ROAD MAP FOR DEVELOPMENT OF POWER SECTOR IN BIHAR

A REPORT OF THE SPECIAL TASK FORCE ON BIHAR

GOVERNMENT OF INDIA
NEW DELHI

JULY, 2007

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ACKNOWLEDGEMENTS

In preparation of this Report, substantial technical inputs were provided by a Team of Officers at the CEA, M/o Power, and this Team worked under the supervision of A.S. Bakshi, Chief Engineer. This Team was assisted by Task Force Member Late Rajender Singh and Senior Research Officer Gopal Prasad. The core members of this Team were Alok Gupta, Amarjit Singh, Ashok Kumar, Balwinder Singh, S.D. Dubey, V.K. Tandon, R. Saha, P.K. Pahwa, A.K. Rampal, Anjuli Chandra, S.C.Marwah, Vandana Singhal, Saumen Biswas, P.K. Bhadra and B.S. Negi. This Team has done commendable work. The Team had intensive dialogue with the Government of Bihar represented by Rajesh Gupta, Secretary (Energy), and Swapan Mukherjee, Chairman (BSEB). The Task Force appreciates their cooperation. Other members of the Task Force made valuable contribution to this Report. The Task Force was assisted by its officer M.P. Singh and Consultant Smita Anand in giving final shape to the Report. The contribution of all these people is deeply appreciated.

Chairman

Contents

ACRONYMS

ACS	Average Cost of Supply
AF	Availability Factor
AMR	Automated Meter Reading
AMDTS	Amorphous Core Distribution Transformer
APDP	Accelerated Power Development Programme
APDRP	Accelerated Power Development and Reform Programme
ARR	Annual Revenue Requirement
AREP	Accelerated Rural Electrification Programme
ASCI	Administrative Staff Collage of India
AT&C	Aggregate Technical & Commercial
BIS	Bureau of Indian Standard
BSHPC	Bihar State Hydro Power Corporation
BREDA	Bihar Renewable Energy Development Agency
BTPS	Barauni Thermal Power Station
CA	Catchment Area
CAGR	Compounded Annual Growth Rate
CFL	Compact Fluorescent Lamp
C-WET	Centre for Wind Energy Technology
DMS	Distribution Management System
DSM	Demand Side Management
DPR	Detailed Project Report
DT	Distribution Transformer
EAA	Energy Accounting and Auditing
EEC	Electrical Energy Consumption
EER	Electrical Energy Requirement
ESCOs	Energy Service Companies
EIA	Environmental Impact Assessment
GIS	Geographical Information System
HVDS	High Voltage Distribution System
ICRA	Indian Credit Rating Agency
ICT	Interconnecting Current Transformer
IPP	Independent Power Producer
IGCC	Integrated Gasification Combined Cycle

LE	Life Extension
LOI	Letter of Intent
MBCC	Master Billing & Customer Care Centre
MIS	Management Information System
MoEF	Ministry of Environment & Forest
MoC	Ministry of Coal
MTPS	Muzaffarpur Thermal Power Station
MTOE	Metric tonne of oil equivalent
MVA	Mega Volt Ampere
MYT	Multi Year Tariff
NBWL	National Board of Wild Life
NABARD	National Bank of Agricultural & Rural Development
PET	Performance Evaluation Test
PLF	Plant Load Factor
PSS	Power Sub Station
R&M	Renovation & Modernisation
RCLM	Remote Controller Load Management Scheme
R&D	Research & Development
REDB	Rural Electrification Distribution Backbone
RGGVY	Rajiv Gandhi Grameen Vidyuti Karan Yojna
RLA	Residual Life Assessment
RPSO	Regional Power Survey Office
RSVY	Rashtriya Sam Vikas Yojna
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SERC	State Electricity Regulatory Commission
ST&D	Sub Transmission & Distribution
T&D	Transmission & Distribution
TOD	Time of the Day
TOU	Time of use
TPS	Thermal Power Station
VPGCL	Vaishali Power Generation Company Ltd.

EXECUTIVE SUMMARY AND RECOMMENDATIONS

Executive Summary

A. All India Installed Capacity

The total all India installed capacity as on 31.5.2007 was 134077 MW comprising 33486 MW hydro, 86326 thermal, 4120 MW nuclear and 10145 MW wind/renewable energy based power plants.

B. Installed Capacity of Bihar

The present installed capacity of Bihar is 586.1MW comprising 46.1 MW Hydro and 540 MW thermal. The Kosi Hydel Power Station could not attain designed generation and is now being operated with derated capacity. The Hydel station needs major rehabilitation and modernization efforts. There is no generation from thermal power stations in the state sector at present. All thermal units are under shut down due to refurbishment/deteriorated condition.

Power Supply Position in Bihar

During the year 2006-07, Bihar faced energy and peak power shortages of 8.1% and 16.9%, respectively. During April-May, 2007, the state had energy shortage of 7.9% and peak deficit of 12.2%.

Considering actual capacity addition of 21180 MW in the 10th Plan and proposed capacity addition of 78577 MW in the country in the 11th Plan, the anticipated power supply position has been worked out. It is expected that at the end of 11th Plan though the country by and large will be able to meet its energy requirement and peak demand, Bihar may face energy & peak shortage of about 41% and 58%, respectively.

Forecast of Electricity Demand for Bihar State

Final report of the 17th Electric Power Survey Committee includes electricity demand & energy of Bihar for the year 2011-12 as 3607 MW and 19905 MU, respectively and in the year 2016-17 as 5598 MW and 32857 MU, respectively. This gives a CAGR of about 19% in energy consumption which is very high and extremely optimistic.

Programme for Revival / Improvement in Performance of Barauni TPS

With a view to improve the PLF/Generation of Barauni Thermal Power Station of BSEB, NTPC has been appointed as a consultant for RLA / Cost Estimates/ Performance Evaluation Test(PET) / Refurbishment / R&M/ LE & introduction of modern O&M practices at unit No. 4 to 7 (2x50 MW+2x110 MW) of BTPS. After completion of R&M work, PLF is expected to improve significantly.

Programme for Revival / Improvement in Performance of Muzaffarpur TPS

In the light of recommendation of Planning Commission to improve the Power Generation scenario, M/s. BHEL had been appointed as an executing agency to carry out RLA/R&M/LE works of M.T.P.S under Rashtriya Sam Vikas Yojana. Accordingly, L.O.I. No.810 dated 29.9.05 have been placed on BHEL. The restoration work of Unit No. 2 of VPGCL started in August, 2006 by BHEL. During the review meeting taken by Secretary (Power), Ministry of Power, Govt. of India, BHEL has given the commitment for commissioning of unit No. 2 in the June 07 after completion of its restoration work. After restoration of Unit-2, LE/R&M works will be carried out on unit-1.

C. Hydro Electric Development in Bihar

Hydro Potential and its Development

As per the reassessment of Hydro Electric Potential of the Country, carried out by Central Electricity Authority (CEA) during 1978-87, the Hydro Electric potential in Bihar is assessed at 60 MW at 60 % load factor. The corresponding probable installed capacity of these schemes is estimated at about 70 MW. About 64.1% of the total potential in terms of installed capacity has been developed and 35.9% of the potential remains yet to be developed.

Schemes in Operation

Six hydro stations namely Kosi ,Eastern Gandak, Sone Western Canal , Sone Eastern Canal, Agnoor and Dhelabagh with an aggregate installed capacity of 46.1 MW are in operation in Bihar. The Kosi Hydel Power Station could not attain designed generation and is now being operated with derated capacity. R&M of this power station has to be carried out to increase efficiency.

New Schemes

i) Four Pumped Storage Projects in Kaimur District of Bihar

Pre-feasibility reports of the 4 pumped storage projects for a total capacity of 2570 MW, i.e. Telhar Kund PSS (400MW), Hathidah & Durgawati PSS (1600MW), Sinafdar PSS (345MW) & Panchgotia PSS (225MW) were received in CEA from BSHPC during the month of Sept., 2003. BSHPC have informed on 14.6.2007 that besides above four pumped storage projects in Kaimur district, pre-feasibility for Kohira Dam PSS has also been established.

ii) Development of Hydro Electric Schemes(226 MW) on Kosi River

As per information obtained from BSHPC, they have identified several locations in the Kosi basin with a total capacity of 226 MW have been identified. Amongst them , one Hydro-electric scheme (126 MW) has been identified on Kosi river in district Supaul . BSHPC informed that they have issued NIT on 7th June, 2007 for detailed survey investigation and for preparation of DPR for Dagmara HEP (3x42 MW). The opening of technical part of the tender was scheduled for July,2007.

D. Transmission System Development

To strengthen the sub transmission and distribution system in Bihar, a comprehensive scheme for strengthening of sub transmission system was formulated under Rashtriya Sam Vikas Yojana for Bihar in consultation with BSEB. The scheme is funded through central assistance under the Special Plan for Bihar component of Rashtriya Sam Vikas Yojana. The total scheme has been envisaged to be implemented in phases as under:

(i) Bihar Sub-transmission Scheme Phase-1

(ii) Bihar Sub-transmission Scheme Phase-2, Part-1

(iii) Bihar Sub-transmission Scheme Phase-2, Part-2

Operation and Maintenance of Transmission System

There is an urgent need to evolve a system for maintenance of the substations by BSEB for which they should deploy trained manpower in proper strength at the various substations for operation and maintenance so that infrastructure created is properly utilized. Alternatively, BSEB may consider outsourcing this activity of O&M.

E. Requirements for Sub-Transmission & Distribution System

The development of infrastructure of power distribution system in the State could not take place with requisite pace due to the following reasons:

(i) Delay in land acquisition;

(ii) Lack of human resources;

(iii) Delay in formulation of project reports due to lack of base line data;

(iv) Lack of experience in preparation of bankable detailed project reports (DPRs); and

(v) Frequent transfers of implementing officers.

F. Accelerated Power Development and Reforms Programme

In Bihar, APDRP schemes broadly cover following works:

i. Establishment of new power sub-stations;

ii. Installation of consumer and feeder metering;

iii. Re-conductoring of over loaded 33 and 11 kV lines;

iv. Renovation and modernization (R&M) of power sub-station (33/11 kV) and distribution transformers;

v. Installation of new distribution transformers (DTs) and augmentation of existing DTs;

vi. Computerisation of various functions in distribution systems and implementation of DMS, supervisory control and data acquisition (SCADA) system for PESU (Patna).

The status of the works sanctioned under APDRP is as below:

i) Work for PESU(E), Patna, Muzaffarpur, PESU(W), Darbhanga, Chapra, Gaya, Rohtas, Bhagalpur, Purnea and Saharsa Circles(Eleven) is under execution

ii) Work for PESU(W) – Phase II and Munger supply circle has just started.

G. Status of Rural Electrification

Rajiv Gandhi Grameen Vidyutikaran Yojana

Central Govt. has launched a new scheme “Rajiv Gandhi Grameen Vidyutikaran Yojana(RGGVY) of Rural Electricity Infrastructure and Household Electrification” in April, 2005

for providing access to electricity to all households in the country in five years. As per the present position of Rural Electrification in Bihar, out of a total of 39015 villages, 20610 villages have been electrified by March, 2006.

Development of Franchisee in BSEB

As per the information received from BSEB, it has adopted a Phased Manner Development of Franchisee Scheme for different activities of Electricity Distribution in Rural Areas for empowerment of Rural Consumers and to improve consumer services and also to increase revenue collection.

System Improvement Works During XI Plan

Since the works taken up under APDRP would not be sufficient to meet the power requirements by 2012, more number of 33 kV sub-stations, 33 kV, 11 kV and LT lines, re-conductoring of lines, installation of capacitors, installation of new DTs, meters, adoption of IT facilities would be required in a phased manner. Following major works are required to be taken up during XI Plan:

- Completion of ongoing works under APDRP(12 circles) and APDRP works for remaining 4 circles;
- Works (in addition to RGGVY) related to additional anticipated load due to agriculture, small scale industry, cold storage etc.;
- Development of distribution network for meeting the load growth;
- Development of Buddhist cum cultural corridor; and
- Provision of IT facilities keeping in view the modernization of Distribution Systems.

H. Renewable Energy

Energy Scenario

The renewable energy sources such as hydro, biomass, solar, wind, etc. can meet the energy requirements, to some extent for lighting, minor irrigation in the villages, and captive power generation for industries, as there is a significant potential of renewable energy in the State.

The Bihar Renewable Energy Development Agency (BREDA) is the State Nodal Agency responsible for the development and implementation of renewable energy programmes in the

State. For hydropower development, the State has a dedicated corporation namely Bihar State Hydro Electric Power Corporation (BSHPC).

Small Hydro – Potential and Achievement

Among the various renewable energy resources for power generation, the State has highest potential for small hydropower projects. So far 92 potential sites with an aggregate capacity of about 195 MW to set up small hydropower projects have been identified. This potential is mainly on irrigation canals and small streams. six small hydro power projects of an aggregate capacity of 46.1 MW have so far been installed in the State.

Biomass Power and Co-Generation - Potential and Achievement

It is estimated that there could be a potential of about 200 MW to set up biomass based power projects including co-generation projects. Rice husk based biomass gasification and combustion technology for industrial application and decentralized power generation may be one of the important sources for power generation in the State, particularly in northern region of Bihar.

Wind Energy

The state nodal agency is in the process of taking up wind resource assessment programme in associate with C-WET, Chennai, to identify suitable potential sites to set up wind energy based power projects.

Other Renewable Energy Sources

Biogas is an important source of renewable energy for meeting the cooking energy needs in villages. As per the estimates, the State has a potential of about 9.4 lakhs family size biogas plants to meet the cooking energy needs, against which about 1.25 lakhs biogas plants have so far been installed.

Remote Village Electrification Programme

BREDA, the State nodal agency for implementation of village electrification programme, has informed that about 500 unelectrified remote villages have been identified for electrification through renewable energy sources. However, these villages are yet to be verified by REC. BREDA has, therefore, not been able to prepare detailed project reports for electrification of these villages.

I. Financial Status of BSEB

Financial performance of BSEB/ Power Sector in the Bihar is not satisfactory. Its financial position is very weak. As per the Balance Sheet for the year 2004 as on 31st March, and for the year 2005 as on 31st March, there is a modest improvement in the net assets of BSEB in the year 2005 while the current liabilities has gone down slightly in the year 2005. There is a considerable increase in deficit in the funds on liability side. Borrowing is on a much higher side to meet the working capital requirement, thus reflecting a sizeable amount of debt service taking place, while the current assets does not generate much revenue to even meet the working capital demand. Capital expenditure has gone up significantly and so is the capital liability. There is a sizeable amount of payment due on capital liabilities which reflects poor receivables of bills of BSEB. The reserves fund position is very meagre and has shown a slight improvement.

One of the reasons for the poor financial performance of BSEB is implicit in Aggregate Technical & Commercial (AT&C) Losses, which are very high in comparison to other states. In a study regarding ranking in power sector conducted by Ministry of Power, Govt. of India, Bihar is at 27th position. Average per capita power consumption in Bihar is 75 kWh/Person (2004-05) vis-à-vis 613 kWh/Person(2004-05) at All India Level. Bihar Govt. is fully aware of the constraints in power sector reforms and appropriate course of action is being formulated.

The reasons for unsatisfactory performance and poor financial health of the Power Sector in Bihar are:

- High manpower levels/overstaffing not commensurate with energy generated and number of consumers;
- State is lagging behind in the area of new generation capacity addition;
- Low rural household electrification;
- Less than 50% revenue of the cost incurred. The gap between ARR and ACS is about Rs. 2.00 / kWh.;
- High interest cost and non-receipt of subsidy from Govt. has resulted in large cash losses;
- State has made very limited attempts to curb the theft of power;
- Consumer Metering - The action is yet to be taken for consumer metering by the BSEB;
- The AT&C losses are estimated to be more than 40% for the last three years. Whereas as per the report on the performance of State Power Utilities prepared by PFC, AT&C Losses are about 70% in Bihar; and
- Agricultural Sector:-In Bihar the agricultural consumption/sales in million KWh was 28% of the total sales. The level of cross subsidization in Bihar for agricultural consumers is sizeable.

J. Status of Regulatory / Reforms Process

In the process of reforms, Bihar has constituted its State Electricity Regulatory Commission which has become operational since August 2005. Bihar State Electricity Regulatory Commission has issued its first tariff order. The Regulatory Commission has framed seven regulations these have been notified in the official gazette of Bihar. One major step that Bihar has already taken is power distribution through the private sector. An understanding has been reached with the NTPC following the practice of due diligence, to undertake a few pilot districts for power distribution.

It is also noteworthy that revenue collection in recent months has significantly improved, which would gradually help improve the financial health of BSEB. The arrangements for wide scale consumers metering are being finalised. This would have positive results on revenue generation.

K. Human Resource Development

Importance of Manpower Planning & Training

It has been observed that there is an acute shortage of trained man power in the organization. There has been no recruitment in BSEB since 1984. Bihar Govt. has recently initiated action plan for setting up new generating capacity in thermal and hydro sector and taken up work related to strengthening of existing transmission network, construction of Grid sub stations with associated transmission line, strengthening of distribution system under APDRP scheme and rural electrification project under RGGVY to meet the growing electricity demand of the State. The goal of the utility is to generate electricity of right quality and quantity at an economic cost and supply to the consumers, efficiently, whenever and wherever required. However, in recent months,some concrete steps have been taken by BSEB in recruitment of technical staff on contractual basis.

Existing Training Facilities in the Power Sector

In pursuance of the above provision in the Act and to ensure the required standard of training, CEA had issued guidelines and norms for setting up of training institutes and procedural requirements of getting recognition from CEA. Accordingly, CEA has been regularly inspecting training institutes established in the state/central/private sector Power Utilities.In response, BSEB has already decided to establish a trainer's Institute in Patna and has made arrangement with IIM, Kolkatta, for training of its staff.

As there is no recruitment in BSEB since 1984 most of the employees are above 50 years of age. Induction of fresh technical personnel and imparting training to fresh recruits for at least one year is necessary for proper operation of the existing generating units, T&D system and future expansion plan taking into consideration the retirement of the existing technical manpower.

Total manpower requirement at the end of 11th Plan:

	Category	Technical (In number)
	Thermal (below 500 MW unit)	621
	Hydro	68
	Power System (T&D)	3843
	Total	4532

L. Fund Requirements in Power Sector

Estimated fund requirement for the proposed Generation, (upto XII plan), and Transmission and Distribution schemes during XIth plan period are as under. The phasing of funds will depend on the progress of works:

(i)	Thermal projects : (considering capacity addition up to XII plan) Barauni Extn. (2x250 MW)-500 MW Muzaffarpur Extn. (2x250 MW)-500 MW Katihar (4x250 MW)-1000 MW	Rs. 8000 Crores
(ii)	R&M of existing thermal units :	Rs. 506.2 Crores
(iii)	Hydro Electric Schemes :	
(a)	Short Term Plan	Rs. 9.6 Crores
(b)	Medium Term Plan	Rs. 1800 Crores
(c)	Long Term Plan	Rs. 2317 Crores
	Sub total	**Rs. 4126.6 Crores**
(iv)	Strengthening of Sub-Transmission system:	Rs. 2772.86 Crores
(v)	Distribution system :	Rs. 6705 Crores
	Total fund requirement	**Rs. 22,110.66 Crores**

Recommendations

A. Power Scenario

- It is essential that new and additional generating capacity (as indicated in para-1.4 of chapter-1) be added to the State sector as proposed by BSEB and BSHPC after proper planning so that projects are implemented and commissioned within the stipulated time frame to mitigate the shortages in the State.
- As proposed by MNRE ,small hydel plants on canal systems throughout the State can be tapped for power generation till the bigger projects like Indrapuri (5x90MW), Telhar Kund PSS(4x100MW), Sinafdar PSS(3x115MW), Panchghotia PSS(3x75MW), Hathiadah–Durgawati PSS(8x200MW), Dagmara Barrage(3x42MW) etc.are on stream.
- Optimum utilisation of available power by strengthening of inter-state and inter-regional transmission capacity and restoration of transmission lines/elements which are out of service over a long period.
- State Govt. to formulate Captive Power Policy and facilitate Captive Power Plants to provide spare generating capacity to the grid to partially mitigate the power shortage in the State.

B. Thermal Power Stations(R&M)

- The revival cost of Rs. 204.30 crores for Barauni TPS units 4&5 (2x50 MW) is very much on higher side. Instead of reviving these outlived units of 50 MW capacity, it would be advisable if BSEB could consider installation of new units of higher capacity & efficiency in their place.
- Inadequate supply of critical spares at site by BHEL causing delay in restoration of Barauni TPS units 6 (110 MW). NTPC/BSEB/BHEL to expedite the commissioning of unit-6 and R&M/LE of both the unit 6&7.
- BHEL needs to supply critical spares at sites to expedite commissioning Unit No.2 of Muzaffarpur TPS . NTPC/BSEB/BHEL to expedite R&M/LE of both the unit (1&2) of Muzaffarpur TPS.

C. Hydroelectric Development

- DPR of Kadhwan (Indrapuri) Project (450 MW) to be revised with changed optimal levels and submit the same to CWC for appraisal.
- Action to be taken for preparation of DPR of Sinafdar pumped storage project (345 MW).

- The DPR of the hydro-electric project identified on Kosi river at Dagmara in district Supaul with an installation of 126 MW to be prepared

D. Transmission System

- Proper maintenance of the existing transmission lines and sub-stations.
- Protection system and metering arrangements of the State transmission network should be revamped by BSEB for reliable power supply to the consumers
- Measures to reduce AT&C losses, prevention of thefts and adequate reactive power compensation for better quality of power.
- Taking over of completed sub-transmission works from POWERGRID by BSEB.
- Early restoration of the 220 kV and 132 kV transmission lines in BSEB which are not in service over a long period of time.
- Early finalization/execution of works covered under strengthening of sub-transmission system-Phase-II, Part-II.

