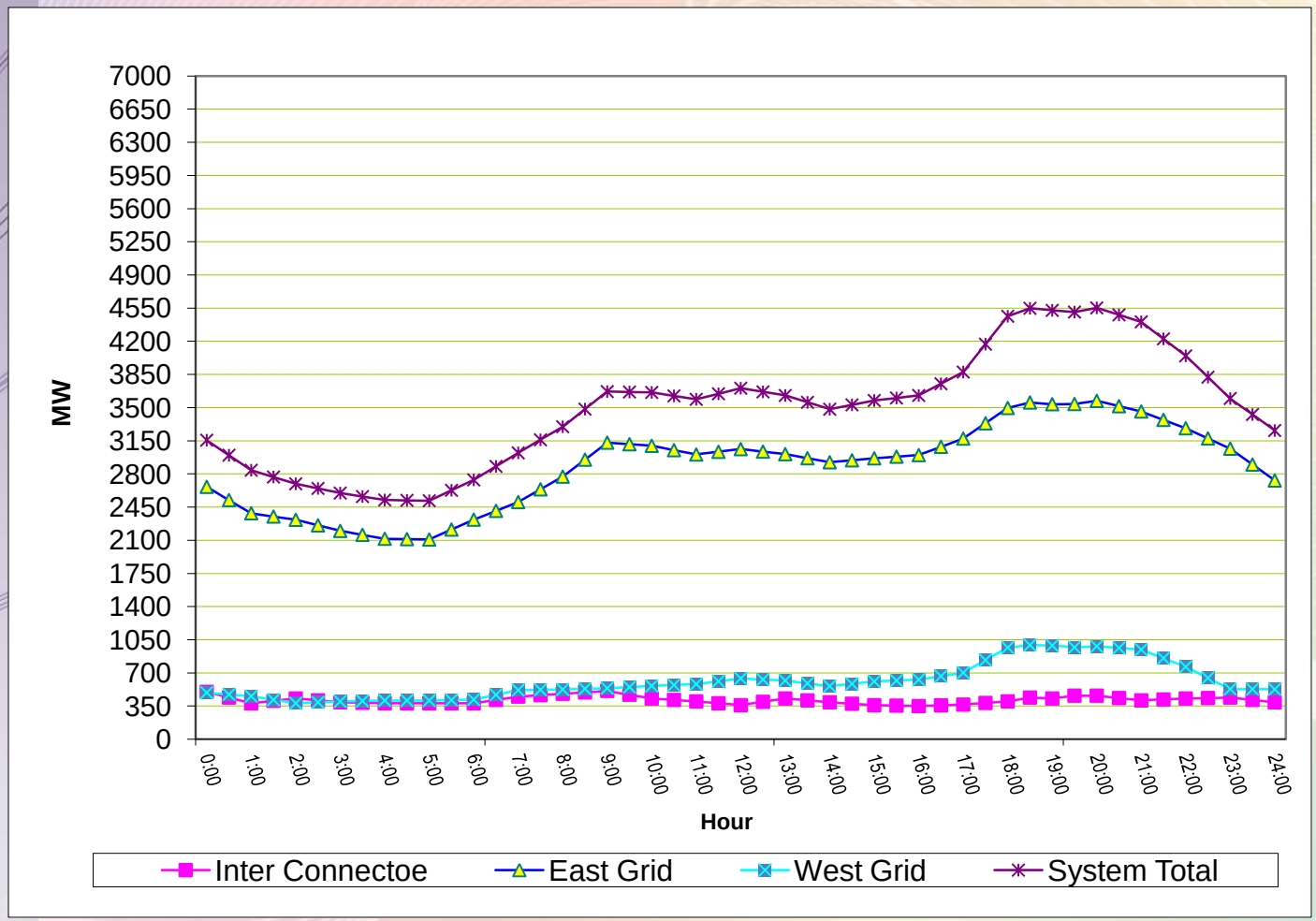
OVERALL POWER SECTOR SCENARIO IN THE COUNTRY

DAILY LOAD CURVE (SUMMER) *30-Mar-13*



OVERALL POWER SECTOR SCENARIO IN THE COUNTRY

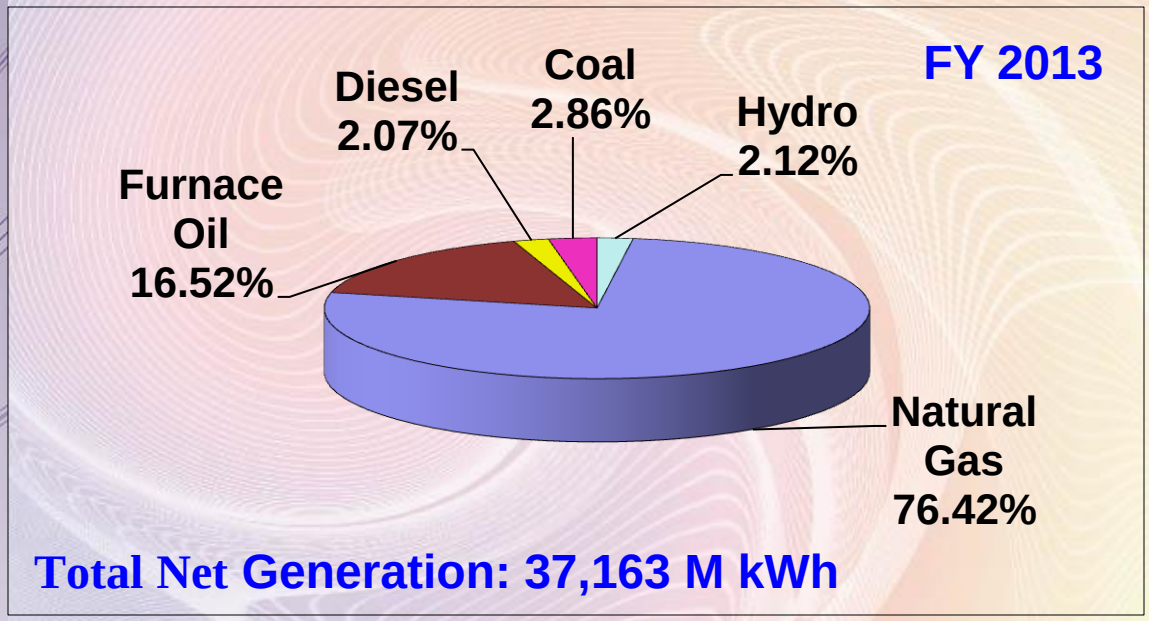
DAILY LOAD CURVE (WINTER) *30-Dec-12*



OVERALL POWER SECTOR SCENARIO IN THE COUNTRY

- Issues of fuel availability like coal, gas etc:

❖ Present Situation:



❖ Action Required:

- Enhanced Gas Exploration, Production
- Domestic Coal development
- Coal and LNG Import and deep sea port for coal handling
- Safe Nuke for Base Load

CURRENT GENERATION AND TRANSMISSION SCENARIO

Installed Capacity (MW)	8,537
Maximum Generation (MW)(12 July'13)	6,675
Present Demand (MW)	7,500
Transmission Line, 230 KV & 132 KV(Ckt. km)	9,150
No. of 230/132kV substation (capacity)	17 (7525MVA)
No. of 132/33kV substation (capacity)	103 (11780MVA)
Transmission Loss	2.70%
Access to electricity(including 7% renewable energy)	60%
Per capita generation (including captive power)(KWh)	292
Generation from Renewable Sources(MW)	120