E. Distribution System & Rural Electrification

- Due to the absence of an adequate backbone infrastructure like power sub-stations, 33 and 11 kV lines, distribution sub-stations and LT lines , it would require much more investment in the State as compared to other States.
- Urgent steps are needed to strengthen the existing sub-transmission & distribution network in the State so that it is able to cater to the future power development in the State. High AT&C losses and lack of IT facilities in distribution sector is also a cause of concern.
- The metering position is not very comfortable and due to the continuous growth of consumers, feeders and distribution transformers, by 2012 funds would need to be provided for metering as well as energy audit.
- The works taken up under APDRP may not be sufficient to meet the requirements of power by 2012 and more number of 33 kV sub-stations, re-conductoring of lines, installation of capacitors, installation of new DTs, meters, adoption of IT facilities would be required in a phased manner.

F. Renewable Energy

- 92 potential sites with an aggregate capacity of about 195 MW to set up small hydro power projects have been identified. The State needs to undertake detailed survey and

investigation of these sites and prepare DPRs, so that the shelf of project are available with the state for implementation in phased manner.

- Village electrification of about 500 identified remote villages needs to be taken up on priority through small hydro, biomass and/or solar energy depending upon their feasibility.
- In order to implement renewable energy programme in the State effectively, the state nodal agency, BREDA needs to be strengthened. It should have a full-time Director to look after the renewable energy programmes in the State.

G. Energy Conservation And Demand-Side Management

In regard to the demand side management, the following measures may be considered by Power Utilities/ State Government:

(i) State power utilities should promote CFL (Compact Fluorescent Lamp) even by providing subsidy since the present cost of CFL is not conducive to its large scale application.

(ii) State Government should consider providing incentives to Municipality/ Local bodies for up gradation of energy efficiency of water pumping and sewage treatment plants as well as municipal lighting. Energy efficiency measures in water pumping and sewage treatment plants could help in solving the problem of payment of electricity supply dues payable to the utility.

H. Financial Status of BSEB

- The gaps between ARR & ACS need to be reduced by reducing ARR and increasing ACS. Steps are required to reduce Commercial Losses and increase the Revenue realisation. Recent steps of the Bihar Government are in right direction and all attempts should be made to further expedite the collection process in order to help improve financial health of BSEB and reduce the Government's debt burden.
- Action should be taken for metering of power consumption, and reduce power theft, particularly in rural areas.
- Distribution of power through the private sector (i.e. NTPC) on a pilot basis must be expedited both from regular availability of power to consumers and better revenue collection.

I. Human Resource Development

- Each technical/non technical staff should be provided training of minimum one week per year. Nature of training may be refresher/advanced/managerial as per the actual need.

Total manpower (excluding headquarter) available in generation, transmission & distribution is about 14760 (as on June, 2007). It is understood that most of the employees are above 50 years of age and no recruitment has been made since 1984. Induction of fresh technical personnel and imparting training to the fresh recruits for at least one year is necessary for proper operation of the existing generating units, T&D system and future expansion plan.

- About 80% of the power sector personnel are engaged in T&D, adequate attention must be given to ensure proper training in this field. As the nature of activity and system are different in transmission and distribution, the training in these two fields should be organized separately. Creation of necessary infrastructure like power system simulator, resource centre, diversification of existing training institutes is recommended.

  A minimum of 1.5% salary budget may be provided initially, gradually increasing it to a level of 5% depending on organisation's requirement.

Preamble

Each state or nation has a destination to reach. Bihar's current destination is to reach all India level of socio-economic development and thereby bring overall welfare of common people of Bihar. In this context, power remains the single most important segment on which hinges the entire process of socio-economic development. Power has a multiplier effect on development. Reliable and competitive power can transform the pattern of agricultural production, the village industry development, the commercial and industrial activities, bring renaissance in the rural economy, and raise the overall standard of living of people of Bihar. The importance of power sector development must be viewed in this context and hence, this exercise, by the Special Task Force, on power sector development in Bihar.

POWER SCENARIO IN BIHAR

1. In this Chapter, an attempt has been made to show the existing power scenario in India vis-a-vis Bihar.

A. All India Installed Generating Capacity by May, 2007

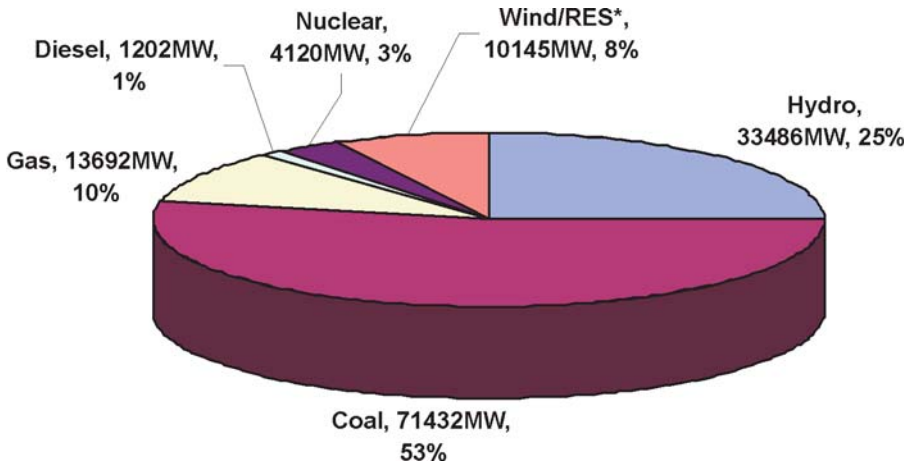
Table-1 All India Total Capacity

(Figures in MW)

Sector	Hydro	Thermal				Nuclear	Wind/RES*	Total
		Coal	Gas	Diesel	Total			
State	24618	38931	3610	605	43146	0	2084	69848
Private	1306	4241	4183	597	9021	0	8061	18388
Central	7562	28260	5899	0	34159	4120	0	45841
Total	**33486**	**71432**	**13692**	**1202**	**86326**	**4120**	**10145**	**134077**

*RES-Renewable Energy Sources

Figure - 1



Total : 134077 MW

2. A description of existing power stations in BIhar is shown in Table-2 below:

B. Existing Power Stations In Bihar–State Owned

Table-2 Existing Power Stations

Name of power station	Installed Capacity(MW)	Agency
Hydro		
Kosi (4x4.8)	19.2	BSHPC*
Sone E&W Canal(2x1.65+4x1.65)	9.9	BSHPC
East Gandak Canal(3x5)	15	BSHPC
Agnoor	1.0	BSHPC
Dhelabagh	1.0	BSHPC
Total	**46.1**	
Thermal		
Barauni (2x50+2x110)	320	BSEB
Muzaffarpur (2x110)	220	BSEB**
Total	**540**	

**BSEB transferred the project to BSHPC on 16th Nov.2003*
** Now transferred to new JV-Vaishali Generating Co.

3. The Kosi Hydel power station could not attain designed generation and is now being operated with derated capacity. The Hydel station needs major rehabilitation and modernization efforts.There is no generation from thermal power stations in the state sector at present. All thermal units are under shut down due to refurbishment/deteriorated condition.

C. Actual Power Supply Position

4. During the year 2006-07, Bihar faced energy and peak power shortages of 8.1% and 16.9%, respectively. During April-May, 2007, the state had energy shortage of 7.9% and peak deficit of 12.2%. The details of actual supply position during 2006-07 and April-May, 2007 is given

in the following table:

Table-3 Supply Position

Peak	2006-07	April-May, 2007
Peak Demand (MW)	1399	1415
Peak Met (MW)	1162	1243
Peak Deficit(-)/Surplus(+)-MW	-237	-172
Peak Deficit/Surplus (%)	-16.9	-12.2
Energy		
Energy Requirement (MU)	8425	1500
Energy Availability (MU)	7741	1381
Energy Deficit(-)/Surplus(+)-MU	-684	-119
Energy Deficit/Surplus (%)	-8.1	-7.9

D. Proposed New Power Projects

5. Keeping in view the present status of the state owned thermal and Hydro power stations, BSEB/BSHPC has proposed to install the following new power plants to meet the future power requirement. This is presented below in Table-4:

Table-4 Proposed Projects

Name of power PROJECT	Installed Capacity(MW)	Agency
Hydro		
Indrapuri Reservoir (5x90)	450	BSHPC
Telhar Kund PSS (4x100)	400	BSHPC
Sinafdar PSS (3x115)	345	BSHPC
Panchghotia PSS (3x75)	225	BSHPC
Hathiadah-Durgawati PSS(8x200)	1600	BSHPC
Dagmara Barrage (3x42)	126	BSHPC
Thermal		
Barauni Extn. (2x250)	500	BSEB
Muzaffarpur (2x250)	500	BSEB
Nabi Nagar	2000	BSEB
Katihar(4x250)	1000	BSEB
Pirapanti	4000	BSEB

E. Allocation of Energy Shares to Bihar from Central Sector Projects

Table-5 Bihar's Share of Power Projects

Name of the project	Total share(MW)	Unallocated Shares (MW)
Farakka (3 x 200 MW+ 2 x 500 MW)	363	-
Kahalgaon (4 x 210 MW)	222	12(included in total share)
Talcher St-1(2 x 500 MW)	354	13(included in total share)
Kahalgaon St-II (1x500MW)	63*	
Sub-total	1002	
Rangit Hydro (3 x 20 MW)	21	
Chukha (270 MW)	80	
Tala HPS (3x170 MW)	130	
Sub-total	231	
Total allocation to Bihar	**1233**	Including unallocated share of 25 MW

* Date of Commercial Operation (COD) yet to be declared.

Table-6 Tentative Share Of Bihar In Central Sector Projects Expected During 11th Plan

Name	Agency	Capacity (MW)	Tentative Share(MW)	Target date
TEESTA ST-V	NHPC	510	52	2007-08
Thermal				
Kahalgaon St-II	NTPC	1000	126 (Firm Share)	2007-08
BARH-I	NTPC	1980	324*	2009-11
NORTH KARANPURA	NTPC	1320	127*	2011-12
FARAKKA ST-III	NTPC	500	53	2009-10
BARH-II	NTPC	1320	188	2011-12
NABINAGAR (OTHER THAN RAILWAY)	NTPC	500	103	2010-12

* As indicated by NTPC. Allocation yet to be decided by MoP

F. Anticipated Power Supply Position at the End of 11th Plan

6. At the end of 11th Plan Bihar is expected to face an energy shortage of 41% and peak deficit of 58%. The details of anticipated power supply position during 2011-12 is given in the following table:

Table-7 Power Scenario at the End of 11th Plan

Peak	**2011-12**
Peak Demand (MW)	3607
Peak Met (MW)	1534
Peak Deficit(-)/surplus(+) MW	-2073
Peak Deficit/Surplus (%)	-57.5
Energy	
Energy Requirement (MU)	19905
Energy availability (MU)	11755
Energy Deficit(-)/Surplus(+)	-8150
Energy Deficit/Surplus(%)	-40.9

7. It may be seen from the above table-7 that Bihar is expected to face acute power shortage in coming years. The following steps are immediately required to improve the situation:-

(i) There is no generation from Thermal units at present. It is essential that new and additional generating capacity be added to the state sector as proposed by BSEB and BSHPC after proper planning so that projects are implemented and commissioned within the stipulated time frame to mitigate the shortages in the state.

(ii) Small hydel plants on canal systems throughout the state can be tapped for power generation. These projects entail considerably lower capital cost and can be set up and commissioned quickly. Making use of these will help reduce the demand-supply gap and help tide over the power crisis in short term till the bigger projects like Indrapuri(5x90MW),Telhar Kund PSS(4x100MW), SinafdarPSS(3x115MW), Panchghotia PSS(3x75MW),Hathiadah–Durgawati PSS(8x200MW) Dagmara Barrage(3x42MW) etc. come through.

(iii) Optimum utilisation of available power by strengthening of inter-sate and inter-regional transmission capacity and restoring the transmission lines/elements which are out of service over a long period.

(iv) State Govt. to formulate Captive Power Policy and facilitate Captive Power Plants to provide spare generating capacity to the grid to partially mitigate the power shortage in the state.

G. Forecast of Electricity Demand for Bihar

8. Bihar State Electricity Board furnished a detailed short term forecast of electricity demand to the Regional Power Survey Office, Kolkata and 17th Electric Power Survey Committee, in February, 2004, indicating therein a peak electric demand of 1516 MW and electrical energy requirement of 9871 GWh for the year 2011-12. Consequent to the constitution of Special Task Force in January, 2006on issues relating to the state of the economy of the Bihar, its finances and possible development strategies, a Technical Committee was constituted at the CEA to draw a road map for development of power sector in Bihar. During the visit of the Members of the Technical Committee to Patna in June, 2006, discussions were held with the Bihar State Government regarding short term electricity demand. It was estimated to be 15076 GWh of electrical energy requirement and 2868 MW of annual peak electric load for the year 2011-12.

9. It was informed to the Bihar authorities that the forecast of electricity demand gives a compounded annual growth rate of about 14 % in the electrical energy requirement over the actuals for the year 2003-04 when compared with All India Growth Rate of about 8 %. It was clarified that this forecast is considered an optimistic programme of accelerated domestic household electrification resulting into about 27% CAGR in domestic consumption. The electrical energy requirement and peak load growth worked out to about 2.5 times of 2004-05 actuals, which was highly optimistic and shall pose challenging task for Bihar State Electricity Board.

10. The first review of the electricity demand of the State of Bihar was carried out in June-July, 2006 taking care of initiatives taken by the Government of Bihar for growth of domestic, industrial and agricultural sectors. As per this review, the electrical energy requirement worked out to 19905 GWh & 3255 MW for the year 2011-12. The revised forecast was communicated to Bihar Government on 6th July, 2006. However, the draft report of the 17th EPS Committee in its 3rd meeting in August, 2006 approved electricity demand forecast of 3607 MW of annual peak electric load and 19905GWh of electrical energy requirement for the year 2011-12 for the State of Bihar. Final report of the 17th Electric Power Survey Committee has shown electricity demand of Bihar as tabulated below:

Table-8 Demand Forecast

Year	Peak Load (MW)	Energy Requirement (MU)
2006-07	1570	9629
2007-08	1842	11134
2008-09	2177	12874
2009-10	2575	14886
2010-11	3046	17213
2011-12	3607	19905
2016-17	5598	32857
2021-22	9567	58248

This gives CAGR of about 19% in energy consumption which is very high and extremely optimistic.

11. The 17th EPSC has taken an optimistic view in regard to Bihar State and given a very high growth rate for electrical energy consumption (EEC), electrical energy requirement (EER) and peak load (PL). The CAGR (compounded annual growth rate) of EEC, EER & PL is tabled below:

Table-9 Power Growth Rate

Plan	CAGR - EEC	CAGR - EER	CAGR - PL
11th Plan (CAGR-5 years)	21.98	15.63	18.10
12th Plan (CAGR-5 years)	11.98	10.54	9.19
13th Plan (CAGR-5 years)	13.50	12.13	11.31

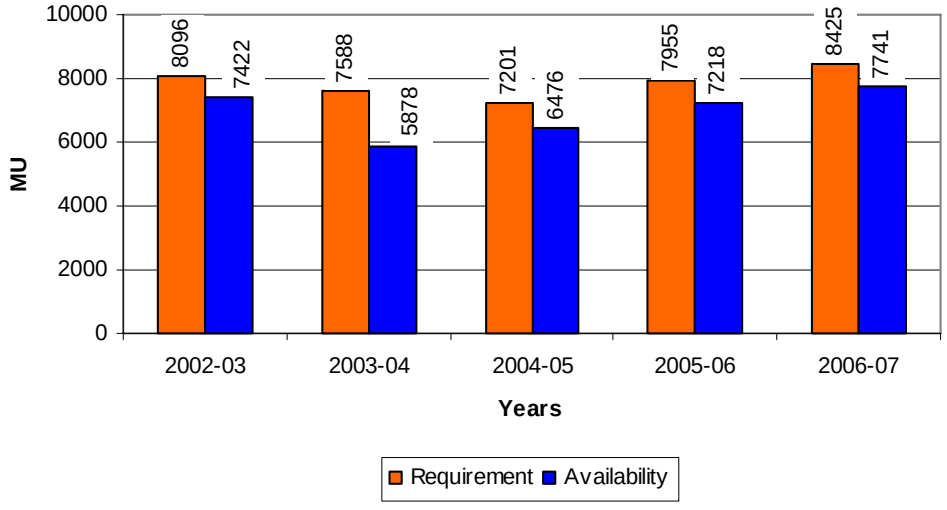
The above forecast of electricity demand has been finalised despite dissatisfactory progress made in the electricity sector of Bihar which may be observed from below:

Table-10 Power Supply Position

Year	Requirement (MU)	Availability (MU)	Deficit (MU)	Deficit (%)
2002-03	8096	7422	674	8.3
2003-04	7588	5878	1710	22.5
2004-05	7201	6476	725	10.1
2005-06	7955	7218	737	9.3
2006-07	**8425**	**7741**	**684**	**8.1**

Energy Requirement v/s Availability (2002-07)

Figure-2



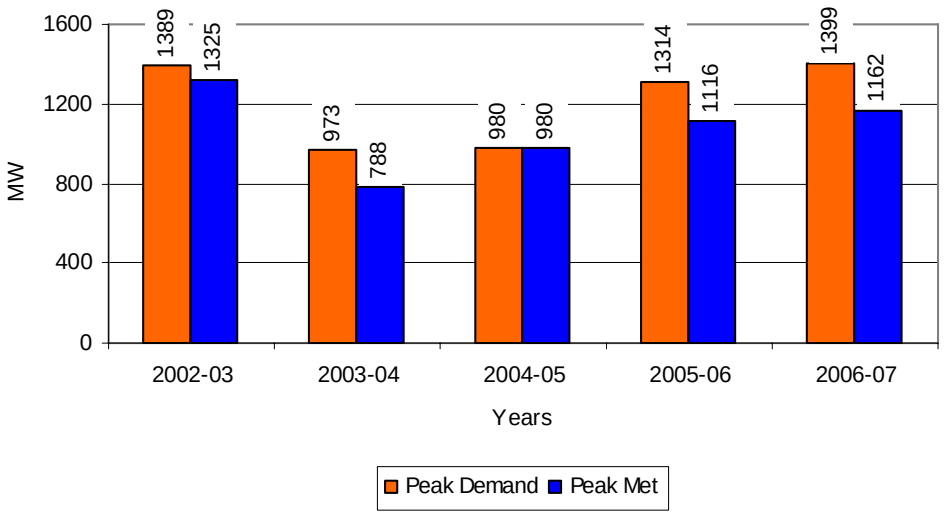
12. The 17th EPS Forecast of EER for 2006-07 is higher by 14.3% than the actual. This is shown in Table below:

Table-11 Power Supply Position – Peak : Bihar

Year	Peak Demand (MW)	Peak Met (MW)	Deficit (MW)	Deficit (%)
2002-03	1389	1325	64	4.6
2003-04	973	788	185	19.0
2004-05	980	980	0	0.0
2005-06	1314	1116	198	15.1
2006-07	1399	1162	237	16.9

Peak Demand v/s Peak Met (2002-07)

Figure-3



13. The 17th EPS forecast of Peak Electric Load for 2006-07 is 11.7% higher than the actual, as shown below:

Table-12 T & D losses

Year	T & D losses* (%)
2002-03	39.0
2003-04	37.0
2004-05	35.9
2005-06	40.0 (Estimated)

* Data Source "General Review"

It may be observed that the T&D losses are on rise while the 17th Electric Power Survey estimates considered declining trend in T&D losses so that more electrical energy is made available to the consumers with the same generation level.

14. The Technical Team has recommended that the growth of electric load and electricity consumption of Bihar may be observed for one year (2007-08) and the demand projections indicated in the 17th EPS will be reviewed accordingly. In this regard, RPSO, Kolkata will interact frequently with BSEB to record the progress made in rural electrification, distribution network, franchise programme, etc.

CHAPTER-2

THERMAL POWER STATIONS

A. Thermal Power Stations Installed in Bihar in State Sector

15. At present, Barauni (2x50 + 2x110 MW) and Muzaffarpur (2x110 MW) are two Thermal Power Stations in Bihar in State Sector. A meeting was held under chairpersonship of Principal Adviser, in Planning Commission GoI, on 10.05.2005 regarding Residual Life Assessment (RLA)/ R&M of all units of Barauni TPS and of Muzaffarpur TPS under Rashtriya Sam Vikas Yojna (RSVY). A sum of Rs. 75 crores was released to BHEL by Ministry of Power / Planning Commission, as advance payment for the above R&M works, during the year 2005-2006 for both the power stations. A sum of Rs. 120 Crores was also released to BHEL by MoP/ Planning Commission as advance payment for the R&M works during the year 2006-07 for both power station.

16. Verified bills amounting to Rs. 2.53 crores has been submitted to MOP/Planning Commission for release of payment to NTPC against consultancy charges. In addition to the above a sum of Rs. 0.25 crores as advance payment has already made to NTPC by BSEB against the consultancy charges. Unit-wise details of capacity, date of commissioning, broad reasons for shut down and the programme for revival/ improvement in performance are indicated below:

Table-13 Barauni TPS

i)	Unit No.	4	5	6	7
ii)	Capacity (MW)	50 MW	50 MW	110 MW	110 MW
iii)	Date of commissioning	9.11.69	1.12.71	1.12.84	31.3.85
iv)	Make of Boiler & TG	Polish	Polish	B.H.E.L.	B.H.E.L.
v)	No. of operating hours completed	107668	76042	89828	77629
vi)	Whether operating or under shut down. If under shut down, since when ?	Under S/D since 24.04.96	Under S/D since 15.03.95	Under S/D since 05.03.06	Under S/D since 23.08. 06
vii)	Reasons for Shut Down/ Low performance	Due to pollution problem as well as for refurbishment.		Due to deteriorated condition as well as high cost of generation.	

B. Programme for Revival / Improvement

17. With a view to improve the PLF/Generation of Barauni Thermal Power Station of BSEB, NTPC has been appointed as a consultant for RLA / Cost Estimates/ Performance Evaluation Test(PET) / Refurbishment / R&M/ LE & introduction of modern O&M practices at unit No. 4 to 7 of BTPS. After completion of R&M work, PLF is expected to improve significantly.

Unit No. 4&5 (2x50 MW)

18. The Planning Commissioning has identified these units for Renovation & Modernisation in 10th Plan. Accordingly a Team of Experts of NTPC, CEA & BSEB visited the site, completed their viability study and observed/opined that both the units would be viable after completion of R&M. The Committee recommended Unit No.5 for immediate restoration as its turbine is new one, while Unit No.4 was recommended for RLA/R&M works.

Unit No. 6&7 (2x110 MW)

19. In the light of recommendation of Planning Commission, M/s. BHEL has been appointed as executing agency for carrying out RLA/R&M/LE works under the supervision of N.T.P.C. Accordingly, L.O.I. No.428 dated 10.06.05 & 577 dated 18.07.05 have been placed on B.H.E.L, for the above works. Unit No. 6 was handed over to BHEL on 10.03.2006 for restoration work. RLA of Unit-6 has been completed by BHEL. The restoration schedule was given by BHEL for 120 days i.e. Commissioning schedule was 10.07.2006. After dismantling BHEL had prepared a list of spares on 19.05.2006 and forwarded to PPIB/BHEL for supply of the same from their inter units.

20. During RLA study of T/G of unit No. 6 cracks were observed in HP & IP rotors and the same were sent to BHEL (Hyderabad works) for repair in June, 2006. The rotors have been received back at site after repair in the last week of October,06. Bearing No. 6 of Generator, which was sent to BHEL/Varanasi for repair, has been received at site and the work of Generator is in progress.Successful hydraulic test of Boiler unit No. 6 was carried out at 175 Kg/cm2 pressure on 27.12.2006.

Due to inadequate supply of spares as well as delay in finalization of agencies by BHEL, the schedule commissioning of the unit during the month of July, 2006 failed and the revised schedule date of commissioning of unit No. 6 was fixed by the end of Nov.2006 but the same could not be achieved. Further, BHEL has neither submitted the detailed offer nor any programme for taking up R&M/LE works as agreed during Planning Commission review meeting on 9th Nov., 2006. Approximately 60% of restoration work for Unit No. 6 has been completed. The progress of

remaining work is very slow due to inadequate supply of spares from inter units of BHEL and non-start of work at few sites.

21. During the review meeting taken by Secretary (Power), Govt. of India on 13th January, 2007, BHEL has come out with new target for lit up of boiler unit No. 6 in the month of May 07 after completion of restoration work. After unit- 6 is put into operation, based on the RLA studies done for Unit - 6, unit -7 would be taken up for R&M /LE. After the restoration of unit-7, Unit-6 would be taken under R&M/LE.

Table-14 Muzaffarpur TPS (MTPS)

i)	Unit No.	1	2
ii)	Capacity (MW)	110 MW	110 MW
iii)	Date of Commissioning	31.3.85	17.3.86
iv)	Make of Boiler/TG	BHEL	BHEL
v)	No. of operating hours completed	67856	69239
vi)	Whether Operating/ Under Shut Down	Under S/D since 06.10.2003	Under S/D since 03.10.2003
vii)	Reasons for Shut Down/ Low Performance	Under S/D due to very deteriorated condition as well as high Cost of Generation	

In the light of recommendation of Planning Commission to improve the Power Generation scenario, BHEL had been appointed as an executing agency to carry out RLA/R&M/LE works of M.T.P.S under Rashtriya Sam Vikas Yojana. Accordingly L.O.I. No.810 dated 29.9.05 have been placed on BHEL. MTPS stands transferred to Vaishali Power Generating Company Ltd.(VPGCL) a Joint Venture Company of BSEB & NTPC from 08.09.2006. The restoration work of Unit No. 2 of VPGCL has been started from 12th August, 2006 by BHEL. During the review meeting taken by Secretary (Power), Ministry of Power, Govt. of India, BHEL has given the commitment for commissioning of unit No. 2 in the June 07 after completion of its restoration work. After restoration of Unit-2, LE/R&M works will be carried out on unit-1.

C. Partnership in Excellence (PIE) Programme

22. A Renovation and Modernisation (R&M) Programme for Thermal Power Stations was launched by the Government of India all over the country in September 1984 for completion during the Seventh Plan Period. This programme was successfully completed and intended benefits were achieved. In the subsequent 8th and 9th Plans, Renovation and Modernisation and Life Extension (LE) works were carried out on a number of older generating units which resulted in improvement in their performance and extension of their useful life by about 15 to 20 years.

This is evident from the fact that the average plant load factor (PLF) of these thermal power stations increased from 53.9% in the year 1990-91 to 74% during the year 2006-07 (upto Nov.).

23. At the beginning of the 10th Plan, 106 old thermal units aggregated to a capacity of about 10413 MW were identified for Life Extension works at an estimated cost of Rs.9200 crores for completion during 10th Plan. The programme could not be completed during 10th Plan due to inability on the part of many utilities to carry out capital intensive works of LE / R&M. The cash-starved power utilities did not have enough funds even to carry out routine maintenance works / overhauling. It was also found based on techno-economic studies that for certain power plants which were old and under long shut down, it was not economical to refurbish / revive them. In the case of some of the units which were not performing satisfactorily, it was decided to first improve their performance and then decide about major investment for R&M / LE works based on techno-economic studies.

24. Accordingly, CEA has drawn up an action Plan first to improve the Plant Load Factor (PLF) of existing thermal power stations in the country which are running at low PLF, to the level of National Average under **'Partnership in Excellence'** (PIE) Programme and PFC will provide loan assistance at concessional rate of interest. Under this programme, 26 low performing thermal stations (having PLF below 60%) have been identified to improve their performance through improved O&M practices, comprehensive overhauling etc through partnership with better performing utilities like NTPC, APGENCO, Tata Power etc. Out of these 26 thermal stations, revival of 4 thermal stations was not found economically viable. Out of the remaining 22 stations, NTPC have already signed the agreement for 15 stations and Tata Power has signed agreement with 1(one) station under PIE programme. The managements of 4 thermal stations have decided to improve the performance themselves by adopting better O&M Practices and comprehensive overhauling of plants. For, remaining 2(two) thermal stations, improvement in performance is to be achieved under Rashtriya Sam Vikas Yojana of Planning Commission.

CHAPTER-3

HYDRO ELECTRIC DEVELOPMENT IN BIHAR

A. River System in Bihar

25. The drainage system of Bihar can be broadly divided under two river systems:

i) Ganga River System

ii) Central Indian River System

Ganga River System:

The river Ganga enters Bihar near the town of Chhapara where it is joined by the river Ghaghra. Important tributaries of Ganga which flow through Bihar are described below:

Sone: The river Sone rises at Sonbhadra in the Maikala hills in Madhya Pradesh at an elevation of 4655 m. The Sone river drains a total catchment area (CA) of about 71,000 sq km, out of which about 17000 sq.km lies in Bihar, before it joins Ganga about 16 km upstream of Danapur near Patna. The main tributaries of Sone flowing through Bihar are North Koel (CA – 11,111 sq.km) and Kanhar (CA – 5950 sq.km).

Gandak: The river Gandak, known as the river Kali in the upper reaches, rises at EL 7620 m in Tibet near Nepal border. From Nepal, the river emerges into the plains of Champaran district of Bihar. The total length of the river is about 630 km, out of which 250 km lies in Bihar. The river joins Ganga near Patna. The total catchment area of the river Gandak is about 46,300 sq. km, out of which only 7620 sq km lies in Bihar.

Burhi Gandak: The river Burhi Gandak, also known as the river Sikrana, rises from the springs of Someshwar hills at EL 300 m and drains a total catchment area of about 10,000 sq km before it joins the river Ganga near Munger.

Kosi: The river Kosi is formed by the confluence of three stream viz Sunkosi, Arun Kosi and Tamur Kosi all originating in the Himalayan region of Nepal and Tibet. The river drains a total catchment area of about 74,500 sq km, of which 11,070 sq km lie within India. The main tributaries of river Kosi are the rivers Bagmati and Kamla. The river Bagmati rises in Nepal and intercepts a catchment area of 13,400 sq.km, of which 6,320 sq km lies in India. The river Kamla has a total catchment area of 5,071 sq km.

Damodar: The river Damodar, also known as Deonadi in its initial reaches, rises in Palamu district of Bihar at an elevation of 600 m and drains total catchment area of 25,820 sq km. It joins the river Hoogly in West Bengal after traversing 541 km. The important tributaries of the river Damodar are river Barakar and Konar.

Ajay: The river Ajay is formed by the confluence of small rivers like Kunur, Hingla etc. It rises in the hills of Santhal Parganas and Hazaribagh districts in Bihar. The river has a total length of 267 km and drains a catchment area of 6,056 sq km.

Kiul: The river Kiul rises in Chhotanagpur plateau at EL 605 m. It has a total length of about 130 kms. and drains a catchment area of 16,885 sq.km. The main tributary of Kiul is river Harohar with a catchment area of 13,918 sq.km.

Punpun: The river Punpun also rises in the Chhotanagpur plateau at EL 300 m. The river drains a catchment area of 8558 sq.km. Its main tributary is Morhar river. It drains a total catchment area of 3865 sq.km.

Central Indian River System

26. The main rivers of Central Indian River System flowing through Bihar are described below:

Subernarekha: The river Subernarekha rises near village Nagri in Ranchi district at an EL 600 m. It is an inter-state river with a total catchment area of about 19,300 sq.km. The catchment areas in Bihar, Orissa and West Bengal are 70% , 11% and 18% respectively. Out of its total length of about 400km, 300 km lie in Bihar and balance in other two States. The main tributaries of the river Subernarekha are the rivers Kanchi and Kharkai etc. The river Kanchi rises at EL 730 m and drains a catchment area of 1095 sq km in a total course of 90 km. The river Kharkai drains a catchment area of 6290 sq km.

Brahmani: The river Brahmani, also known as South Koel in the upper reaches, originates in Ranchi district at EL 700 m. The river traverses a total length of 758 km, of which 265 km is in Bihar and the balance in Orissa. The major tributaries of the river Brahmani in Bihar are the rivers North Karo (CA – 2740 sq.km), South Karo (CA – 1720 sq km) and Sankh (CA – 6930 sq.km).

B. Hydro Potential and its Development

27. As per the Reassessment of Hydro Electric Potential of the Country, carried out by Central Electricity Authority (CEA) during 1978-87, the Hydro Electric potential in Bihar is assessed at

60 MW at 60 % load factor . The corresponding probable installed capacity of these schemes is estimated at about 70 MW. As on 1.8.2006, 64.1% of the total potential in terms of installed capacity has been developed and 35.9% of the potential remains yet to be developed.

Schemes in Operation

Following six hydro stations with an aggregate installed capacity of 46.1. MW are in operation in Bihar:

Sl. No	Name of project	Install Capacity (MW)
1	Kosi	19.2
2	Eastern Gandak	15
3	Sone Western Canal	6.6
4	Sone Eastern Canal	3.30
5	Agnoor	1.0
6	Dhelabagh	1.0
	Total	**46.1**

Since the above small hydro power stations are less than 25 MW they have also been included in chapter 6 on renewable energy. The Kosi Hydel Power station could not attain designed generation and is now being operated with derated capacity. The hydel station needs major rehabilitation and modernization efforts.

Pending Hydro Schemes

Name of the Scheme	Installed Cap. (MW)	Benefit (MW)	Date of Receipt/ Return of DPR
Sector			
Kadhwan (Indrapuri)	5x90	450	02/1995/03/1995

28. Indrapuri Resevoir Project, located in Garwaha District of Jharkhand/Rohtas District of Bihar was received in CEA in Feb. 1995 (January 1994 Price Level) from Bihar Hydro Electric Power Corporation (BSHPC). Indrapuri is a multi-purpose Storage Project on river Sone with irrigation, hydro power and flood control as the main objectives. The main features of the project are :-

- A 45 m. high Earth dam of length 3895 m.
- 5 Penstocks of length 60 m. each and dia 8.7 m.

- A surface power house with an installation of 5 units of 90 MW each/vertical Kaplan driven generation units, operating under a design head of 33.3 m.
- A tail pool of size 180 m x 185 m.

29. The status of these schemes is as follows:

i. The DPR of Kadhwan Project (5 x 90 MW) (renamed as Indra Puri Reservoir Project) located in Rohtas Distt. of Bihar / Garwaha Distt. of Jharkhand was received in CEA in February 1995 from Bihar State Hydro-electric Power Corporation (BSHPC). Indirapuri is a Multi-purpose storage project on river Sone with irrigation, hydro-power and flood control as the main objectives. The DPR was returned to BSHPC in March 1995 with a request to submit a consolidated project report for Multi-purpose project in co-ordination with Department of Water Resources, Government of Bihar.

ii. Govt. of Bihar had submitted DPR on Kadhwan Project to CWC in May 1998. However, copies of the same was not sent to CEA.

iii. This project is still hanging in lurch due to several reasons, ranging from submergence and rehabilitation issues, non-concurrence of affected state governments to lack of coordination among central agencies and government of Bihar. A detail status is given at **Annexure-I.**

30. There are four pumped storage projects in Kaimur District of Bihar. Pre-feasibility reports of the following 4 pumped storage projects of capacity 2570 MW were received in CEA from BSHPC in 2003. These projects are:

Sl No	Name of project	Installed Capacity (MW)
1	Telhar Kund PSS	400
2	Hathidah & Durgawati PSS	1600
3	Sinafdar PSS	345
4	Panchgotia PSS	225
	Total	**2570**

BSHPC have informed on 14.6.2007 that besides above four pumped storage projects pre-feasibility for Kohira Dam PSS (400 MW) in Kaimur Distt. has also been established.

(i) Telharkund PSS scheme(400 MW) is located on Sura river in Kaimur district of Bihar. The project area has latitude N 24°51'21'' – N 24°49'44'' and longitude E 83°31'18'' – E 83° 32'12''. The upper dam of the scheme has a height of 65 m with a live storage of

9.45 MCum. The lower reservoir has a dam height of 55 m with live storage of 9.36 MCum. The project having an installation of 4 units of 100 MW operating under net design head of 112.5 m would generate an annual energy of 876 MU. The corresponding energy required for pumping has been estimated as 1314 MU.

(ii) **Hathiadah-Durgawati PSS (1600 MW)** is located on Hathiadah river and Durgawati river in Kaimur district of Bihar. The project area has a longitude of E 83°44'24'' and latitude of N 24°40'41''. There are two Upper dams proposed, one on the Hathiadah river and other on the Durgawati river . The upper dam on Hathiadah river has a height of 41 m with a live storage of 13.05 MCum and upper dam on Durgawati river has a dam height of 42 m with live storage of 11.59 MCum. The lower dam on Durgawati river has a height of 71 m with a live storage of 24.77 MCum. Hathidah river is a tributary of Durgawati river and Durgawati river is the major tributary of Karmnasa river. The project envisages installation of 4 units of 200 MW each in two Power Houses (one on right bank of Hathiadah and other on right bank of Durgawati) operating under a Net design head of 175.8 m . The project would be able to generate 3504 MU and annual energy required from grid network for pumping operation would be 5256 MU.

These two projects falls in the identified Wild life sanctuary. Permission/Concurrence of MOEF may be required before proceeding further on these two projects.

(iii) **Sinafdar PSS (345 MW)** is located on Sura river (right fork) in the Kaimur district of Bihar. The project area has a longitude of E 83°36'47'' and latitude of N 24°49'51''. The upper dam of the scheme has a height of 45 m with a live storage of 8.08 MCum and the lower dam has a height of 42 m with a live storage of 7.88 MCum. The project envisages an installation of 3 units of 115 MW operating under a net design head of 120 m. The project would generate an annual energy of 756 MU with annual energy required from grid network for pumping operation as 1133 MU.

(iv) **Panchgotia PSS (225 MW)** is located on Karsotha Nallah (tributary of Durgawati river) in Kaimur district of Bihar. The project area has a longitude of E 83°37'54'' and latitude of N 24° 46'36''. The upper dam of the scheme has a height of 36 m with a live storage of 6.04 MCum while the lower dam has a height of 57 m with a liver storage of 5.54 MCum. The project envisages installation of 3 units of 75 MW operating under a net design head of 110 m. The project would be able to generate 493 MU with an annual energy required from grid network for pumping operation as 739 MU.

31. After a series of meeting taken by Secretary (Power) Government of India, and deliberation therein, following two alternatives emerged:

(i) NHPC may execute the Sinafdar Pumped Storage Project provided the off-peak power is given by the State of Bihar for the pumping purpose. It was taken that the State of Bihar would be in a position to supply off-peak power to the Sinafdar Pumped Storage Project by the time it is completed i.e. 2011-12. Initial optimization studies have indicated optimal operation of the project with 9 hours of pumping and 6 hours of peaking. Secondly, the Government of Bihar shall give commitment to purchase entire peaking power. Consequently, it will have freedom to sell surplus power, if any, outside the State of Bihar. Thirdly, the concerns of NHPC regarding security of plant & personnel would be adequately addressed by the Government of Bihar.

(ii) NHPC may be asked to prepare the DPR, which would take about a year. The matter would be discussed again after the DPR is finalized. If implementation of the project is entrusted to NHPC, then it would proceed with the execution of the project provided the principles enunciated at option no. (i) above are agreed to by the Government of Bihar. Otherwise, the cost of preparation of the DPR will be reimbursed by the Government of Bihar to NHPC.

Secretary (Power) advised the representatives of Government of Bihar that the confirmation of Government of Bihar regarding the preferred option may be furnished to the Ministry of Power. Thereafter necessary action in the matter would be taken. Department of Energy, Government of Bihar vide notification No. 205 dated 17.01.2007 have communicated to MoP their consent in regard to conditions stipulated in para (i) above.

Development of Hydro Electric Schemes (226 MW) on Kosi River

32. As per information obtained from BSHPC, BSHPC have identified several locations in the Kosi basin with a total capacity of 226 MW . Amongst them , one Hydro-electric scheme (126 MW) has been identified on Kosi river in district Supaul . As per preliminary studies, the scheme envisages construction of a Barrage on the river Kosi to divert water into a Power House housing three generating units of 42 MW each operating at a net head of 9m with an annual energy generation of 463 GWh. The cost of the project has been assessed as Rs. 504 crores and cost of energy generation from the project works out to be Rs. 1.70/kWh. The Salient Features of the project are given in **Annexure – II**.

33. The DPR of the project is yet to be prepared. The Key parameters of the project including costs/financial evaluation would be firmed up after completion of the Survey & Investigation and preparation of the DPR.

34. During the visit of the team constituting officers of CEA & Planning commission to Patna on 14th June,2007 to discuss with Secretary (Energy), Government of Bihar regarding finalisation of Draft Report, BSHPC informed that they have issued NIT on 7th June, 2007 for detailed survey and investigation and for preparation of DPR for Dagmara HEP (3x42 MW). The opening of technical part of the tender has been scheduled on 3.7.2007 at 4 PM.

Action Plan

- DPR of Kadhwan (Indrapuri) Project (450 MW) to be revised with changed optimal levels and submit the same to CWC for appraisal.
- Action to be taken for preparation of DPR of Sinafdar pumped storage project (345 MW).
- The DPR of the hydro-electric project identified on Kosi river at Dagmara in district Supaul with an installation of 126 MW to be prepared. These Projects are likely to yield benefits beyond 11th Plan.

C. Fund Requirements of Hydro Power

1. Short Term Plan

(i)	Preparation of DPR of Sinafdar Pumped Storage Project (345 MW)	Rs. 7.00 Crores
(ii)	Preparation of DPR of Hydro-Electric Project on Kosi River at Dagmara (126 MW)	Rs. 2.60 Crores
	SUB TOTAL	**Rs. 9.60 Crores**

2. Medium Term Plan

(i)	Revision of DPR and Execution of Kadhwan (Indrapuri) Project (450 MW) (As per DPR submitted in 1994, cost was shown as Rs.759.90 Crores)	Rs. 1800.00 Crores (updated to present Price level)
	SUB TOTAL	**Rs. 1800.00 Crores**

3. Long Term Plan

(i)	Execution of Sinafdar Pumped Storage Project (345 MW)	Rs. 1750 Crores.
(ii)	Execution of hydro-electric project identified on Kosi river at Dagmara in district Supaul with an installation of 126 MW	Rs. 567 Crores
	SUB TOTAL	**Rs. 2317 Crores**
	TOTAL :	**Rs. 4126.6 Crores**

CHAPTER-4

TRANSMISSION SYSTEM DEVELOPMENT

35. To strengthen the sub transmission and distribution system in Bihar a comprehensive scheme for strengthening of sub transmission system was formulated under Rashtriya Sam Vikas Yojana for Bihar in consultation with BSEB. The scheme is funded through central assistance under the Special Plan for Bihar component of Rashtriya Sam Vikas Yojana. The total scheme has been envisaged to be implemented in phases as under:

i) Bihar Sub-transmission Scheme Phase-1

ii) Bihar Sub-transmission Scheme Phase-2, Part-1

iii) Bihar Sub-transmission Scheme Phase-2, Part-2

A. Bihar Sub Transmission Scheme Phase-I

Bihar sub transmission scheme phase-I (approved estimated cost – **Rs. 526.28 crores**) involves construction of 18 no (2 no 220 kV, 15 no 132 kV and 1 no 33 kV) new substation, bay extension works at 12 no 220/132 kV existing substations of BSEB and construction of 1240 ckt km (220 kV 170 ckm, 132 kV -1030 ckm and 33 kV- 40 ckm) transmission line. Details are at **Annex-III**. Implementation of the scheme is being done by PGCIL on behalf of BSEB and the same has been completed.