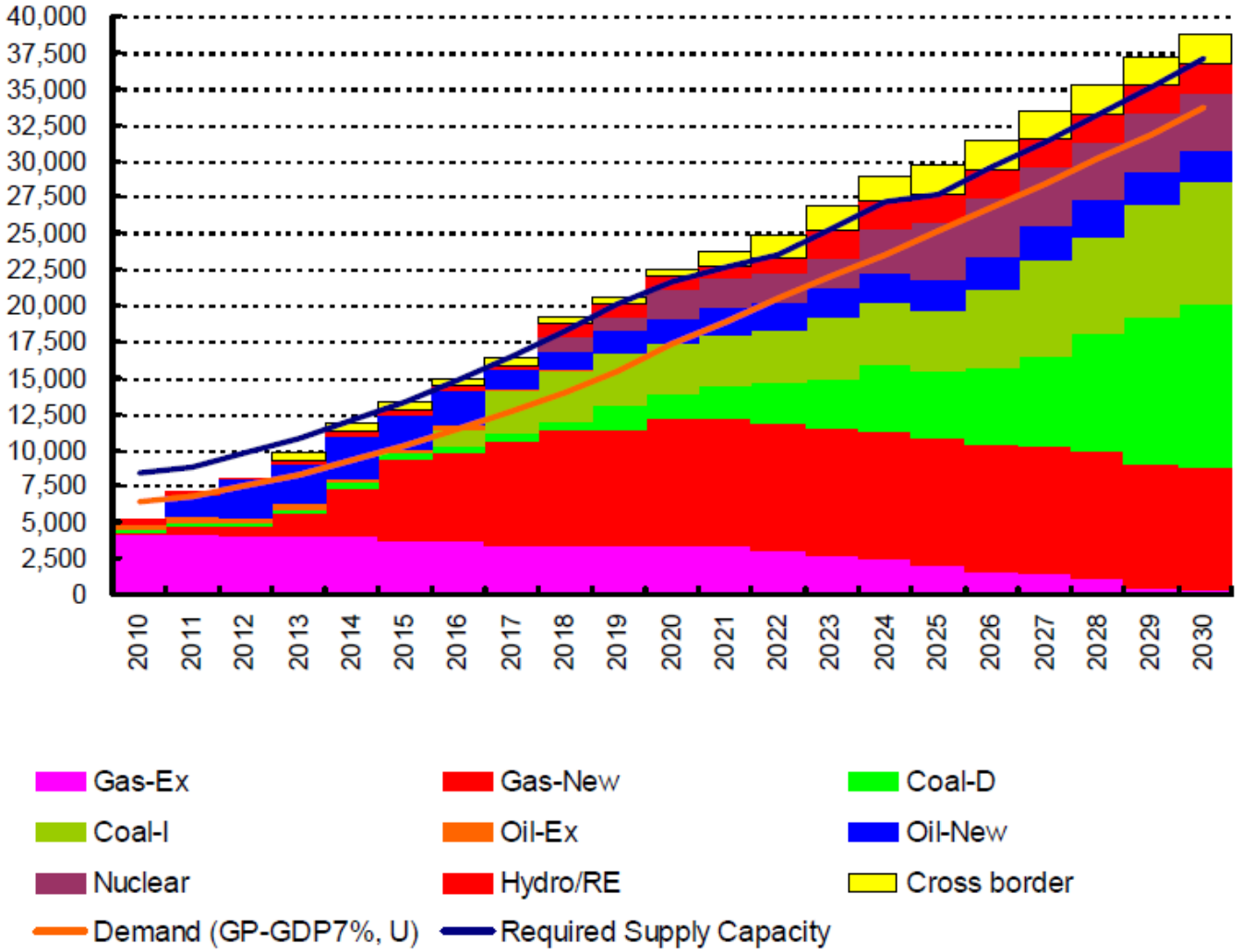
LOAD PROJECTION OVER THE NEXT 20 YEARS MW / MU

Summery of Demand & Generation Forecast Master Plan-2010

	Demand forecast			*Generation Plan*	
	Government Policy: 8%	Considering GDP: 6%	Considering GDP: 7%	Gen. Capacity Proposed	Gen. Capacity Present Proposition
2015	10 GW	8 GW	9 GW	13.3 GW	18.2 GW
2020	18 GW	10 GW	13 GW	22.5 GW	22.5 GW
2025	25 GW	14 GW	19 GW	29.3 GW	29.3 GW
2030	33 GW	18 GW	28 GW	38.3 GW	38.3 GW

GENERATION EXPANSION PLANNED

Fuel Diversification & Demand Supply Scenario



GENERATION EXPANSION PLANNED

- **Any Dedicated Export oriented Power Plant**
  - No
- **Availability of climate data for renewable**
  - Yet to be studied.
- **Environmental constraints**
  - Dense Populated Country (Land Acquisition Issue)
  - World's Largest Mangrove Forest
  - Environmental Governance: Third World Quality