An evaluation of works carried out by PGCIL sub transmission Phase-I scheme in Bihar has also been done by CEA and it has been found that while the equipment and installations at various substations is of good quality, there is need of better infrastructure and developmental works within the substation complex that is facilities such as land- filling/landscaping, internal roads/footpaths, boundary walls etc could be improved.

B. Bihar Sub-Transmission Scheme Phase-2, Part-1

Phase-II, Part-I of the scheme at an estimated cost of Rs 629.22 crores. was approved by BSEB in May 2006 The scope of works included works to be implemented by PGCIL on behalf of BSEB and certain works to be implemented by BSEB. Subsequently, BSEB has requested for inclusion of certain additional scope under the scheme to be implemented by POWERGRID. Details of the scope of works including additional scope are as per **Annex-IV**. The scheme is under implementation and as per PGCIL some of the contracts for major Transmission Lines and

Sub-Station packages have already been awarded and for balance packages bids have been received/ NIT have been issued. PGCIL have also submitted revised cost estimate of **Rs 1005.72 crores** including cost for additional scope of works for approval.

C. Bihar Sub-Transmission Scheme Phase-2, Part-2

Feasibility cum Detailed project Report at an estimated cost of **Rs 1240.86 crores** has been prepared and submitted by PGCIL for approval. Details of the scope of works covered under Phase-2, Part-2 are at **Annex-V**. Implementation of the scheme is proposed to be taken up after completion of Phase-2, part-I of the scheme.

36. After the implementation of the above schemes sub-transmission requirements of Bihar would generally be adequate for meeting the increased load requirements for the next three to four years. However, depending upon areas/pockets of future load growth certain sub-transmission strengthening works and augmentation of transformation capacity at 220/132/66/33 KV may be required for which BSEB would need to assess their requirements and take further necessary action.

D. Operation and Maintenance of Transmission System

37. There is an urgent need to evolve a system for maintenance of the substations by BSEB for which they should deploy trained manpower in proper strength at the various substations for operation and maintenance so that infrastructure created is properly utilized. Alternatively BSEB may consider outsourcing this activity of O&M.

E. Out of Service Transmission System

38. A number of 220 kV and 132 kV transmission lines in BSEB are not in service over a long period of time, which not only affect power supply to the consumers of Bihar but also created operational difficulties of the integrated grid operation of the Eastern Region as a whole. Based on the information received from Eastern Region Power Committee, the out-of-service transmission lines/elements are given at **Annex-VI**. These transmission elements are required to be restored immediately. Recently, BSEB has informed that they have taken up necessary initiative in this regard.

39. Also, the protection system of BSEB system/lines at 132 kV & 220 kV level is very weak and not functioning properly resulting in sustained faults not cleared by protection system and thereby causing stress on 400/220 kV ICTs at Biharshariff grid S/S of Power Grid and delayed clearing of faults by tripping of 400/220 kV ICTs. Frequent tripping of this type may soon lead to damage to the ICTs which may force disruption of power supply to Bihar.

A power map of Bihar sub-transmission scheme is enclosed at **Exhibit-1.**

F. Recommendations

40. The following recommendations would have far reaching implications on the entire transmission system of Bihar-leading to positive results.

- Proper maintenance of the existing transmission lines and sub-stations.
- Protection system and metering arrangement of the State transmission network should be revamped by BSEB for reliable power supply to the consumers
- Measures to reduce AT&C losses, prevention of thefts and adequate reactive power compensation for better quality of power.
- Taking over of completed sub-transmission works from POWERGRID by BSEB.
- Early restoration of the 220 kV and 132 kV transmission lines in BSEB which are not in service over a long period of time.
- Early finalization/execution of works covered under strengthening of sub-transmission system-Phase-II, Part-II.
- BSEB to identify system requirements identifying weak areas to meet future load growth in Bihar by 2011-12 and implement necessary transmission, sub-transmission and distribution system and also tie-up for sufficient generation so as to achieve at least 3400 MW of demand level by 2011-12.

CHAPTER-5

REQUIREMENTS FOR SUB-TRANSMISSION & DISTRIBUTION SYSTEM

Introduction

41. Bihar State Electricity Board is responsible for promoting coordinated development of Generation, Transmission and Distribution of electricity in the State. Power development in Bihar has not kept pace with other States and over the years the gap in respect of basic infrastructure, per capita consumption of electricity and rural electrification has widened. Reorganisation of the erstwhile State of Bihar in to the States of Bihar and Jharkhand (a new State) in 2001 has deprived it from major generating plants which have gone to Jharkhand. A change in the consumer base with substantial loss of industrial consumers and increase in domestic consumers has further added to the woes of Bihar State Electricity Board (BSEB). The State Government and the BSEB have initiated concerted and coordinated efforts to improve the situation which inter-alia includes strengthening of Transmission & Distribution (T&D) system and electrification to reach all households by 2012.

42. The T&D losses have increased from 15.46 per cent in 1999-2000 to the order of 38.88% (2004-05) as compared to the national average of 31.25% (2004-05). The revenue collection in the year 2005-06 was Rs.867 corers (50%) against an assessment of Rs. 1630 crores. AT&C losses in the State have been reported by BSEB as 46.38 % for 2004-05 as compared to the national average of 33.82 %, which shows very poor collection efficiency in the State. All the feeders, consumers and distribution transformers are not metered reflecting on revenue realisation and identification of high loss areas.

43. Due to the absence of an adequate backbone electricity infrastructure like power sub-stations, 33 and 11 kV lines, distribution sub-stations and LT lines, it would require much more investment in the State as compared to other States. Investment friendly climate has been created and more than 100 investors have shown their interest to set up industries in the State including NRIs. With this, the demand for electricity in the State of Bihar is likely to increase tremendously and electricity distribution network has to be designed so as to cater to the requirements of power of various sections of consumers.

44. It has also been reported that as many as 662597 consumers(irrigation) are to be energized and the demand would thus increase due to this. Peak demand projected by CEA in Bihar in the year 2012 is 3607 MW. However, BSEB has estimated that the peak demand of Bihar would rise to 10000 MW plus by 2011-12 based on state power policy to attend per capita consumption of 650 units. CEA has agreed to review the demand after one year.

45. As per the information given by BSEB, the availability from various sources in the year 2012 would be of the order of 5165 MW(present allocation:1170 MW, projected allocation 3595 MW and Generation from MTPS & BTPS : 400 MW) against a peak demand of 10000 MW plus thereby indicating a shortage of 4835 MW plus. This is based on the demand projected by the CEA. However, additional schemes would be required for peak demand beyond 3607 MW.

A. Need for Further Improvements in Sub-Transmission and Distribution (ST&D) Network

46. The per capita consumption of electricity in Bihar is presently estimated at 75.06 kWh (2004-05), which is very much below the national average of 612.5 kWh (2004-05). The economic growth rate has been practically stagnant during the last few years. Inadequate infrastructure is posing a major constraint in reaching reliable and quality power to millions of people of the State and has put a cap on industry and power demand. The present distribution system in the State, before the implementation of APDRP, is considered to be very weak. Most of the villages are without any electricity. However, with the initiatives being undertaken by the State Government, it is expected that that this situation would improve in the near future and the economic growth rate would increase.

47. Some progress in this regard is already visible. Rural Bihar has started getting power supply, with improved sub-transmission and distribution system. Urgent steps, however, are needed to strengthen the existing sub-transmission and distribution (ST&D) network in the State so that it is able to cater to the future power development in the State. High level of aggregate technical and commercial (AT&C) losses and lack of adoption of Information Technology (IT) facilities in electricity distribution sector is also a cause of concern. The development of infrastructure of power distribution system in the State could not take place with requisite pace due to the following reasons:

i. Delay in land acquisition;
ii. Lack of human resources;
iii. Delay in formulation of project reports due to lack of base line data;
iv. Lack of experience in preparation of bankable detailed project reports (DPRs); and
v. Frequent transfers of implementing officers.

B. Accelerated Power Development and Reforms Programme

48. The Government of India approved during 2000-01 a scheme called Accelerated Power Development Programme (APDP) - now rechristened as Accelerated Power Development and

Reforms Programme (APDRP) to provide systematic finance to enable SEBs/Utilities to take up distribution sector reform. APDRP has been formulated to finance specific projects for up-gradation of sub-transmission and distribution (ST&D) network. Under this programme strengthening of distribution system has been taken up to improve the quality and reliability of power supply and reduce T&D losses. In Bihar, APDRP schemes broadly covers following works:

i. Establishment of new power sub-stations;

ii. Installation of consumer and feeder metering;

iii. Re-conductoring of over loaded 33 and 11 kV lines;

iv. Renovation and modernization (R&M) of power sub-station (33/11 kV) and distribution transformers;

v. Installation of new distribution transformers (DTs) and augmentation of existing DTs; and

vi. Computerisation of various functions in distribution systems and implementation of DMS, supervisory control and data acquisition (SCADA) system for PESU (Patna).

49. The status of the works sanctioned under APDRP and the expenditure status is as below:

i) Cost Estimates

Sanctioned Cost	Rs 854.02 Crores
Revised Cost	Rs. 1066.58 Crores

ii) Work Status

Work for PESU(E), Patna, Muzaffarpur, PESU(W), Darbhanga, Chapra, Gaya, Rohtas, Bhagalpur, Purnea and Saharsa Circles(Eleven) are under execution as shown below:

Table-15 Schemes and their Status

S.No.	Name of Scheme	Target	Completed
1	New 33/11 kV PSS	38	29
2	R&M 33/11 kV PSS	200	198
3	New 33 kV Line	680.2 Km	289 Km
4	New 11 kV Line	378.1 Km	585 Km
5	Reconductoring of 33 kV line	939.0 Km	634 Km
6	Reconductoring of 11 kV line	3046.8 Km	3400 Km
7	System Meter	14,753 Nos.	2190 Nos.
8	Consumer Meter(1 Ph & 3 Ph	5,70,571	2,83,325 Nos.
9	New Distribution Transformer	1919 Nos.	1806 Nos.
10	R&M of DT	6513 Nos.	5275 Nos.

iii) Expenditure Status

	Fund received from MoP	Rs. 311.26 crores
a)	Payment to PGCIL	
	i) PFC Loan account	Rs. 283.08 crores
	ii) Payment by BSEB through GoI fund	Rs. 241.64 crores
	TOTAL	**Rs. 524.72 crores**
b)	Payment for work from BSEB under APDRP	
	Total payment(L.S.)	Rs. 34.09 crores
	GRAND TOTAL(a + b)	**Rs. 558.81 crores**

50. Under APDRP, schemes amounting to Rs.854.01 crores had been sanctioned (Revised sanctioned cost Rs. 1066.58 crores) and are under execution in 12 distribution circles out of a total of 16 circles. Implementation of major portion of the schemes has been entrusted to POWERGRID.

51. As per the information received from BSEB, SCADA system is being established in Patna and IT implementation is being undertaken in the remaining 9 distribution circles. The revised scheme cost of the Project for establishment of this system in these circles is Rs.19.59 crores. Under this system, a common SCADA/DMS Control Centre, Master Billing and Customer Care Centre (MBCC) will be established at BSEB colony. All Billing and Energy Audit Applications would primarily be resided at Master Billing Centre. The database for entire PESU shall be maintained centrally at the Master billing Centre. This Center will be linked with bill collection center to be established at each division and sub-division of both the circles and called as Bill Collection Centre (BCC). To meet the communication requirement of the project, all the substations covered under the project, Division and Sub-division offices and Master control center at BSEB Colony will be linked by Optical Fibre/Radio Communication. Remote Terminal Units) RTUs would be installed at 45 Nos power sub-stations (PSS) for data transmission from PSS to Division/Sub-division offices and finally to Master Billing and Customer Care Centre (MBCC). Computerized billing and GIS based Consumer Indexing is being implemented in Muzaffarpur, Chapra, Darbhanga, Saharsa, Purnea, Bhagalpur, Gaya, Rohtas and Munger circles. The cost of the project works out to Rs.5.27 crore.

52. As per the information received from BSEB, under APDRP, metering for 4 Distribution circles namely PESU (E&W), Patna and Muzzaffarpur is being done by the Board. Metering for 7 Distribution circles namely Bhagalpur, Chapra, Sarsa, Purnea, Rohtas, Dharbhanga and Gaya is being undertaken by PGCIL. The remaining Distribution circle namely Munger would also be taken up by PGCIL.

C. Status of Rural Electrification

53. The coverage under this programme is as follows:

Rajiv Gandhi Grameen Vidyutikaran Yojna: Central Govt. has launched a new scheme "Rajiv Gandhi Grameen Vidyutikaran Yojana(RGGVY) of Rural Electricity Infrastructure and Household Electrification" on 4th April, 2005 for providing access to electricity to all households in the country in five years. As per the report prepared by CEA on monthly basis, the present position of Rural Electrification in Bihar (as on 31.3.2006) is shown below:

i	Total Nos. of Villages	39015
ii	Total Nos. of Villages electrified(as per old definition)	20610
iii	Total Nos. of Villages yet to be electrified	18405

54. As per the information received from BSEB, the works taken up under this scheme are as follows:

(i) PGCIL/NHPC/BSEB have taken up the work of rural electrification in 38 districts as per the details given below:

PGCIL : 24 districts

Patna	Nalanda	Bhojpur	Buxer	Rohtas
Kaimur	Gaya	Nawadah	Aurangabad	Jehanabad
Arwal	Munger	Lakhisarai	Jamui	Bhagalpur
Banka	Vaishali	Muzaffarpur	Saran	Siwan
Gopalgunj	Purnea	Kishangunj	Araria	

NHPC : 6 districts

Sitamadhi	Sheohar	E. Champaran	W. Champaran	
Darbhanga		Madubani		

BSEB : 8 districts

Katihar	Saharsa	Supaul	Madhepura	Khagaria
Samastipur	Begusarai	Sheikhpura		

(ii) On going electrification work in 964 villages and construction of 22 Nos. PSS are to be completed during current financial year by BSEB under RE State Plan.

(iii) The infrastructure for village electrification in Bihar is poor in comparison to other States, as such more budget provision is required to meet the requirement for each village in Bihar against the Budget Provision of Rs.6.50 lacs per village at National level. At present as per the Detailed Project Report (DPR) submitted by BSEB the requirement is Rs.14-15 lacs per village. Even this amount is less considering the fact that the Agricultural and Small Industries connection have not been taken into account in the DPR as per the norms of RGGVY.

(iv) The details of Accelerated Rural Electrification Programme (AREP)/RGGVY being implemented by BSEB are as follows:-

Particulars	Estimated Cost (Rs crore)	Remarks
PGCIL (22 Districts under AREP) PGCIL (Muzaffarpur & Vaishali districts)	1384.49 119.64	 Supplementary proposal under RGGVY submitted to REC.
NHPC (6 Districts under AREP)	233.50	Supplementary proposal under RGGVY submitted to REC.
Bihar State Electricity Board (8 Districts Proposed under RGGVY)	749.63	In principle approval communicated

So far, POWERGRID has reported progress in 7365 villages and NHPC has reported progress in 564 villages.

D. Development of Franchisee in BSEB

55. As per the information received from BSEB, the Board has adopted a Phased Manner Development of Franchisee Scheme for different activities of Electricity Distribution in Rural Areas for empowerment of rural consumers and to improve consumer services and also to increase revenue collection.

56. Franchisee system for management of rural development has been made mandatory under RGGVY to make the revenue model sustainable. RGGVY allows individuals, NGOs, Private Enterprises, Cooperatives, Panchayat Raj Institutions to become franchisee. At present, franchisee are mostly revenue based where the activities are limited to revenue collection, attending to compliance, minor repair etc. Bihar has initiated activities for appointment of franchisees for management of distribution of power in rural areas. As per the Agenda circulated by MoP for Conference of Chief Secretaries/ Power Secretaries of States/ UTs on Power Sector Issues held on 23rd and 24th April, 07 at New Delhi , the franchisee system in Bihar is Revenue

collection based. NIT has been issued for 14,370 RGGVY & 20,091 other villages and revenue collection based franchisee are operational in 600 villages.

E. System Improvement Works During XIth Plan

58. Since the works taken up under APDRP would not be sufficient to meet requirement of power by 2012, more number of 33 kV sub-stations, 33 kV, 11 kV and LT lines, re-conductoring of lines, installation of capacitors, installation of new DTs, meters, adoption of IT facilities would be required in a phased manner. Following major works are required to be taken up during the XI Plan:

(i) Completion of ongoing works under APDRP(12 circles) and APDRP works for remaining 4 circles(Details given in **Annexure – VII**).

(ii) Works (in addition to RGGVY) related to additional anticipated load due to agriculture, small scale industry, cold storage etc.

(iii) Development of distribution network for meeting the load growth

(iv) Development of Buddhist cum cultural corridor; and

(v) Provision of IT facilities keeping in view the modernization of Distribution Systems.

59. To meet the power demand of 3600 MW, the transformation capacity at 33 kV level would be of the order of 9000 MVA. The transformation capacity available after implementation of the ongoing schemes would be of the order of 6300 MVA and the balance requirement would be of the order of 2700 MVA. BSEB has proposed that 2600 MVA capacity addition would be done by way of establishment of new Sub-stations and about 100 MVA by way of augmentation of existing Sub-stations capacity. Scheme wise (ongoing) capacity addition envisaged is given in **Annexure-VIII.**

60. Additional requirement of new 33 kV sub-stations, associated 33 kV, 11 kV, LT lines and distribution sub-stations has been tentatively worked out by BSEB as per details given in **Annexure-IX**. In addition some augmentation/R&M works are also required to be carried out. The same have been detailed in **Annexure-X**. The exact requirement would be finalized at the time of preparation of detailed project reports by BSEB or Advisor-cum-Consultant like POWERGRID under APDRP.

61. Installation of capacitors is considered essential to improve the power factor and voltage profile. Accordingly capacitors are proposed to be installed at the existing 33/11 kV Substations. BSEB would ensure installation of capacitors on the new 33/11 kV Sub-stations at the time of construction of the Sub-stations. The installation of capacitors on Distribution transformers was

suggested to BSEB. However they feel that it would be difficult to install and maintain capacitors on Distribution transformers. The BSEB may initially install capacitors on 33/11 kV Sub-station and thereafter install capacitors on Distribution transformers as per requirement. The tentative fund requirement of capacitors is indicated in **Annexure-XI.**

62. In addition to the above works, some additional works such as Computerized billing, GIS based consumer indexing etc. required to be implemented for efficient functioning/modernization of distribution system in the balance 21 District Head Quarters which have not been covered under APDRP. They have also been included in these works.

63. The developmental need for power due to the expected increase in the flow of tourists(after the establishment of Buddhist circuit) and also the associated development of industry etc., which will come up due to the increased commercial avenues in this area in the next 10 years, has also been worked out. The details of the fund requirement for establishment of sub-transmission and distribution system for Buddhist/cultural circuit are given in **Annexure-XII**.

F. Implementation

64. The implementation of activities can be sub-grouped into short term(2007-08), medium term(2008-2012) and long term(2012-2017) depending upon the time schedule in which they are required to be completed. The major activities are classified as under :

Preparedness for Meeting Load Growth

65. During the 11th Plan it is expected that load growth in State of Bihar would be tremendous in view of upcoming commercial activities and due to the State Governments' plan to encourage tourism. New 33/11 kV Sub-stations are to be established at various locations depending upon the consumer congestion. It is generally seen that in setting up of 33/11 kV sub-stations, time and cost over-runs occurs due to delay in identification of site and land acquisition. Therefore, land acquisition for creation of new sub-stations be given top priority so that there is no delay on this account. This activity should be started and completed in the short term plan.

Metering

66. 100% metering at all levels i.e. consumer level, feeder level and distribution transformer level is the first step towards reduction of losses in the system and should be given top priority. Proper emphasis should be laid on energy accounting and auditing(EAA) which is not being done till now in Bihar due to which the present level of losses in Bihar is quite high. Energy auditing would provide the means to identify the areas of leakage, wastage or inefficient use of energy. Preparation of an

effective energy account would be possible only if metering at all levels is in place.

67. Metering at feeder level should be completed in the short term plan. Simultaneously metering at consumer level and distribution transformer level should also be started and ultimately be completed in the long term plan. Implementation of AMR for high valued customers to start with should be undertaken on a pilot basis in the mid term plan and if found successful, the activity can be extended to other customers also.

Computerized Billing and Collection Centres

68. Bihar is lacking in two most basic requirements –consumer database and asset database which can be addressed through IT and communication solutions. The Utility is not having complete record of all consumers which is resulting in revenue loss and thereby low collection efficiency. Mostly the records are being maintained manually especially in rural areas. Electromechanical meters, manual reading of meters, manual bill preparation and delivery and inadequate bill collection facilities is resulting in to overall delay in revenue collection and revenue leakage. Conventional complaint handling process is resulting in delayed redressal and increased dissatisfaction among customers. This problem can be addressed through computerization of billing, collection and service centres. This activity should be started in the short term plan from State Capital, District Headquarters etc. and completed in the mid term plan for other towns.

Consumer Indexing and GIS Mapping

69. Geospatial database developed through GIS based Consumer Indexing and Asset Codification would help the utility in addressing metering and billing issues, new connection release, fuse off call etc. under the aegis of customer care centre. Integrated GIS mapping and Consumer Indexing should be given priority in all the towns. The completion of consumer indexing based on GIS mapping may take 3-4 years time for the entire State. As such identification of Consultant for carrying out this activity, preparation of project report etc. should be taken up in the first year itself. This activity would go parallel to providing metering of consumer, feeders and distribution transformers. However, from second year onwards, the award can be given for consumer indexing and the field activities for data collection, data validation can be started.

Human Resource Development

70. Lack of fresh talent and domain expertise (e.g. in area of IT, communication, SCADA) is impeding development of the power sector in Bihar. Induction of new technology at the field and office level and also proper training of the staff is urgently required for efficient handling of the Distribution systems. Training programmes for employees working in different areas should be

started immediately. This activity is of perennial nature and human resource development with up-gradation of skills and keeping abreast with state of the art technologies should be continued in the short, medium and long term plans.

Outsourcing of Construction and O&M activities

71. It is felt that Bihar is not adequately equipped with manpower resources to develop the infrastructure and to carry out operation and maintenance of distribution equipment efficiently. As such, it is suggested that the construction activities be outsourced to POWERGRID as is being done under APDRP. It is also suggested that outsourcing of O&M activities can be tried on pilot basis and replicated to other sub-stations in case any improvement is observed in distribution system on account of this outsourcing.

Setting up of Accredited Test Labs

72. Bihar is not having adequate number of accredited test labs for meter testing due to which the consumer complaints regarding metering are increasing. Appropriate number of test labs need to be set up so that the work regarding meter testing is handled efficiently. This activity should be started in the short term plan and completed in medium term plan. Details of capacity addition (on going schemes) has been shown in **Annexure XIII**.

G. Fund Requirements

73. The total estimated cost of the works in respect of bringing improvement of the distribution segment and to match with the rising load growth in Bihar has been worked at Rs. 6703 crores (approx.) up to 2011-12. The details of this estimated cost of works is shown in the table-16.

Table-16 Fund Requirements

S.No.	Works	Estimated Cost (Rs. Crores)
1	Construction of New PSS	3844.92
2	Augmentation of PSS / R&M Works	628.45
3	Civil Works(Control room/Swithyard) (139 PSS x21 lacs)	29.19
4	Installation of capacitors	110.00
5	Modernization Works (Computerized billing, data logging at PSS, GIS based consumer indexing for balance 21 Dist. Head Qtrs. Not covered under APDRP (21x 61 lacs)	12.81
6	APDRP works for remaining 4 circles (Motihari, Bhojpur, Arrah and Nalanda)	129.58
7	Development of Buddhist cum cultural corridor	138.25
8	Additional funds for ongoing APDRP Schemes(12 circles)	377.56
9	Energy audit and segregation of losses	2.00
10	Human Resource Developmemt (including establishment of training institute (Rs 1.5 crores))	2.5
11	Outsourcing of O&M activities	479
12	Funds other than RGGVY(agriculture, small scale industry, cold storage etc.(New PSS – 172, 100 kVA DT – 20,000, 63 kVA DT – 1900, 11 kV line – 19,500 Km, LT line 46,800 Km)	Covered under S.No. 1
13	TOTAL	5754.26
14	Price Variation @ 10% 5754.26-377.56(remaining fund for APDRP)	537.7
15	Consultancy (3%) and DPR preparation (3%)=5% of (5754.26-377.56-129.58(4 circles)-4.5(Energy audit & HRD) – 479.00(Outsourcing))	238.2
16	Contingency @ 3% of 5754.26	172.63
17	**Grand Total**	**6702.79**

H. Phasing of Expenditures

74. The estimated fund requirement during short term, medium term and long term for implementation of the above schemes shall be as follows:

Table-17(a) Expenditure Plan in Short Term

Short Term (2007-08)

Particulars	Amount (Rs. Crores)
Additional funds for APDRP	377.56
Additional funds under APDRP for remaining four circles	129.58
Sub-Total	507.14
2% of Remaining amount i.e.(6705 – 507)x.02 =6198x.02	123.96
TOTAL	**636.8**

Table-17(b) Expenditure Plan in Medium Term

Medium Term (2008-12)

Year	Particulars	Amount (Rs. Crores)
2008-09	Issue of NIT(15%), land acquisition(5%)	1215
2009-10	Execution of work(50% of 6065 .00)	3035
2010-11	Execution of work(20% of 6065)	1215
2011-12	Execution of work(10% of 6065)	600
	TOTAL	**6065**

Long Term (2012-17)

It would be too premature to anticipate the fund requirement for improvement of the Distribution sector beyond the year 2012. However, assuming a uniform growth rate, a rough estimate with some expected escalation could be as follows:

Table-17(c) Expenditure Plan in Long Term

Year	Amount(Rs. Crores)
2012-13	1500
2013-14	1500
2014-15	1500
2015-16	1500
2016-17	1500
TOTAL	**7500**

I. Anticipated Benefits

75. Up till now, the focus on the Distribution Sector in Bihar has not been to the extent desired. The result is that the level of AT&C losses in the State are quite high. However with the launching of APDRP schemes which are under progress, the system is expected to improve. In addition, during the XI Plan more schemes for system improvement and strengthening of the sub-transmission and distribution system are likely to be taken up. Benefits anticipated by BSEB in terms of reduction of losses after the implementation of the above schemes are as follows:

Table-18 Accruing Losses (Projection)

Year	% T&D loss	% AT&C Loss	% DT failure
2006-07	36	48	13
2007-08	34	45	11
2008-09	31	37	09
2009-10	28	34	07
2010-11	25	27	05
2011-12	22	25	04

The benefits would further increase if vigorous anti-theft measures are taken.

CHAPTER-6

RENEWABLE ENERGY

A. Energy Scenario

76. Bihar is the third largest populated state in the country. Undivided Bihar had huge coal deposits and water resources necessary for Thermal and Hydel Power Generation. Separation of Jharkhand has left Bihar only with three power generating stations, which are Barauni and Muzaffarpur Thermal Power Generation Stations, and Kosi Hydel Power Station with installed capacity of 1628 MW. The per capita consumption of energy in the state is only 75 units against the national average of 613 units. The overall power position of the state, therefore, is far from satisfactory. The renewable energy sources such as hydro, biomass, solar, wind, etc. can meet the energy requirement, to some extent for lighting, minor irrigation in the villages and captive power generation for industries, as there is a significant potential of renewable energy in the State. The Bihar Renewable Energy Development Agency (BREDA) is the State Nodal Agency responsible for the development and implementation of renewable energy programmes in the State. For hydropower development, the State has Bihar State Hydro Electric Power Corporation (BSHPC).

B. Small Hydro – Potential And Achievement

77. Among the various renewable energy resources for power generation, the state has highest potential for small hydropower projects. So far 92 potential sites with an aggregate capacity of about 195 MW to set up small hydropower projects have been identified. This potential is mainly on irrigation canals and small streams. The following 6 small hydro power projects of an aggregate capacity of 46.1 MW have so far been installed in the State. The project wise details are given below:

Sl. No.	SHP Project	Village / Block / District	Head (m)	Discharge (Cumec)	Installed capacity (unitsXkw)	Date of commissioning
1.	Valmikinagar (East Gandak Cannal)	Valmikinagar / Bagaha–II / West Champaran	5.30	357.30	3x5000	1995-97
2.	Dehri (Sone Western Cannal)	Dehri-on-Sone / Dehri-on-Sone / Rohtas	3.87	226.24	4x1650	1993
3.	Barun (Sone Eastern Cannal)	Barun / Barun / Aurangabad	3.87	99.12	2x1650	1996
4.	Kataiya	Birpur / Basantpur / Supaul	6.10	393.44	19200 (Derated at 1 MW by BSEB, but presently generating at 7 to 8 MW)	BSEB transferred this project to BSHPC on 16th Nov. 2003
5.	Agnoor	Agnoor / Kaler / Arwal	3.37	41.40	2x500	2006
6	Dhelabagh*	Rohtas Distt.	-	-	2x500	17-2-2007

* As informed by BSHPC on 14.6.2007

78. Sixteen small hydro power projects of an aggregate capacity of 13.60 MW funded by NABARD are at various stages of implementation in the State. During the visit of the team constituting members of CEA and Planning Commission on 14th June 2007 for discussion with Secretary (Energy), Govt. of Bihar at Patna, BSHPC informed that 4 more small hydro electric projects namely Dhoba (2 MW), Katanya (2MW), Mathauli (0.8 MW) and Triveni Link Canal -IInd Unit(1x1.5 MW) are under construction. The details of these projects are given at **Annexure-XIV**. In addition, out of the 92 potential sites, detailed survey and investigation of 46 sites have been completed. The State has a significant potential for implementation of mini / micro hydro power projects at Gandak canal system, Sone canal system, Tilabeh Dhar, Khardaha Dhar and Parwana Dhar sites.

C. Biomass Power and Co-Generation - Potential and Achievement

79. It is estimated that there could be a potential of about 200 MW to set up biomass based power projects including co-generation projects. Rice husk based biomass gasification and combustion technology for industrial application and decentralized power generation may be one of the important sources for power generation in the state particularly in northern region of Bihar. Based on the Planning Commission Report, about 65 lakhs tonne of rice is produced in the state. The rice husks of about 22 lakhs tonne produced every year is sufficient to generate nearly 200 MW power in decentralized manner. Nearly 4000 medium and small rice mills are operational in Bihar. Most of the rice mills are running on diesel generating sets due to non availability of electricity in rural Bihar. Nearly, 1000 tonne of husk/day is transported to other states. Since there is no market for sale of the rice husk therefore, it is available at free of cost from the rice millers. In some of the areas, rice mills owners are paying money for the disposal of rice husk. Considering this fact, biomass gasification technology would be the most appropriate and cost effective option for rice millers and other industries for meeting their captive power requirement and energy requirement in rural area on a sustainable basis. So far, following 13 gasifier systems have been installed in Rice mills and other industries in Bihar during the last two years for captive power requirement. These are shown below:

Table-19 Gasifier Systems

Sl. No.	Name and Address	Capacity
1.	Ma Mandeshwari Mini Rice Mill, Barhari, Rohtas	60 KW
2.	Om shakti Sitaram Mini Rice Mill, Ghusiyakalan, Bikramganj, Rohtas	60 KW
3.	Minakshi Modern Mini Rice Mill, Admapur, Karwandia, Rohtas	60 KW
4.	Ma durga Modern Mini Rice Mill, Takia Bazar, Rohtas	80 KW
5.	M/s. Hanuman Industries, Parsathuwa, Mohnia, Bhabhuwa	100 KW
6.	Sri Jamunajee Modern Rice Mill, Dharmpur, Nokha, Rohtas	60 KW
7.	Sir Shankar Mini Rice Mill	60 KW
8.	Sri Mahadeo Jee Modern Rice Mill, Panjar, Rohtas	60 KW
9.	M/s. Arun Rice Mill, Kasaba, Purnia	120 KW
10.	Sinha Rice Mill, Station Road, Masaurhi, Patna	60 KW
11.	M/s. Gupta Re-Rolling Mills Pvt. Ltd., Old G.T. Road, Aurangabad	500 KW
12.	Ashok Cold Storage Ltd., Biharsarif, Nalanda	250 KW
13.	M/s. Swarnkamal Mini Modern Rice Mill, Thatheri Bazar Road Dakhin Tola, Dumraon, Buxar.	60 KW

All the above industries were running on diesel generating sets. The pay back period for biomass gasifier systems ranges from 3 months to 12 months.

Bagasse Based Co-Generation Power Projects at Sugar Mills in Bihar.

80. A study was carried out by MITCON, Pune under Ministry of New and Renewable Energy (MNRE) sponsored project during 1999. As per the study report, 85 MW exportable surplus energy can be generated from 7 major sugar mills in Bihar. Of these, exportable surplus in 5 sugar mills are as under. The details of other two sugar mills are shown below:

Table-20 Sugar Mills

Sl. No.	Sugar Mill Name	Exportable Surplus (MW)
1.	Harinagar Sugar Mills Ltd., Harinagar	40.0
2.	Motilal Padampat Udyog Ltd., Majhaulia	7.0
3.	New Sawdeshi Sugar Mills, Narkatiaganj	7.0
4.	Riga Sugar Co. Ltd. Riga.	3.0
5.	Eastern Sugars and Industries Ltd., East Champaran	7.0

D. Wind Energy

81. A fairly large number of wind pumps were installed and used by the farmers, in particular, in Nalanda district of the state for minor irrigation. After post installation of the wind pumps, due to inadequate arrangement for repair and maintenance and lukewarm attitude of the state nodal agency, the wind pump programme could not be expanded and propagated. It is noted that out of the 117 wind pumps sanctioned by the Ministry to BREDA since 1994-95, only 46 have so far been installed. The State nodal agency, however, is in the process to take up wind resource assessment programme in associate with C-WET, Chennai, to identify suitable potential sites to set up wind energy based power projects.

E. Other Renewable Energy Sources

82. Biogas is an important source of renewable energy for meeting the cooking energy needs in villages. As per available estimates, the State has a potential of about 9.4 lakhs family size biogas plants to meet the cooking energy needs, against which about 1.25 lakhs biogas plants have so far been installed. Solar photovoltaic lanterns have been fairly popular in the state and over 33,000 solar lanterns have been distributed. In addition, about 1700 solar home lighting systems/street lights for lighting and 140 solar photovoltaic pumps for drinking water and minor irrigation have been installed.

F. Remote Village Electrification Programme

83. The village electrification programme of the Ministry is being implemented in the country for providing basic lighting facilities for unelectrified census villages. The Rural Electrification Corporation, which is the implementing agency for the Rajiv Gandhi Gramin Vidyutikaran Yojana (RGGVY), has been given the responsibility of furnishing lists of unelectrified census villages that are not likely to receive grid connectivity apart from lists of remote hamlets of electrified census villages. BREDA, the state nodal agency for implementation of village electrification programme in the state has informed that about 500 unelectrified remote villages have been identified for electrification through renewable energy sources, however, these villages are yet to be verified by REC. BREDA has therefore, not been able to prepare detailed project reports for electrification of these villages.

G. Observations & Recommendations

84. The major observations and recommendations that have emanated from the critical examination of renewable energy resources of Bihar are as follows:

(i) The overall power position in the state is far from satisfactory. The general level of development is low and there is shortage of basic infrastructure. In addition there is a lack of awareness about the various renewable energy resources, available technologies, systems/devices and programmes / schemes of Ministry of New and Renewable Energy.

(ii) Amongst the various renewable energy resources there is an abundant biomass in the form of rice husks and baggasse, small hydro in the form of rivers and irrigation canals and solar energy.

(iii) 92 potential sites with an aggregate capacity of about 195 MW to set up small hydro power projects have been identified. The state needs to undertake detailed survey and investigation of these sites and prepare DPRs, so that the shelf of project are available with the state for implementation in phased manner.

(iv) Business meets/local workshops should be arranged at a few locations in the state to encourage private entrepreneurs/industries to promote biomass gasifiers for captive power generation by utilizing rice husk, baggasse, etc. and to familiarize with fiscal and financial incentives available under various schemes of Ministry of New and Renewable Energy.

(v) With a view to attract private sector participation, in particular, under small hydro and biomass power/cogeneration programme, the Govt. of Bihar needs to formulate and announce conducive policy/guidelines for private investment in these sectors.

(vi) Village electrification of about 500 identified remote villages needs to be taken up on priority basis through small hydro, biomass and/or solar energy depending upon their feasibility.

(vii) In order to implement renewable energy programme in the state effectively, the state nodal agency, BREDA needs to be strengthened. It should have a full-time Director to look after the renewable energy programmes in the state.

(viii) Captive Power Policy should be formulated immediately so that Private Sector participation could increase and private investors can also contribute to development of power sector.

CHAPTER-7

FINANCIAL STATUS OF BIHAR STATE ELECTRICITY BOARD (BSEB)

85. Most of the States in the country has acted fast and took quick steps in the direction of Power Sector Reforms as stipulated in the Electricity Act 2003 and restructured/unbundled their State Electricity Boards and constituted State Electricity Regulatory Commissions to increase the pace of development, their SERCs are issuing Tariff Orders from time to time regularly, whereas the performance of Bihar in the direction of Power Sector Reforms is rather slow. In accordance with the stipulation of the Electricity Act 2003, the State Government has already moved in the directions of restructuring the BSEB with a break down of five sets and Bihar Govt. has constituted its State Regulatory Commission and it has become operational recently i.e. since 15th August, 2005. Generation Capacity is very limited. Bihar's Power Policy is yet to be finalized. Bihar has received 8 offers for IPPs, these will be considered after finalisation of its Power Policy. Financial performance of BSEB/ Power Sector in Bihar is not satisfactory. Its financial position is very weak. As per the Balance Sheet for 2003-04 as on 31st March, 2004 and for 2004-05 as on 31st March, 2005 there is a modest improvement in the net assets of BSEB while the current liabilities has gone down slightly in the year 2005. There is a considerable increase in deficit in the funds on liability side. Borrowing is on a much higher side to meet the working capital requirement, thus reflecting a sizeable amount of debt service taking place, while the current assets does not generate much revenue to even meet the working capital demand. Capital expenditure has gone up significantly and so is the capital liability. There is a sizeable amount of payment due on capital liabilities which reflects poor receivables of bills of BSEB. The reserves fund position is very meagre and has shown a slight improvement in the year 2004-05. A large amount of receivables from its customers is due and this is eroding the financial strength of BSEB. Its inability to collect revenue from its customers is leading to increased borrowings, which further leads to higher interest burden on the expenditure side. On the other hand, chances of realising the arrears which are more than four to five years old, are poor. The net worth of BSEB will be affected severely, in case it decides to waive the interest and/or portion of arrears.

86. Its poor financial position is reflected in certain key areas i.e. Aggregate Technical & Commercial (AT&C) Losses, which are very high in comparison to other States. In a study regarding ranking in power sector got conducted by Ministry of Power, Govt. of India, Bihar is at 27th position. Average per capita power consumption in Bihar is 75 kWh/Person(2004-05) vis-à-vis 613 kWh/Person (2004-05) at All India Level. It was indicated during the discussions with officials of Power Ministry of Bihar that Bihar Govt. is going to take action in this direction very shortly.

87. The major reasons for unsatisfactory performance and poor financial health of the Power Sector in Bihar are outlined below:

(i) Poor performance of power stations. The power stations are running at low Plant Load Factor (PLF) and Availability Factor (AF) is also less due to old age of plants and inadequate Renovation and Modernization activities.

(ii) High manpower levels/overstaffing

(iii) State is lagging behind in the area of new generation capacity addition.

(iv) Low rural household electrification.

(v) Less than 50% revenue of the cost incurred. The gap between ARR and ACS is about Rs. 2.00 / kWh.

(vi) High interest cost and non-receipt of subsidy from Govt. has resulted in large cash losses. Non-receipt of fresh equity support from Govt. has resulted in erosion of its net worth and defaults to lenders/ institutional loans etc.

(vii) Slow progress in the area of reforms.

(viiii) State has made very limited attempts to curb the theft of power.

(ix) Although the BSEB has commenced energy accounting activities in Bihar, in the absence of adequate number and quality of meters (both at 11 KV level, DT levels and at consumer end), it is difficult to carry out comprehensive energy audit to determine real T&D Losses.

(x) As regards Consumer Metering, the action is yet to be taken by the BSEB.

(xi) The AT&C losses are estimated to be more than 40% for the last three years. These figures may be misleading in the absence of any data on the units metered and any scientific assessment of agricultural consumption. For the year 2004-05, Bihar State Electricity Board has reported 46% AT&C losses. In the report submitted by ICRA Limited, the AT&C Losses for the year 2004-05 has been indicated as 48%. Whereas as per the report on the performance of State Power Utilities prepared by PFC, AT&C Losses are more than 70% in Bihar. It has shown trend of reduction by 3% during 2004-05 as compared to 2003-04

(xii) The agricultural consumption/sales of power (in million KWh) was 28% of the total sales, whereas agricultural power revenue was 4% of the total revenue during the year 2004-05. The level of cross subsidization in Bihar for agricultural consumers is sizeable and an area of concern.

88. The comparative power scenario-salient features of physical and financial status of Bihar vis-à-vis All India during 2003-04 & 2004-05 are shown below. The balance sheet for the year 2003-04 and 2004-05 as furnished by BSEB is given at Annexure – XV.

Table-14 Comparative Scenario

Sl. No.	Description	2003-04		2004-05	
		Bihar	All India	Bihar	All India
1.	Total Generation (MkWh)	357	288237	153	298589
2.	Thermal PLF%	7.45		3.24	
3.	Energy Available for Sale (MkWh)	6071	508911	6555	538073
4.	Units Realised (MkWh)	1397	316797	1698	340226
5.	AT&C Losses%	77.00		74.09	
6.	Sale of Power (Rs.in Crores)	947	89489	985	97918
7.	Energy Sold (MkWh)	3883	334082	4072	358915
8.	ACS (Rs./Kwh)	3.40	2.39	3.44	2.50
9.	ARR (Without Subsidy) (Rs./Kwh)	1.77	2.02	1.73	2.08
10	Gap (Without Subsidy) (Rs./Kwh)	1.63	0.37	1.71	0.42
11.	Profit before Tax (Rs. Crores)	(987)	(8162)	(1122)	(10501)
12.	Profit after Tax (Rs. Crores)	(987)	(8265)	(1122)	(10816)
13.	Profit/Loss without subsidy (Rs.Crores)	(987)	(19722)	(1122)	(22126)

(Figures in brackets indicate negative i.e. loss)

Source: Report on the Performance of the State Power Utilities for the year 2002-03 to 2004-05 of PFC (March 2006) and Performance Rating Report of MOP.