TRANSMISSION EXPANSION PLANNED 2010-2030

New Transmission Lines to be added from 2010-2030

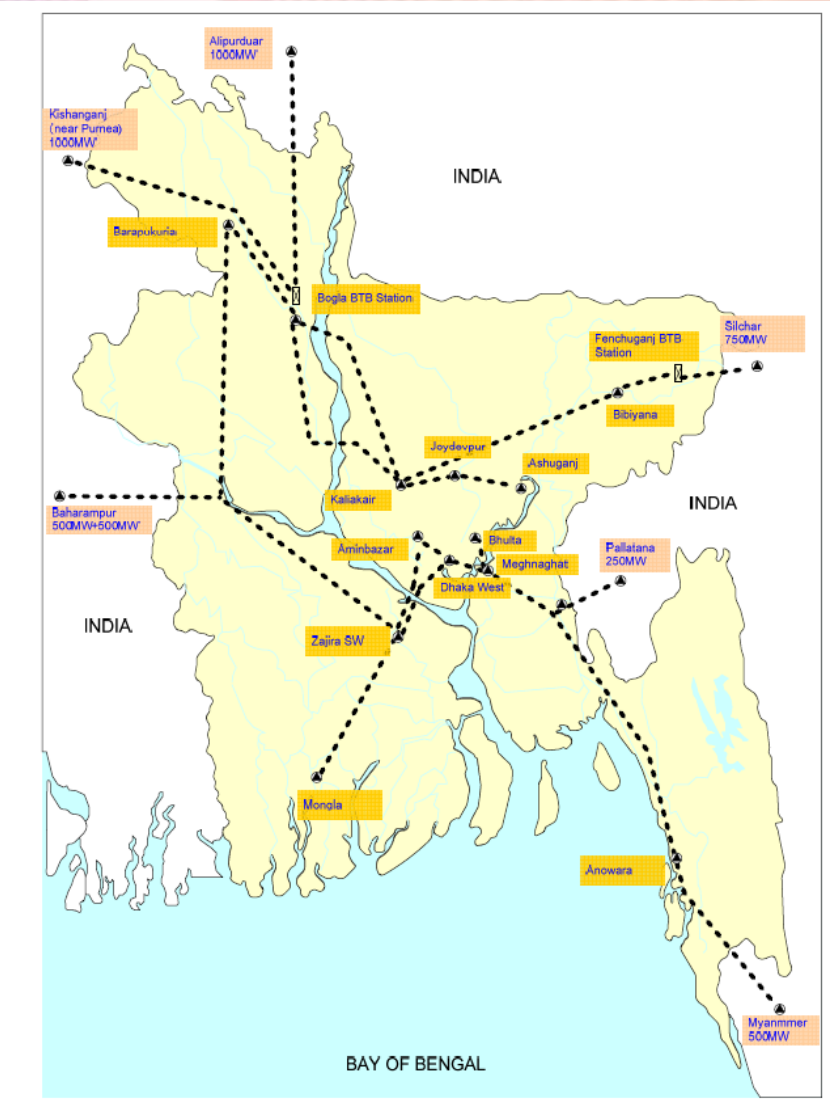
Voltage (kV)	2010	2030	Additional (2010-2030)
	Length (km)	Length (km)	Length (km)
230	2645	9360	6715
400	0	4479	4479

New Substations to be added from 2010-2030

Voltage (kV)	East or West	Region	Additional Number of Substation		
230/132	East	Central	8	56	88
		Dhaka	25		
		Southern	23		
	West	Northern	17	32	
		Western	15		
400/230	East	Central	3	11	14
		Dhaka	6		
		Southern	2		
	West	Western	3	3	