89. Bihar State has constituted its State Electricity Regulatory Commission which has become operational since 15th August 2005. Bihar Electricity Regulatory Commission has issued its first Tariff Order. The Regulatory Commission has framed seven regulations and under the provisions of Electricity Act 2003, has issued guidelines which include the following:

(i) Reduction of losses in the system;

(ii) Rational power supply to the consumers;

(iii) Augmenting generation, transmission & distribution system;

(iv) Third party meter testing arrangement for random checking of the meter;

(v) Massive drive to be conducted to check pilferage & theft of electricity;

(vi) To promote 100% metering arrangement as per guidelines of the Act & National Electricity policy; and

(vii) Establishment of sound redressal mechanism to mitigate the grievances of power consumers.

Recommendations

90. In view of the position stated above, major initiatives are to be taken by State/Central Govt. and BSEB in the following directions:

(i) The gap between ARR & ACS needs to be reduced by reducing ARR and increasing ACS; Steps are required to be taken to reduce Commercial Losses and increase the Revenue realisation;

(ii) Action should be taken for 100% metering of power consumption;

(iii) Reforms process in the state is required to be expedited by restructuring of BSEB;

(iv) Progress of rural electrification under Rajiv Gandhi Grameen Vidhyutikaran Yojana needs to be improved;

(v) Tariffs are to be decided for Energy generated through Non-conventional/Renewable sources; and

(vi) Regulation for intra-state wheeling charges, open access etc. also need to be issued.

CHAPTER-8

ENERGY CONSERVATION AND DEMAND-SIDE MANAGEMENT

Background

91. There has been a steady growth of power generating capacity in India. However, the growth in demand for power has exceeded the generation capacity as a result of which country is facing energy as well as peaking shortage. Besides capacity addition to meet the growing demand, the other alternate way to bridge the gap between demand and supply is to optimally utilize the existing generating capacity and ensuring the efficient use of available energy by adopting energy conservation measures at consumers end as well. With increase in the cost of energy, there has been improvement in the general awareness level of consumers to make efforts to reduce energy consumption/requirement by using more efficient equipment.

92. There is substantial scope for conservation of energy in various sectors of the economy. The report of National Development Council Committee on Power has indicated the potential for energy the conservation in industrial, agricultural and domestic sectors. Sector-wise conservation potential in the country has been estimated as follows: Industrial – 25%, Agricultural – 30%, Domestic & Commercial – 20%, Transport – 20%, Economy as a whole – 23%. Though a large number of energy conservation measures have been taken to realize its potential, there is a need to consolidate further the gains made so far, including the consequential reduction in environmental emissions. Thus, it is an imperative need to have an integrated approach to make available the basic infrastructure essential for strengthening further the action plan for taking up the energy conservation in a big way to mitigate the gap between demand and supply with least cost options.

A. Supply Side Management

93. The thermal units in the country have a unit capacity of upto 500 MW. Higher rating units may be installed in the coming decade. There are many smaller units of size ranging from 30 to 100 MW, which have been operating for over 20 years. Some of the earlier units of size 200/210 MW are of old design and are operating with poor efficiency. These units need residual life assessment studies, renovation and modernization and complete refurbishment to improve the efficiency in generation.

94. Thermal power stations in the country are operating with high auxiliary power consumption and secondary fuel oil consumption. These factors, coupled with poor operation and maintenance practices, result in poor efficiency of the stations. Energy audit studies carried out by CEA on a few thermal power stations have revealed that the power stations are losing heavily due to poor condenser vacuum, non-availability of HP heaters, excessive consumption of DM water, air ingress into the boiler, high flue gas temperature and a number of other reasons. Most of the power stations were incurring huge financial losses due to sub-optimal operation resulting in increased coal & oil consumption.

95. CEA has also prepared "Guidelines for establishment of Energy Audit Cells at Thermal Power Station" to encourage thermal power stations to establish energy audits cells in their TPS. Energy Conservation Act 2001 would make it mandatory to get energy audit of power stations done through Accredited Energy Auditors. Energy Audit and implementation of recommendations to improve operational efficiency may form part of regular activity and necessary financial arrangements may be made accordingly. Thermal Power Stations whose annual energy consumption is 30,000 metric tonne of oil equivalent (MTOE) and above have been notified as designated consumers.

96. The Act empowers the central government to direct designated consumers to:-

(i) Designate & appoint certified energy manager in charge of activities for efficient use of energy and its conservation;

(ii) Get an energy audit conducted by an accredited energy auditor in the specified manner and intervals of time;

(iii) Furnish information with regard to energy consumption and action taken on the recommendations of the accredited energy auditor to the designated agency; and

(iv) Comply with energy consumption norms and standards

97. Transmission and Distribution (T&D) losses in the Indian system are amongst the highest in the world. Presently, the all India T&D losses are around 31% out of which substantial portion is non-technical losses and theft. Reduction of the non-technical losses could be achieved with better management at a little extra cost. Schemes have been drawn up to reduce technical losses by installation of additional capacitors, appropriate size of the transformers, installation of amorphous core transformers, augmentation and strengthening of transmission and distribution lines and reduction of the length of low voltage lines. Based on the guidelines issued for reduction of transmission and distribution losses and energy audit in power system, Utilities have been encouraged to reduce the T&D losses by implementing the schemes in regard to computerised system load management through segregation of load to agriculture and introduction of Time of

Use (TOU) differential tariffs etc. T.O.U. Tariffs should be such designed in the form of incentive of lower rate that it should encourage use of more energy during off-peak hours and higher rate should be fixed to discourage the use of energy during peak-hours. Regional staggering of load should be aimed to stagger the load and minimizing the load of the system during peak hours. These efforts have to be vigorously followed up along with steps to curb pilferage and theft of electricity.

98. Indian power system is around hundred years old. With latest technology developments, there is ample scope for improvement in the system of generation and supply of electricity to the ultimate consumers in the most effective and efficient way within acceptable environmental level. Some of the latest technologies are computer aided up-gradation of sub-stations, supercritical pulverized fuel units, and Integrated Gasification Combined Cycle (IGCC) plants.

B. Demand Side Management

99. Electric utilities in the country have increasingly realized that load commitments can be met not only for constructing new generating plants but also by influencing electricity demand. This demand side management (DSM) process requires that electric utilities promote measures on the customer's side of the meter to directly or indirectly influence electricity consumption to meet desired objectives. DSM programs must aim to achieve three broad objectives:

Energy Conservation

100. DSM programs can reduce the overall consumption of electricity by reducing the need for heating, lighting, cooling, cooking and other functions. For example, adding insulation to a building can help reduce the need of heating in winter and cooling in summer.

Energy Efficiency

101. DSM programmes can encourage customers to use energy more efficiently and thus get more out of each unit of electricity produced. For example energy efficient light bulbs or ballasts provide the same amount of light but use significantly less energy than conventional units.

Load Management

102. DSM programme must encourage the consumers to use electricity during off peak hours so as to reduce the gap between peak and off peak demand. This is to be addressed through judicious pricing of electricity. It must not result into shifting of the crest of the load curve.

Energy conserved is energy produced. There is an imperative need for adopting energy saving measures and demand side management to even out the load curve as well as make productive use of energy. The effective DSM can result in vast saving.

C. Strategy of Load Management in Agricultural Sector

103. Load Management aims at regulating loads without any loss of productivity such that the system load curve matches with system optimal capability, to minimize the overall cost. Load management results in substantial reduction of peak power losses and better utilization of system facilities. The irrigation pump sets are adjudged to offer the best opportunities for Load Management in Indian power systems, on account of their unique characteristics. Therefore, Load Management of agricultural loads must be encouraged in the districts with substantial number of agricultural pump sets. Some utilities are practicing single phasing arrangement for control of agricultural pump sets. The practice is not advisable as it leads to unbalance loading of the network causing considerable burning of transformers. Remote Controller Load management schemes (RCLM), which involve segregation of agricultural consumers and regulation of supply as per pre-announced schedule in two or three groups with power supply during non-peaking hours, may be evolved for DSM if 24 hour supply is not available due to gap between generation and load.

104. The benefits of the scheme would be reduction in technical losses on account of reduction of peak demand at the 11 kV bus. There would be uninterrupted power supply to domestic, commercial and industrial consumers etc. Surveys conducted on end use efficiency have indicated that the overall efficiency of pump sets is as low as 15% - 28%. Energy efficient pump sets having efficiencies up to 60% are available in the market. A mechanism through the DSM policy is to be evolved so that use of efficient pump sets is encouraged. Incentive and disincentive schemes can also be devised to discourage use of low efficiency pumps. The improvement of end use energy efficiency has assumed great importance in view of continuing power shortages. The following measures could be adopted:

(i) Improvement of efficiency of agricultural pump sets through rectification, use of PVC pipe, efficient foot valve.

(ii) Improvement in end use efficiency through customer education to popularise the use of energy efficiency devices viz. energy efficient motors through variable speed derive, compact fluorescent lamps (CFL),electronic ballasts.

(iii) A three phase agricultural pump set to be enabled to run only if capacitor is installed and to be disabled to either to start or run without a capacitor. These capacitors shall be inbuilt and not transferable.

(iv) Launching of campaign by utilities for replacement of existing inefficient pump sets by

newly developed energy efficient pump sets.

(v) To take up Research & Development (R&D) programme for development of energy efficient pumping system and commercialization of prototype of energy efficient pumping system.

(vi) Infrastructure for setting up comprehensive motor/pump testing facility including design, evaluation of energy efficient labeling system etc.

(vii) All household electrical appliances e.g. mixer grinder, coolers, air conditioners, heater etc., should be covered under energy labeling scheme.

D. Strategy of Load Management in Industrial Sector

105. Energy consumption in any industry is dependent on many complexities viz. technology used, variety of raw material and its quality, structural & operational disparities, heterogeneous composition of newer and old plant etc. There is a need to carry out energy audit in the industries and regulatory frame work to be introduced to implement the same. The energy efficient integrated steel plant are to be made available with high efficiency. The other strategies to achieve demand side management are;

(i) Use of equipment for Time of Day (TOD) employing TOD meters to be promoted in the first phase for HT consumers and in the second phase it could be employed for LT consumers as well, The tariff should be such that it enables flattening of load curve rather than shifting the peak.

(ii) Staggering of working shift/working hours of the industries.

(iii) Staggering of weekly off days by the industries.

E. Strategy of Load Management in Domestic and Commercial Sector

106. The major end users are lighting lamps, fans, refrigerator, air-conditioners, desert coolers, electrical heaters and other appliances. Strategies to be adopted for energy conservation in this sector are:

(i) Development and enforcement of energy efficiency standards;

(ii) Energy labeling and Bureau of Indian Standard (BIS) certification of all energy using devices to be made mandatory;

(iii) Consumer awareness campaign;

(iv) To provide incentive to energy efficient equipment manufacturers and

(v) Promotion of vapour absorption refrigerators to utilize waste heat available in hotel/ restaurant and also energy efficient lighting appliances such as CFL, electronic ballasts etc. Presently CFL electronic ballasts are very highly priced as compare to conventional bulbs. The price of such CFL/electronic ballasts is to be regulated to make their sale competitive, only then DSM programme can be effected. DSM need to address this issue suitably.

107. The following measures on the Demand Side Management(DSM) in Power Systems at Low Tension (LT) Level should be adopted:

(i) Reduction of Aggregate Technical & Commercial (AT&C) losses in LT distribution system by installation of LT switched capacitors and amorphous core distribution transformers (AMDTS)

(ii) Adoption of High Voltage Distribution System (HVDS).

(iii) Metering to all the consumer has been the mandate of the Electricity Act 2003 it has been experienced by the DISCOMs/SEBs that the installation of meters have resulted in reduced energy consumption as a result of curb on use of free electricity. DSM policy can advice SERCs to make the energy audit compulsory and ensure 100% metering all the time through regular vigilance.

(iv) Computerized Load Management Scheme at LT level through segregation of agricultural load from other loads to reduce peak load.

(v) Energy Audit of Power Systems up to LT level to pin point excessive loss area. This scheme is also being implemented as MoP sponsored programme in Haryana and Punjab etc. Such schemes may be taken up at larger scales in all states having larger LT network with high losses in the system.

(vi) Introduction of time of Day (TOD) electronic meters and introduction of TOD tariff. Installation of TOD meters and Time of Use (TOU) tariff would help in flattening the load curve by way of giving incentive/disincentive to consumers during off peak/peak hours respectively. This activity may be taken up in respect of all LT consumers only after success of TOD use in case of HT consumers in the country. DSM policies need to address this issue and advice SERC to devise methodology.

F. Consumer Awareness

108. Improvement in customer awareness can be brought by providing relevant information to customers on demand side via seminars, brochures and other literature which will include broadly:

(i) Application of rewound motors to be discouraged;

(ii) Stringent legislative frame work to check energy theft;

(iii) Load balancing among phases to be taken up by the Utilities;

(iv) Use of light colors on walls and ceilings;

(v) Regular cleaning of lamp fixtures;

(vi) Avoid use of decoration and concealed lights;

(vii) Turn off the lights when not in use;

(viii) Minimize break down in the process and in the utility operations to flatten the load curve;

(ix) Avoid idle running of the drive motors; and

(x) To encourage demand management from the consumer side in terms of quality and price of the various devices, effective monitoring should be carried out by suitable regulatory mechanism.

G. Other Measures

109. The other measures that need to be adopted are as follow:

(i) Setting up of Energy Conservation Cells by the utilities and industries and energy audit with maintenance of consumer data base is made mandatory.

(ii) Promotion of Industrial Cogeneration through bio-mass and other resources.

(iii) Incentive for maintaining better plant load factor and penalty for low plant load factor especially for Arc furnaces and welding transformers.

(iv) Carrying out the load survey to assess the proper matching of induction motor rating and the load to be driven.

(v) Use of Information Technology for load survey, adoption of Distribution automation and implementation of DSM be made mandatory by the DISCOMs.

(vi) Benefits need to be quantified

(vii) Regular Training of manpower by the Power Utilities to promote DSM activities be made compulsory.

(viii) Incentives to DISCOMs for achieving best results on implementation of DSM in terms of improved load factor and reduction of losses.

(ix) Reward to employees on individual basis as well as in groups at Division/Sub-Division level.

(x) Control of street lights by use of suitable timers.

(xi) Regular maintenance and checking of meters for assessment of Peak Demand.

(xii) Maximum utilizations of natural energy in buildings i.e. encourage energy efficient buildings.

(xiii) Reduce failure of distribution system elements.

(xiv) Proper alignment of motor and pump (load).

(xv) Development of Management Information System (MIS) for DSM.

(xvi) Development of Quality Plan and Quality systems.

(xvii) Systematic approach of Distribution System Planning.

(xviii) Optimize the lighting system.

(xix) Incentive to consumers for energy conservation.

H. Incentives for Energy Conservation Measures

110. The Government is giving following incentives to industries & others for encouraging conservation of energy:

(i) Government of India provides 50% to 80% subsidy to utilities/industry & others for implementing energy conservation measures, getting energy audits done, energy conservation related pilot/ demonstrative and R&D projects etc.

(ii) Yearly National Energy Conservation Awards are given to industries in recognition of their special efforts to reduce energy consumption while maintaining their production.

(iii) Annual incentive awards are given to thermal power stations in the country for encouraging them to reduce their own Auxiliary Power Consumption and fuel consumption during generation of electricity.

(iv) Incentive awards are given to Power generation & transmission companies for encouraging them to reduce T&D losses.

I. Recommendations

111. The following recommendations need serious consideration and implementation by the State Government:

(i) State Power Utilities should promote CFL (Compact Fluorescent Lamp) even by providing subsidy since the present cost of CFL is not conducive to its large scale application. The saving achieved by extensive use of CFL would be more than the subsidy on this

account and would justify the latter. State Governments like Haryana, Punjab, Delhi etc. have issued notifications for mandatory use of CFLs and ISI Mark equipments for use in all Government buildings to promote energy conservation in Govt. Sector.

(ii) State Government should consider providing incentives to Municipality/ Local bodies for up gradation of energy efficiency of water pumping and sewage treatment plants as well as municipal lighting. Energy efficiency measures in water pumping and sewage treatment plants could help in solving the problem of payment of electricity supply dues payable to the utility.

(iii) The institution of Energy Service Companies (ESCOs) should be consciously promoted. ESCOs should be encouraged to promote energy efficiency particularly in agricultural pumping system.

(iv) There is a need to isolate the feeder at block level where ESCOs could be encouraged to revamp and repair the entire agricultural pumping system to improve energy efficiency. This would ensure the integrity of the pump and its energy efficiency level.

(v) Energy audit in the government buildings shall be arranged by State governments and implemented to effect the energy conservation.

(vi) Time of the day (TOD) meters would be introduced for large consumers to start with.

(vii) The State utilities would provide budget for making energy conservation campaign on TV, Radio, newspapers etc. communicating the message “Do not waste energy” by appropriate slogans etc.

(viii) Quantifiable energy conservation targets shall be fixed by the state government through the state designated agencies.

(ix) Automatic switching on and switch off for the street lights in various municipal areas needs to be introduced on an urgent basis. The devices installed could be photo-sensitive or other automatic timers etc.

(x) The State Government may introduce state energy conservation awards on lines similar to the national energy conservation awards for industries, commercial buildings etc.

CHAPTER-9

HUMAN RESOURCE DEVELOPMENT

A. Importance of Manpower Planning & Training

112. It has been observed that there is a shortage of trained man power in the BSEB and in the entire power sector of the State. There has been no recruitment in BSEB since 1984.Moreover with subsequent retirement, the shortage of technical workforce is further aggravated. Of late, BSEB has started recruitment of engineers on contract basis. Besides the Board is contemplating regular appointment in each cadre. It is proposed that the whole appointment process will be outsourced to I.I.T.

Bihar Govt. has recently initiated action plans for setting up new generating capacity in thermal and hydro sector and taken up works related to strengthening of existing transmission network, construction of Grid sub stations with associated transmission line, strengthening of distribution system under APDRP scheme and Rural electrification project under RGGVY to meet the growing electricity demand of the State. The goal of the utility is to generate electricity of right quality and quantity at an economic cost and supply to the consumers efficiently, whenever and wherever required.

113. To accomplish this task, trained manpower is required at every stage of design, planning engineering, procurement, handling and storing, construction, commissioning and operation and maintenance of power plants and associated transmission and distribution system, energy sales and collection of revenue, management of personnel and finance etc.

114. The technical knowledge acquired from engineering colleges, polytechnics, industrial training institutes and other technical institutions provides the basic foundations but needs to be supplemented with the applied engineering skills required for professional success in particular speciality. All these skills are to be regularly updated to cope with the ever progressing and rapidly advancing technologies being introduced in the power sector where the speed of obsolescence often overtakes the acquisition of particulars skill and knowledge. It has been noticed that due to the introduction of more sophisticated technology and automation, the Man/MW ratio is declining. The Man/MW ratio in thermal sector has been reduced from 4.71 in 6th Plan to less than 2.0 in the 9th plan and expected to go down further in the subsequent Plans. The same trend follows in the Hydro Power Sector also, where the Man/MW ratio of 6.04 in the 6th Plan has come down to about 2.0 in the 9th Plan and expected to go down further. This indicates the increasing importance of each individual which, in turn, makes manpower quality

more demanding. Also, it must be noted that power sector industry is a highly capital intensive industry. Cost of installing a power plant has increased three to four times during the last decades. This necessitates the operation of the plants and equipment in the most safe and efficient manner possible to minimize the cost of generation.

115. Bihar Government is in the process of restructuring BSEB. The reforms will change the way BSEB has been functioning for the last decade and will usher in major changes in the roles of technical/managerial personnel at various levels of hierarchy. As power sector reforms involve a number of complex and intricate issues, the people involved will need specific inputs in terms of knowledge and skill to enable them to play their change role effectively. To achieve the above objectives, it is very important to assess the manpower engaged in the power industry and future trends in this regard (based on the assumed norms of Man/MW and capacity addition programmes) in the coming Plans so that identification of important thrust areas for vital, essential and desirable training activities for the future are planned in an appropriate manner.

B. Existing Training Facilities in the Power Sector

116. Training is basically needed for imparting requisite skills to fresh recruits and to update the knowledge and skills of serving personnel from time to time to absorb the latest technologies and innovations. As per Section 73 of the Electricity Act, 2003, CEA is responsible for promoting measures for advancing the skill of persons engaged in the electricity industry. In pursuance of the above provision in the Act and to ensure the required standard of training, CEA had issued guidelines and norms for setting up of training institutes and procedural requirements of getting recognition from CEA. Accordingly, CEA has been regularly inspecting training institutes established in the state/central/private sector Power Utilities.

117. National Power Training Institute (NPTI) is the National Apex body for Training and Human Resources Development in Power Sector with its Corporate Office at Faridabad. NPTI operates on an all India basis through its nine (9) Units in different power zones of the country located at Faridabad, Neyveli (established 1965), Durgapur (established 1968), Badarpur (established 1974), Nagpur (established 1975), Centre for Advanced Management and Power Studies (CAMPS), Faridabad (established 2000), Hydro Power Training Institute (HPTI), Faridabad (established 2002), Power System Training Institute (PSTI) (established 1972), Banaglore and Hotline Training Centre also at Bangalore (established 1974).