TRANSMISSION EXPANSION PLANNED 2010-2030

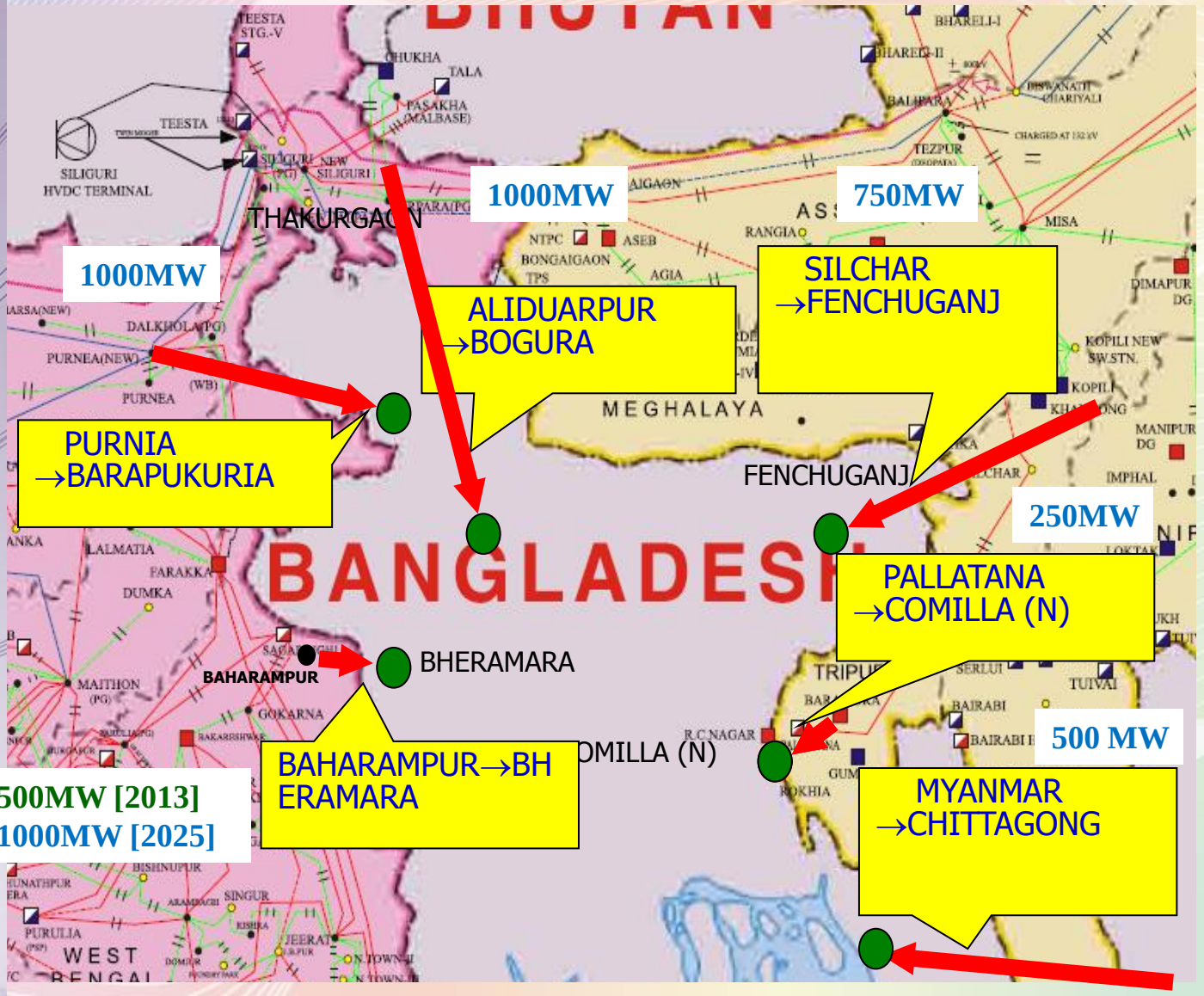
400 kV Power Transmission Routes for 2030 Bangladesh



Source: PSMP Study Team

Fig. 9-16 Summary of potential interconnections (2030)

CROSS BORDER INTERCONNECTION LINKS EXISTING AND PLANNED



POWER EXPORT/IMPORT - EXISTING AND PLANNED

As per PSMP 6 cross border interconnection lines are considered as follows:

	Power Import (MW) by Year			
Name of Interconnection	2015	2020	2025	2030
Bheramara Bahrampur	500	500	1000	1000
Mayanmar Bangladesh	0	500	500	500
Palatana Comilla	0	0	250	250
Shilchar Fenchuganj	0	0	750	750
Kishanganj Bogra (Hydro Power from Nepal)	0	0	500	500
Alipurduar Bogra (Hydro Power from Bhutan)	0	0	500	500

If advanced initiatives can be taken to bring hydro power from Nepal & Bhutan before 2020, PGCB will build Alipurduar/ Kishanganj-Bogra-Jamalpur-Kaliakoir 400kV Transmission Line

SYSTEM PARAMETER LIMITS

What are the operational limits for system frequency and system voltage and at different voltage levels?

- Frequency Variation Limit:
  - 49.0 – 51.0 Hz (50 Hz ± 2%).
- Voltage Variation Limit:
  - +/- 10% during emergencies
  - +/- 5% during normal operation

What are the maximum deviations observed?

- Frequency Variation Observed:
  - 48.5 – 51.5 Hz
- Voltage Variation Observed:
  - +5% (Over Voltage) ~ -30% (Under Voltage)

What are the actions to keep them under control?

- Voltage Control:
  - Exciter Control & Capacitor Banks
- Frequency Control:
  - Demand Side Management
  - Under Frequency Auto Load Shedding Scheme

TRANSMISSION PLANNING CODE

Is there a Transmission planning code?