118. The Power Management Institute (PMI) was set up by NTPC in Noida,UP in recognition of the vital role that management development has to play, in the context of the challenges associated with the growth of the Indian Power Sector. The Institute is involved in the training and development of middle and senior level personnel not only from the power sector but from

organizations outside the sector also. The Power Management Institute is committed to be a leading institute in developing world-class competencies by providing a state-of-the-art training, which responds to and proactively meets the needs of the power professionals.

C. Training Strategy

119. Training is needed basically for:

- Fresh personnel being inducted
- Change in technology/operating procedures/environment
- Improvement of Performance/ Skill/ attitude etc.
- Refreshing knowledge/skill

To fulfil the above needs, training of following categories of manpower has been suggested:

- Induction level training for new recruits
- Refresher/advanced training to existing employees
- Management training to the Managers

Induction Level Training

120. Induction level training is mandatory under Indian Electricity Rules for thermal and hydro power stations. Training is to be imparted in recognized training institutes and is of 52 weeks duration for employees (Engineers/Operators/Technicians) engaged in thermal generation. The training is of 9 months duration for engineers and 6 months for the others working in hydro power stations. Though induction level training is not mandatory for Power Systems personnel, BSEB should provide long-term induction level training to their employees engaged in T&D with 12 months for engineers and 6 months for Operators & Technicians. The induction level training is a must, since through this training the organization imparts corporate culture, discipline, responsibility, knowledge and skills to the fresh entrants. NTPC has established a well-designed system of induction level training to the fresh entrants at all levels. BSEB must follow the example of induction level training as is being observed by NTPC.

Refresher/Advanced Training

121. The post employment training provides opportunities for personnel at the different levels of the organizations to gain new skills and to take up new responsibilities and keep pace with the advancement in technology. It is desirable that each employee of the organization must be exposed to at least two weeks refresher/ advanced training during a Plan Period (5 years). It may

be one training programme of two-week duration or two training programmes of one week's duration each. Due to the fast pace of changing technology in the field of control and instrumentation and other fields like modern operation and maintenance practices, environmental protection etc., specialized courses must be organized by the Utility in association with manufacturers/ vendors, consultants, academicians etc. Also, specialized programmes must be organized for improving the workmen's skill mainly in maintenance work. There are instances that equipment/systems do not perform properly after maintenance/overhaul due to poor quality of work. Training should also be arranged for each employee on promotion/ transfer who calls for performing new/different roles and changed working conditions.

Management Training

122. For Non-Technical category, as per recommendation of National Training Policy (1996), Deptt. of Personnel & Training, Govt. of India, the principle of "Training for All" with a 5 year cycle for every Plan is adopted. Continuous development of Executives/ Managers, especially at the transition period in their career and in the context of repeatedly changing business environment, is of utmost importance. It has been noticed that while there is a large number of capable and knowledgeable engineers available in all Divisions/Departments of the Power Sector, but their managerial ability is often below the required standard. Due to the process of Reforms, i.e., restructuring, unbundling, privatization etc., the role of managers has gained more importance. Therefore, Management Programmes to develop necessary competencies among them have become essential. Executives in Finance and Management with non-technical background should also be provided technical orientation through suitable training programmes. It is felt that all Executives/Managers in the Power Sector must be exposed to at least two weeks management training during a Plan period of five years.

D. Manpower Assessment for Future

123. The personnel employed in the power supply industry can be broadly classified as Technical and Non-Technical manpower. Technical manpower comprises of technical officers, engineers, store keeping officers, research officers, chemist, information technology personnel, analyst, study assistants, operators, chargemen, technicians, welders, moulders/ turners, blacksmith, draftsmen/tracers, engine drivers, masons, blue printers, attendants, pump operators, etc. Non-technical manpower comprises of administrative staff, financial/accounts managers/officers, legal adviser, manager, security officers, personnel secretary, labour welfare officers, industrial relations officers, stenographers, welfare/canteen managers, cashiers, security inspectors, time-keepers, telex/ teleprinter operators, receptionist, meters reader, daftry, peon, watchman, etc.

124. The details of total Manpower available in BSEB as on June, 2007 are given below:

(In number)

Category	Technical	Non-technical	Total
Thermal	683	320	1003
Hydro*	-	-	-
Nuclear	-	-	-
Power System (T&D)**	3826	9933	13759
Total	**4509**	**10253**	**14762**

* *Bihar State Hydroelectric Power Corporation (BSHPC) have drawn their executives mainly from BSEB and State Water Resources Deptt. on deputation basis. The generating units are operated and maintained by contractors and only supervisory personnel are provided by the organization. All projects of BSHPC are executed by private contractors on turn key basis.*

** *Includes Load Despatch, Energy billing, Revenue Collection, Rural Electrification etc*.

Norms for Manpower

125. The norms for manpower for 10th Plan is given below:

Category	Man/MW ratio	
	Technical	Non-technical
Thermal (below 500 MW unit)	1.15 *	0.61 *
Hydro	1.53 *	0.26 *
Power System (T&D)	1.12**	0.30**

* *State Sector*
** Central Sector

126. Manpower requirement at the end of 10th Plan is given below:

(In number)

Category	Total Capacity (MW)	Technical	Non-technical	Total
Thermal (below 500 MW unit)	540	621	329	950
Hydro	44.1	68	12	80
Power System (T&D)	1817.1*	2035	545	2580
Total		2724	886	3610

* *Includes total share from existing Central Sector Projects.*

Category	Man/MW ratio	
	Technical	Non-technical
Power System (T&D)	1.01	0.27

127. Additional manpower requirement during 11th Plan:

(In number)

Category	Capacity (MW)	Technical	Non-technical	Total
Power System (T&D)	1790*	1808	483	2291

** Includes firm/tentative share of Bihar from Central Sector Projects which are likely to give benefits during 11th Plan and bilateral agreement with other surplus states to meet the demand as per 17th EPS.*

128. Total manpower requirement at the end of 11th Plan:

(In number)

Category	Technical	Non-technical	Total
Thermal (below 500 MW unit)	621	329	950
Hydro	68	12	80
Power System (T&D)	3843	1028	4871
Total	4532	1369	**5901**

E. Training Methodology

129. In view of the huge training load and advancing technologies emerging in the Power Sector, it is recommended to adopt modern and scientific training methodologies and create an infrastructure accordingly, including course materials and training aids. This will result in cost and time effective training and help in further bridging the training load-infrastructure gap. Some of such training methodologies are described below:

(i) Through Simulators of different types suiting to the organizational/trainee's needs (i.e. through area simulator, compact simulator, generic simulator or full-scope replica simulator etc.)

(ii) Through plant specific on-plant, on-site training at power station/sub station, manufacturer's site.

(iii) Through personnel computer based self-learning package system.

(iv) Through video /CDs/ films.

(v) Through mock up plants, models, rigs, zigs line-up panels etc.

(vi) Through correspondence courses and distant learning packages.

(vii) Maintenance skill development through 'Hands-on' training on actual plants, or obsolete/ redundant equipment.

(viii) Through case studies.

(ix) Arranging training through local languages as medium of instruction and developing course material in these languages.

F. Areas of Concern and Required Measures

130. After carrying out a detailed analysis of various aspects of training requirements, important issues which merit attention are as follow:

Inadequate Importance to Training

131. Training must be made compulsory whenever there is a change in nature of job or role of personnel due to transfer, promotion etc. Today, there is a burning need to develop Training Culture in the power sector organizations.

Less Emphasis on In-Service/Retraining of Power Sector Personnel

132. Presently whatever emphasis is being given to training is to induction level training and very little emphasis is given for in- service/re-training of their personnel. Re-training is required to be planned at regular intervals to meet the specific job requirements and to enlarge the scope of technological changes. It is recommended that at least two weeks Refresher/Advanced training must be provided to each employee during a Plan period.

Introduction of Training on Attitudinal Changes/Behavioural Sciences

133. The attitude of an individual plays an extremely important role in contributing to his/her performance level. Thus, in spite of availability of the best of knowledge and skill, the ability to provide desired services may still be found wanting in individuals if they are not imbibed with appropriate attitudinal disposition. It has been observed that the training is presently concentrated mainly in the area of acquisition of knowledge and up gradation of skills and very little emphasis is laid on attitudinal changes/behavioural sciences. In some of the Utilities, behavioural science has achieved very good results, particularly with respect to the attitudinal change of the lower category of employees. After undergoing such training, the employees develop a sense of belonging to the organization.

Training in Information Technology

134. Information technology has pervaded all spheres of life. Adequate training according to the job requirement should be provided in the field of Information Technology. Use of IT should be

promoted and all employees should be made computer literate. As information technology is also developing very fast, the training should be dynamic in nature to ensure that knowledge and skill of people are in tune with the latest developments in the fields of IT.

Opportunities for Higher Studies

135. In the interest of improving the quality of manpower and the Organisation, eligible employees may be allowed study leave for acquiring Masters/Ph.D or any relevant academic programme or Industrial training. Also efforts of the employees to acquire knowledge/skill through part time Masters/Ph.D. Programmes should be encouraged by some suitable incentives.

Training of Non-Technical Officers and Staff

136. It has been noticed that in the technology-centered organizations like the Power Utilities, the training of Non-technical officers and staff is often neglected/ignored. Training of Non-technical officers and staff should be done at regular intervals in the functional skills/Management areas in association with the concerned Institutes as per needs.

Less emphasis for Training in Power System

137. Though about 80% of the total personnel of the Power System are engaged in the area of Operation and Maintenance of Power System, very little emphasis is being given for training activity in these areas. In view of the rapid technological development in this field and introduction of higher AC and DC voltages in the grid system, greater attention is required for this discipline.

Implications of Reform for Training

138. The following issues would need to be addressed:

(i) Need for a positive attitude among the employees;

(ii) Need for building greater accountability and responsibility in employees;

(iii) Need for the employees to understand the requirement of customers;

(iv) Creating an environment for initiative by linking performance with recognition and reward;

(v) Doing away with “Blame everything on management” syndrome;

(vi) Empowering the employees to cope effectively with the changing scenario;

(vii) Addressing the issue of ageing of skilled employees with no fresh recruitment;

(viii) Emphasis on Energy Conservation;

(ix) Reduction of cost of delivered power;

(x) Providing quality and reliable power.

G. Recommendations

Training for All

139. Each and everybody should be provided training of minimum one week per year. Nature of training may be refresher/advanced/managerial as per the actual need.Total manpower (excluding headquarter) available in generation, transmission & distribution is about 14700 (as on August 2006). It is understood that most of the employees are above 50 years of age and no recruitment has been made since 1984. Induction of fresh technical personnel and imparting training to the fresh recruits for at least one year is necessary for proper operation of the existing generating units, T&D system and future expansion plan.

Training on Promotion/Role Change

140. Training must be arranged for each individual on promotion/transfer, which calls for performing new/different roles and working conditions.

Training on Reforms

141. As Indian power sector is undergoing through a reform process by way of unbundling, restructuring, privatization etc., necessary HRD intervention is a must to ensure its success.

Training Methodology

142. There is urgent need of adopting most modern scientific training tools and methodology for imparting training by utilizing the recent developments in IT for this purpose.

Training on T&D

143. As about 80% of the power sector personnel are engaged in T&D, adequate attention must be given to ensure proper training in this field. As the nature of activity and system are different in transmission and distribution, the training in these two fields should be organized separately. Creation of necessary infrastructure like power system simulator, resource centre, diversification of existing training institutes have been recommended.

Networking

144. Networking with the training/academic institutions like NPTI, IIMs, ASCI and other reputed institutions for providing training to power sector personnel and other stakeholders should be planned.

Recurring Expenditure on Training

145. A minimum of 1.5% of salary budget may be provided initially, gradually increasing it to a level of 5% depending on organisation's requirement.

CHAPTER-10

POLICY THRUST AND FUTURE STRATEGY FOR THE DEVELOPMENT OF POWER SECTOR

A. Future Electricity Demand

146. The future electricity demand is outlined below:

(i) The forecast of electricity demand under domestic consumption category was worked out by 17th Electric Power Survey considering the electrification of all rural households by 2012. Government of Bihar will have to accelerate the pace of electrification of rural households so that the rural domestic consumption increases at a compounded annual growth rate (CAGR) of 58.6% during 11th Plan period. The electricity consumption in the rural areas shall grow at 26% CAGR during 11th Plan period which will require huge investment for developing and strengthening electricity distribution system to cater for demand growth. About 1,30,00,000 households are to be electrified during 11th Plan period.

(ii) The electricity consumption for irrigation purposes is expected to rise at 8% CAGR during 11th Plan period. This fast growing rural demand shall also require development of high capacity distribution system. About 1 lac irrigation pump-sets are to be energized during 11th Plan.

(iii) State Government is required to prepare a five year plan with annual milestones to bring down transmission and distribution losses expeditiously. The 17th Electric Power Survey envisages reduction of T&D losses from the existing level of 40% to a level 25% by 11th Plan end. A determined effort is to be made in this direction by the State Government.

(iv) Demand side management will have to be resorted to check the steep decline of annual electric load factor during the 11th Plan period on account of addition of peaking electric loads. The 17th Electric Power Survey Report provides for 70% annual electric load factor during 2006-07 & 63% in 2011-12 despite huge addition of electric load of peaking nature. The State Government would be required to ensure the application of advance electric load management techniques, differential tariffs for peak and off peak supply apart from promoting energy efficient pumps, motors, drive systems and lighting technologies.

(v) The electricity consumption under industrial category shall grow at a high rate of 11% CAGR. The State Government will have to ensure the addition of industrial load by

creating conducive industrial policy and creation of SEZs and revival of closed industries. Almost 13500 number of LT industries and 400 HT industries will have to be set up during 11th Plan period as per national average norms of electricity consumption.

(vi) The electricity consumption under commercial category is estimated to grow at 9% CAGR requiring special steps from government side for promoting coming up of commercial complexes.

B. Thermal Power Development

Short Term Plan

Efforts should be made for early revival of Barauni TPS Unit 6 & 7 (2x110 MW) and Muzaffarpur TPS Unit 1&2 (2x110 MW).

Medium & Long-Term Plan

The following thermal projects proposed by BSEB should be taken up in a time bound manner so as to implement the projects during 11th & 12th plan.

(i) Barauni Extn. (2x250MW)

(ii) Muzaffarpur Extn. (2x250 MW)

(iii) Nabinagar (2000 MW)

(iv) Katihar (4x250 MW)

(v) Pirapanti (4000 MW)

C. Hydro Power Development

Short Term Plan

(i) Preparation of DPR of Sinafdar Pumped Storage Project (345 MW)

(ii) Preparation of DPR of Hydro-Electric Project on Kosi River at Dagmara (126 MW)

Medium Term Plan

Resolution of inter state issues and Revision of DPR/ Execution of Kadwan (Indrapuri) Project (450 MW)

(i) Execution of Sinafdar Pumped Storage Project (345 MW)

(ii) Execution of hydro-electric project identified on Kosi river at Dagmara in district Sapaul with an installation of 126 MW

D. Transmission System Development

147. In the transmission system development, the following recommendations are outlined below:

(i) Proper maintenance of the existing transmission lines and sub-stations.

(ii) Protection system and metering arrangement of the State transmission network should be revamped by BSEB for reliable power supply to the consumers

(iii) Measures to reduce AT&C losses, prevention of thefts and adequate reactive power compensation for better quality of power.

(iv) Taking over of completed sub-transmission works from POWERGRID by BSEB.

(v) Early restoration of the 220 kV and 132 kV transmission lines in BSEB which are not in service over a long period of time.

(vi) Early finalization/execution of works covered under strengthening of sub-transmission system-Phase-II, Part-II.

(vii) BSEB to identify system requirements to meet future load growth in Bihar by 2011-12 and implement necessary transmission, sub-transmission and distribution system and also tie-up for sufficient generation so as to achieve at least 3400 MW of demand level by 2011-12.

E. Sub-Transmission & Distribution System Development

148. This aspect would cover the following:

(i) Supply of electricity at reasonable rate to consumers is essential for its overall development of the State. Equally important is availability of reliable and quality power at competitive rates to the industry to make it competitive.

(ii) Recognizing that electricity is one of the key drivers for rapid economic growth and poverty alleviation, the State has to set itself the target of providing access to all households in near future.

(iii) The demand for power has been outstripping the availability. Substantial peak and energy shortages prevail in the country and also in the State. This is due to inadequacies in generation, transmission and distribution as well as inefficient use of electricity. Very high level of technical and commercial losses and lack of commercial approach in management of power sector has led to unsustainable financial operations.

(iv) The Electricity Act, 2003 seeks to encourage competition with appropriate regulatory intervention. Competition is expected to yield efficiency gains and in turn result in availability of quality supply of electricity to consumers at competitive rates.

(v) The National Electricity Policy notified by Central Government in compliance to Section 3(1) of the Electricity Act, 2003 aims at laying guidelines for accelerated development of the power sector, providing supply of electricity to all areas and protecting interests of consumers and other stakeholders keeping in view availability of energy resources, technology available to exploit these resources, economics of generation using different resources, and energy security issues. The State may explore the possible alternatives to its full benefits.

Aims and Objectives of National Electricity Policy

149. The National Electricity Policy aims at achieving the following objectives:

(i) Access to Electricity - Available for all households in next five years;

(ii) Availability of Power - Demand to be fully met by 2012. Energy and peaking shortages to be overcome and adequate spinning reserve to be available;

(iii) Supply of Reliable and Quality Power of specified standards in an efficient manner and at reasonable rates;

(iv) Per capita availability of electricity to be increased to over 1000 units by 2012;

(v) Minimum lifeline consumption of 1 unit/household/day as a merit good by year 2012;

(vi) Financial Turnaround and Commercial Viability of Electricity Sector; and

(vii) Protection of consumers' interests.

In line with the National Electricity Policy, the State of Bihar must aims at serious efforts to achieve the targets set.

F. Rural Electrification

150. The key development objective of the power sector is supply of electricity to all areas including rural areas as mandated in section 6 of the Electricity Act, 2003. Both the Central and

State Government would jointly endeavour to achieve this objective at the earliest. Consumers, particularly those who are ready to pay a tariff which reflects efficient costs, have the right to get uninterrupted twenty four hours supply of quality power. Determined efforts should be made to ensure that the task of rural electrification for securing electricity access to all households and also ensuring that electricity reaches poor and marginal sections of the society at reasonable rates is completed within the next five years. Emphasis has been given to create the following:

(i) Rural Electrification Distribution Backbone (REDB) with at least one 33/11 kV (or 66/11 kV) substation;

(ii) Creation of village electrification infrastructure

(iii) Household electrification from distribution transformer to connect every household;

(iv) Wherever above is not feasible (it is neither cost effective nor the optimal solution to provide grid connectivity), decentralized distributed generation facilities together with local distribution network would be provided so that every household gets access to electricity. This would be done either through conventional or non-conventional methods of electricity generation whichever is more suitable and economical. Non-conventional sources of energy could be utilized even where grid connectivity exists provided it is found to be cost effective;

(v) Development of infrastructure would also cater for requirement of agriculture & other economic activities including irrigation pump sets, small and medium industries, khadi and village industries, cold chain and social services like health and education; and

(vi) Particular attention would be given in household electrification to dalit villages, tribal areas and other weaker sections.

151. The RGGVY is being implemented under the aegis of Central Government through REC in association with CPUs. Targetted expansion in access to electricity for rural households in the desired timeframe can be achieved if the distribution licensees recover at least the cost of electricity and related O&M expenses from consumers, except for lifeline support to households below the poverty line who would need to be adequately subsidized. Adequate funds would need to be made available for the same through the Plan process. Also commensurate organizational support would need to be created for timely implementation. The Central Government would assist the State Governments in achieving this.

152. The Rural Electrification Policy notified subsequent to the launch of RGGVY aims at provision of access to electricity to all households by year 2009. This includes:

(i) Quality and reliable power supply at reasonable rates; and

(ii) Minimum lifeline consumption of 1 unit per household per day as a merit good by year 2012.

153. The State Government needs to prepare, within 6 months, and notify a Rural Electrification Plan to achieve the goal of providing access to all households. The Rural Electrification Plan should map and detail the electrification delivery mechanisms (grid or stand alone), considering inter alia the available technologies, environmental norms, fuel availability, number of un-electrified households, distance from the existing grid etc. The Plan may be linked to and integrated with District Development Plans as and when such plans become available. The Plan should also be intimated to the Appropriate Commission/Central Government. The State Government should set up a Committee at the District level pursuant to Section 166(5) of the Act within three months.

154. Necessary institutional framework would need to be put in place not only to ensure creation of rural electrification infrastructure but also to operate and maintain supply system for securing reliable power supply to consumers. Responsibility of operation & maintenance and cost recovery could be discharged by utilities through appropriate arrangements with Panchayats, local authorities, NGOs and other franchisees etc. Franchises are required to operate on sustainable basis covering O&M of the asset.

155. The gigantic task of rural electrification requires appropriate cooperation among various agencies of the State Governments, Central Government and participation of the community. Education and awareness programmes would be essential for creating demand for electricity and for achieving the objective of effective community participation.

G. Open Access and Distribution Management

156. Open access in distribution is being introduced in phased manner to promote competition amongst the generating companies who can now sell to different distribution licensees across the country. Initially, consumers of 1 MVA and above are being considered. This should lead to availability of cheaper power. When open access in distribution networks is required to be introduced by the State Commission for enabling bulk consumers to buy directly from competing generators, competition in the market would increase the availability of cheaper and reliable power supply. The Regulatory Commissions need to provide facilitative framework for non-discriminatory open access. This requires load dispatch facilities with state-of-the art communication and data acquisition capability on a real time basis.