- Yes

Who issues the code?

- BERC(Bangladesh Energy Regulatory Commission)

Who implements it?

- Utilities

Who approves investments in transmission?

- BERC(Bangladesh Energy Regulatory Commission)

What is criterion on

- **Generating unit outage:** 20% Scheduled Outage
- **Line outage:** N-1 security
- **Stuck breaker:** Not Available

GRID OPERATION CODE

Does a Grid operation code exist?

- SOP (Standard Operating Procedure is formulated) Under Formulation Stage

What is the Hierarchy of control?

- Will be available after SOP

GRID CONNECTIVITY REGULATION

Does grid connectivity regulation exist?

- Yes: Grid Code

For Different voltage levels:

- 132kV

What are bus switching schemes adopted?

- One & half scheme
- Double main scheme
- Main and transfer scheme

What is the system design short circuit level?

- It is Location Specific

What is the fault clearance time and breaker opening time?

- Fault Clearance Time
  - 400 kV : 100 ms
  - 230 kV : 160 ms
  - 132 kV : 160 ms
- Breaker Opening Time
  - Not Specified in the Grid Code

METERING REGULATION

Does a metering regulation exist?

- Yes: Grid Code

What are basic principles governing location of import and export energy meters?

- Grid Code

Are Time of day meters provided?

- No

What is accuracy class for meters and instrument transformers?

- 0.2 minimum

Are main and check meters provided?

- Yes

At which locations is energy accounting done?

- Location agreed among parties

What is the frequency of calibration?

- Every 2 years

PROTECTION COORDINATION REVIEW

Is there a system of reviewing protection settings?

- No practice of periodic review
- Reviewed during system up gradation/modification

Who are the participants in such reviews?

- PGCB

How periodically is it done?

- N/A

Are the discussions documented?
Please provide a copy (preferably soft).

- N/A

EMERGENCY RESTORATION PLAN AND BLACK START FACILITIES

Is there a documented procedure for the same? Please provide a copy? (preferably soft).

- Yes
- Copy Available

What are the priorities in restoration?

- Copy Available

How many power plants have black start facility?

- 7 (Seven)

LOAD DISPATCH CENTERS

Is there a documented procedure for load dispatch.

- Yes, QP-PSO-1

Scheduling Mechanism .

- Yes, QP-PSO-1

What is the institutional arrangement for load dispatch and power system operation .

- NLDC (National Load Dispatch Centre)

POWER DISPATCH ON EXISTING CROSS BORDER INTERCONNECTIONS (IF ANY)

Is there a documented procedure for power dispatch cross country interconnected lines .

- Yet to be prepared

What is the philosophy of power dispatch on cross country interconnected lines .

- Yet to be prepared

Scheduling Mechanism on Cross Border electricity Trade

- Based power purchase agreement

What is the institutional arrangement for load dispatch and power system operation Cross Border electricity Trade .

- NLDC

BALANCING MECHANISMS FOR UNSCHEDULED POWER EXCHANGE

Is there a documented procedure for unscheduled power dispatch.

- N/A

What is the institutional arrangement for unscheduled load dispatch and power system operation .

- N/A

BALANCING MECHANISMS FOR UNSCHEDULED POWER EXCHANGE ON EXISTING CROSS BORDER INTERCONNECTION LINKS

Is there a documented procedure for unscheduled power dispatch on the existing cross border interconnection links .

- N/A

What is the institutional arrangement for unscheduled load dispatch and power system operation on these links.

- N/A

POWER TRANSMISSION PRICING AND LOSS SHARING AND CONGESTION MANAGEMENT

Transmission Pricing, Rationale of Pricing

- A fixed transmission wheeling charge rate (BDT/Unit) at different voltage level. No provision for capacity payment.

Pricing for unscheduled power exchange

- N/A

Loss Sharing Mechanism

- Losses incurred in generation shared by Generator.
- Transmission loss borne by Single buyer (BPDB)
- Distribution loss borne by distribution utilities.

Congestion Management

- Yet to be developed.

LAND ACQUISITION AND RIGHT OF WAY

What are the governing policies and procedures for above for generation and transmission?
Please provide a copy (preferably soft).

- Electricity Act.

COMMENTS / VIEWS ON OPEN ACCESS

- In the Gazette for Merchant Power Plant published in 2008, there is provision for open access in transmission.
- Details regulation for open access is yet to be developed.