157. Distribution is the most critical segment of the electricity business chain. The real challenge of reforms in the power sector lies in efficient management of the distribution sector. For achieving efficiency gains proper restructuring of distribution utilities is essential. Adequate transition financing support would also be necessary for these utilities. Such support should be arranged linked to attainment of predetermined efficiency improvements and reduction in cash losses and putting in place appropriate governance structure for insulating the service providers

from extraneous interference while at the same time ensuring transparency and accountability. For ensuring financial viability and sustainability, State Governments would need to restructure the liabilities of the State Electricity Board to ensure that the successor companies are not burdened with past liabilities.

158. Multi-Year Tariff (MYT) framework is an important structural incentive to minimize risks for utilities and consumers, promote efficiency and rapid reduction of system losses. A time-bound programme should, therefore, be drawn up by the State Electricity Regulatory Commission (SERC) for segregation of technical and commercial losses through energy audits. An action plan for reduction of the losses with adequate investments should be drawn up. Standards for reliability and quality of supply as well as for loss levels shall also be specified, from time to time, so as to bring these in line with international practices by year 2012. As per the Act, SERC needs to specify standards of performance covering interruption for supply to consumers, metering complaints etc. SERC may also consider compensation to consumers in the case of default.

159. The SERCs may obtain from the Distribution Licensees their metering plans, infrastructure development plan approve these, and monitor the same. The SERCs should encourage use of pre-paid meters. In the first instance, TOD meters for large consumers with a minimum load of one MVA are also to be encouraged. The SERC should also put in place independent third-party meter testing arrangements.

160. Under APDRP, SCADA system is being introduced and support for IT facilities is encouraged. Modern information technology systems may be implemented by the utilities on a priority basis, after considering cost and benefits, to facilitate creation of network information and customer data base which will help in management of load, improvement in quality, detection of theft and tampering, customer information and prompt and correct billing and collection. Special emphasis should be placed on consumer indexing and mapping in a time bound manner.

161. The Act has provided for stringent measures against theft of electricity. The State and distribution utilities should ensure effective implementation of these provisions. The State Government may set up Special Courts as envisaged in Section 153 of the Act as also special Police Stations in lines with other States to tackle the issue.

H. Renewable Energy

162. The following observations and suggestions in the case of renewable energy should be implemented in a time bound manner:

(i) About 92 potential sites with an aggregate capacity of about 195 MW to set up small hydro power projects have been identified. The State needs to undertake detailed survey

and investigation of these sites and prepare DPRs, so that a shelf of projects is readily available for implementation in a phased manner.

(ii) Business meets/local workshops should be arranged at a few locations to encourage private entrepreneurs/industries to promote biomass gasifiers for captive power generation by utilizing rice husk, baggasse, etc. and to familiarize with fiscal and financial incentives available under various schemes of the Ministry of New and Renewable Energy.

(iii) With a view to attract private sector participation, in particular, under small hydro and biomass power/cogeneration programme, the Govt. of Bihar needs to formulate and announce conducive policy/guidelines for private investment in these sectors.

(iv) Village electrification of about 500 identified remote villages needs to be taken up on priority through small hydro, biomass and/or solar energy depending upon their feasibility.

(v) In order to implement renewable energy programme effectively, the State nodal agency, BREDA, needs to be strengthened. It should have a full-time Director and complement off technical staff to look after the renewable energy programmes.

(vi) Captive Power Policy should be formulated immediately so that Private Sector participation could increase.

I. Energy Conservation and Demand-Side Management

163. The following policy measures may be adopted by State Government to promote energy conservation programme and implement demand side management.

(i) State Utility should promote CFL (Compact Fluorescent Lamp) even by providing subsidy since the present cost of CFL is not conducive to its large scale application. The saving achieved by extensive use of CFL would be more than the subsidy on this account and would justify the latter. State Governments like Haryana, Punjab, Delhi etc. has issued notification for mandatory use of CFLs and ISI Mark equipments for use in all Government buildings to promote energy conservation on Govt. Sector;

(ii) State Government should consider providing incentives to Municipality/ Local bodies for up gradation of energy efficiency of water pumping and sewage treatment plants as well as municipal lighting. Energy efficiency measures in water pumping and sewage treatment plants could help in solving the problem of payment of electricity supply dues payable to the utility;

(iii) The institution of Energy Service Companies (ESCOs) should be consciously promoted. ESCOs should be encouraged to promote energy efficiency particularly in agricultural pumping system; and

(iv) The State Government may introduce state energy conservation awards on lines similar to the national energy conservation awards for industries, commercial buildings etc.

J. Financial Status of BSEB

164. The following suggestions in respect of financial aspects should be taken care of to revive the power sector in the state:

(i) The gap between ARR & ACS needs to be reduced by reducing ARR and increasing ACS. Steps are required to be taken to reduce Commercial Losses and increase the Revenue realisation;

(ii) Action should be taken for metering of power consumption throughout the State;

(iii) Reforms process is required to be expedited by immediate restructuring of BSEB;

(iv) Progress of rural electrification in implementation of programme under Rajiv Gandhi Grameen Vidhyutikaran Yojana needs to be improved;

(v) Tariffs need to be introduced for Energy generated through Non-conventional/Renewable sources; and

(vi) Regulation for intra-state wheeling charges, open access etc. are also needs to be issued.

(vii) An effort may be made to meet the working capital requirements from its current revenue.

K. Human Resource Development

165. It is gathered that Bihar State Electricity Board does not have enough manpower with special skill to develop distribution plans. It is particularly important that the electricity industry has access to properly trained human resource. Therefore, concerted action must be taken for augmenting training infrastructure so that adequate well-trained human resource is made available as per the need of the industry. Special attention would need to be paid for establishing training infrastructure in the field of electricity distribution and employ new brigade of engineers.

166. Sufficient number of trained personnel should be recruited as recommended in the chapter of Human Resource Development. Further, following recommendations in this respect should be implemented:

(i) Each Technical staff in the power sector should be provided training of minimum one week per year. Nature of training may be refresher/advanced/managerial as per the

actual need. Total manpower (excluding headquarter) available in generation, transmission & distribution is about 14700 (as on August 2006). It is understood that most of the employees are above 50 years of age and no recruitment has been made since 1984. Induction of fresh technical personnel and imparting training to the fresh recruits for at least one year is necessary for proper operation of the existing generating units, T&D system and for future expansion plans.

(ii) Training must be arranged for each individual on promotion/transfer, which calls for performing new/different roles and working conditions.

(iii) As Indian power sector is undergoing through a reform process by way of unbundling, restructuring, privatization etc., necessary HRD intervention is a must to ensure its success.

(iv) There is urgent need of adopting most modern scientific training tools and methodology for imparting training by utilizing the recent developments in IT for this purpose.

(v) As about 80% of the power sector personnel are engaged in T&D, adequate attention must be given to ensure proper training in this field. As the nature of activity and system are different in transmission and distribution, the training in these two fields should be organized separately. Creation of necessary infrastructure like power system simulator, resource centre, diversification of existing training institutes are recommended.

(vi) Networking with the training/academic institutions like NPTI, IIMs, ASCI and other reputed institutions for providing training to power sector personnel and other stakeholders should be planned.

(vii) A minimum of 1.5% of salary budget may be provided initially, gradually increasing it to a level of 5% depending on organisation's requirement.

CHAPTER–11

CONCLUSIONS

167. Power situation in Bihar is grim-with a total installed capacity of 586.1 MW (comprising 540 MW from Thermal and 46.1 NW from Hydro). The general level of development is low and there is a shortage of basic infrastructure. This has led to a very low level of per capita availability(76 MW) in comparison to all-India level (1360 MW). In addition, there is a lack of awareness about various renewable energy resources, available technologies, and systems/ devices/and programs. Bihar needs urgent attempts to expand its power generation capacity and improvements in existing facilities (Barauni and Muzaffarpur). There has been no capacity addition for last two decades. In 2006-07, peak demand was estimated at 1400 MW against the actual availability of 1162 MW – leaving a net deficit of 16.9% for the State. It had far reaching implications for economic growth performance of the State.

168. As mandated by the Central Government, Bihar must aim at electrifying all its villages during the current 11th Plan. For that, its power demand is expected to grow, on an average, more than 10% annually. Bihar would, thus, require additional capacity of roughly 2000-2500 MW by 2011-12. This would impose heavy financial burden on the State. Renovation and Modernization (R&M) should have been taken up by the BSEB on an urgent basis to make the existing plants (which have been under deterioration-both Barauni and Muzaffarpur) operative and obtain the maximum output in order to bridge the demand – supply gaps. New generation Thermal capacity of estimated 4000 MW (for the cost of Rs.16,000 crores at present level prices) is planned for XIth and XIIth Plan periods. This would require massive efforts by the State Government -both on policy and institutional side.

169. There is a wide scope in Bihar for generation of power from hydro sources as well as from renewable/non-conventional sources of energy. This would require well planned strategy as well as innovative policy and institutional arrangements to make it economical and sustainable.

170. To make power available to different segments of population with a widespread coverage in Bihar, special focus is required on transmission system development, with a particular focus on operation and maintenance of transmission systems. Besides, the sub-transmission and transmission has been in bad shape over past decades. In the recent past, major initiatives have been taken by the Power Grid Corporation of India Ltd. (PGCIL) and steps are required to expedite the whole process. A large number of recommendations are under consideration of the BSEB and these are expected to materialize soon.

171. One of the major constraints to the development of power sector is the shortage of trained technical manpower at all levels. As power sector reforms involve a number of complex issues, the people involve would need inputs in terms of knowledge and skills in order to play meaningful role in their assigned responsibilities. There would be an urgent need to develop sound strategy, policies, and plans for development of human resources in the power sector.

172. The process of implementation of power sector reforms in Bihar is slow. Hence, the whole process needs to be urgently expedited. One of the major core areas of this reform process is restructuring of BSEB. Special focus is required on improving the financial health of BSEB. Policy reforms agenda need focused attention of private sector investment both in power generation and distribution activities. One of the major challenges in Power Sector of Bihar is how to bring reduction in transmission and distribution (T&D) losses and substantial reduction in power theft. Metering of the distribution system also needs urgent attention in order to collect proper charges from the consumers at large.

173. Since Bihar will take some time to generate its own required power, BSEB must be encouraged to make bilateral arrangements with other States or through an arrangement with Trading Agencies like PTC India Ltd. on proper terms and conditions. Immediate dialogue in this regard may be launched to make short-term arrangements.

Detailed Status of Indrapuri Reservoir Project

1) Government of Bihar have requested MOP in September 2001 that project may be entrusted to NHPC. A meeting was taken by Member (Hydro), CEA on November 25, 2002 to discuss the status of the Project, which was attended by Officers from CWC, BSHPC and NHPC. In the meeting CWC intimated that as there would be submergence in the state of U.P., Jharkhand, M.P. and Bihar, concurrence of U.P., Jharkhand and M.P. would be required for this project. In the meeting NHPC expressed their willingness to take up this project as a Multi-purpose project in the Central Sector for which notification under Section 18 (A) need to be issued by Ministry of Power in favour of NHPC. In the meeting it was decided that CWC should write to the involved States to give their concurrence for the Project. CWC vide their letters dated December 12, 2002 and 17th Jan. 2003 have requested Government of Uttar Pradesh to convey their concurrence. However, concurrence of Govt. of Uttar Pradesh is still awaited.

2) CEA vide their letter dated 14th May, 2003, requested Govt. of Jharkhand and Govt. of Uttar Pradesh to convey 'in principle' clearance for the NHPC to take up execution of Indirapuri Project.

3) Principal secretary, Department of Energy, Government of Uttar Pradesh vide D.O. No. 3453/PSE/2003 dated 13th June, 2003 has mentioned that in view of the increasing Naxalite activities and discontent among the population stemming from incomplete rehabilitation measures associated with earlier power projects, it is felt that the submergence and consequent displacement of local population would aggravate this issue. Therefore, it has been decided not to accord 'in principle' approval for the execution of this project.

4) Response of Government of Jharkhand is awaited.

5) NHPC has informed that Govt. of Madhya Pradesh have already given conditional concurrence for execution of the project.

6) A meeting was taken by Chairman, CWC on 10.5.2005. In the meeting representatives of Govt. of UP stated that the minimum tail water level at Obra Power house as per the latest survey conducted by them is 170.80 m. Chairman, CWC desired to know the reasons for not communicating the above information earlier. Chairman, CWC observed that this is a new development to be clarified from Survey of India and may be rechecked with CWC benchmark. In the meeting, the following points were decided:-

   a. GOUP will reconfirm the change in level at Obra in consultation with survey of

India and GOB will also suitably link up their levels on this common Bench Mark.

b. GOB would approach Survey of India to prepare contour maps & property survey from 169.0 m to 173.0 m at 1.00 m interval.

c. The FRL for Indrapuri Dam will be fixed with due consideration of the back water effect at Obra Power House tail water level.

d. GOB would prepare a fresh DPR with changed optimal levels and submit the same to CWC for appraisal.

e. The DPR already submitted earlier by the GOB with FRL at 173.0 m, under examination in CWC will be presumed as returned and dropped from the list of projects under appraisal.

Salient Features of Hydro Electric Schemes (226 MW) on Kosi River

1.0	**LOCATION**	
	District	Supaul
	River	Kosi
	Project Area	
	Longitude	E 86^0 47’
	Latitude	N 26^0 24’
	Access to the Project	Supaul-Bhaptiahi Road (SH)
	Nearest Village	Bhaptiahi
	Airport	Patna -350 km
	Nearest rail Head	Supaul -20 Km
	Port	Kolkata
2.0	**SCHEME**	
	Type	Run of the river
	Installed capacity	126 MW
3.0	**HYDROLOGY**	
	Catchment Area(Upto Hanuman Nagar)	61,816 sq.km.
	Maximum Annual rainfall	2191 mm
	Minimum annual rainfall	1291 mm
	Max Intensity (one day) At Birpur	318.5mm
	Maximum Design flood(AtHanuman Nagar Barrage)	26897 cumec
	Annual average sedimentLoad (1973-81)	57.35 gm/litre.
4.0	**POWER POTENTIAL**	
	Gross Head	11m
	Net Head	9 m
	Discharge available	1582 m^3/s
	Proposed Installed capacity	3x42 MW
	Annual Energy Generation	463 MU

5.0	**DIVERSION STRUCTURE**	
	Type pf Diversion Structure	Barrage
6.0	**POWER HOUSE**	Surface Type
7.0	**TYPE OF TURBINE**	
	Type	Bulb
	Rated Discharge	460 m^3/s
	Number	3
	Capacity	42 MW
8.0	**GENERATOR**	
	Type	Synchronous
	Capacity	46.7 MVA
	Number	3
	Power Factor	0.9
	Frequency	50 Hz
	Number of Phases	3
	Voltage	11 kV
9.0	**STEP UP TRANSFORMER**	
	Type	Outdoor type OFWF
	Quantity	3
	Capacity	46.7 MVA 3- Phase
	Voltage Ratio	11/132 KV (Depending on grid voltage)
10.0	**COST OF PROJECT** (Excl Transm line)	
	Cost of Project @ Rs.6 crore per MW	Rs. 756 Crores
	Cost of Generation at bus bar	Rs. 2.55/ KWh

Works Covered in Phase-I Scheme for Improvement of Transmission System in Bihar

Part-A

(i) Transmission Lines

1. Muzaffarpur Gopalganj 220 kV D/C (S/C strung)
2. Siwan-Gopalganj-Betiah 132 kV D/C line (S/C strung)
3. Muzaffarpur-Vaishali 132 kV D/C line (S/C strung)
4. Muzaffarpur-Darbhanga 220 kV D/C/(S/C strung)
5. LILO of Hazipur-Chapra 132 kV S/C line at Sheetalpur
6. Motihar-Daka-Sitamarhi 132 kV D/C line (S/C strung)
7. Pandaul-Madhubani-Jainagar-Phulparas 132 kV D/C (S/C strung)
8. Phulparas-Supaul-Saharsa 132 kV D/C (S/C strung)
9. Vaishali-Sheetalpur 132 kV D/C (S/C strung)
10. Siwan-Baniapur 33 kV line

(ii) Sub-stations

1. Gopalganj-220/132 kV (New)
2. Gopalganj-132/33 kV (New)
3. Vaishali-132/33 kV (New)
4. Sheetalpur-132/33 kV(New)
5. Phulparas-132/33 kV (New)
6. Daka-132/33 kV (New)
7. Madhubani-132/33 kV (New)
8. Supaul-132/33 kV (New)
9. Jainagar-132/33 kV (New)
10. Baniapur-33/11 kV(New)
11. Darbhanga 220/132 kV (New)
12. Betiah-132 kV (Extension)
13. Motihari-132 kV (Extension)
14. Sitamarhi-132 kV (Extension)
15. Pandaul- 132 kV (Extension)
16. Saharsa- 132 kV (Extension)
17. Muzaffarpur- 220 &132 kV (Extension)

Part-B

Transmission Lines

1. LILO of Lalmatia-Sabour 132 kV S/C line at Kahalgaon
2. Sabour-Banka 132 kV D/C line (S/C strung)
3. LILO of Biharsharif-Barhi 132 kV 2nd circuit at Rajgir
4. LILO of Dehri –Dumraon 132 kV S/C line at Bikramganj
5. LILO of Dehri-Karmnasa 132 kV S/C line of POWERGRID at Bhabhua
6. LILO of Dehri-Kudra-Karamnasa 132 kV S/C line of BSEB at Sasaram
7. LILO of Purnea-Dalkhola 132 kV S/C line at Kishanganj
8. LILO of Purnea-Katariyya 132 kV S/C line at Forbesganj
9. Kishanganj-Forbesganj-Kataiyya 132 kV D/C line (S/S stung)
10. Saharsa-Udakishanganj 132 kV D/C line (S/C strung)
11. LILO of Biharsharif-Hathidah 132 kV D/C line at Barh
12. Khagaul-Bihta 132 kV D/C line

Sub-stations

1. Banka- 132/33 kV (New)
2. Bikramganj - 132/33 kV (New)
3. Bhabhua – 132/33 kV (New)
4. Sasaram – 132/33 kV (New)
5. Forbesganj – 132/33 kV (New)
6. Udaikishanganj – 132/33 kV (New)
7. Bihta – 132/33 kV (New)
8. Barh – 132/33 kV (New)
9. Kataiyya – 132 kV (Extension)
10. Kahalgaon – 132 kV (Extension)
11. Sabour 132 kV (Extension)
12. Rakgir 132 kV (Extension)
13. Khagaul 132 kV (Extension)

Works Covered in Bihar Sub Transmission System Phase 2 – Part-I

A. Transmission Lines (To be implemented by PGCIL)

		Length (Km)
New Transmission Lines		
1.	Biharsharif-Hulasganj 132kV S/C line on D/C tower	45
2.	Muzaffarpur (Kanti) TPS – SKMCH 132 kV S/C line on D/C tower	20
3.	LILO of one circuit at Barauni – Purnea 132 kV S/C at Naughachia	3
4.	LILO of Barauni – Samastipur 132 kV D/C line at Begusarai	10
5.	LILO of one circuit of Barauni – Purnea 132 kV D/C at Khagaria	3
6.	LILO of one circuit of Sitamarhi – Muzaffarpur (Bhikanpura) 132KV of SKMCH	5
7.	LILO of Fatua – Khagaul 220 kV D/C line (one ckt.) at Sipara (New Patna) and one ckt. at Patna (POWERGRID) S/S)	20
8.	220 kV D/C line Patna (POWERGRID)- Patna(BSEB)	5
9.	LILO of both circuits of 132kV D/C Gaya – Jakkanpur line at Sipara	20
10.	LILO of Gaighat - Mithapur 132kV line at Sipara (New S/S)	15
11.	LILO of one circuit of Fatua-Gaighat 132 kV D/C (being constructed by B.S.E.B) at Katra.	5
12.	Dumraon-Buxar 132kV S/C line (on D/C tower)	22
13.	Gaya(Chandauti) – Tekari 132kV S/C line (on D/C tower)	30
14.	Dehri – Sonenegar 132kV D/C line	10
15.	33 kV lines(20 kms. for each new 132/33 kV sub-station(7 nos.) (for Sipra 40 kms)	160
Reconductoring of Existing Transmission Lines		
1.	Gaya (Chandauti)-Patna (Jakkanpur),132kV D/C line (one ckt. Via Jehanabad)	95
2.	Barauni-Khagaria 132 kV S/C portion and Purnea-Naugachia 132 kV S/C portion of Barauni-Purnea 132kV D/C line	200
3.	Barauni – Samastipur 132kV D/C line	67
Spill Over Works of Transmission Lines		
(To be implemented by BSEB)		
1.	Purnea – Begusarai 220kV D/C line	183

B. Substations (To be implemented by POWERGRID)

New Substations

220 kV New Substations

1.	SIPARA New 220/132/33 kV Substation	4 nos 220kV line bays 2x150MVA, 220/132kV 2x50MVA, 132/33kV Transformers with associated Bays, 132 kV New Substations
2.	HULASGANJ	1 no.132kV Line bays 2x20MVA, 132/33kV Transformers with associated bays 4 nos. 33 kV line bays
3.	SKMCH(MUZAFFARPUR)	3 nos. 132kV Line bays 2x50MVA, 132/33kV Transformers with associated bays 6 nos. 33kV line bays
4.	NAUGHACHIA	2 nos. 132kV Line bays 2x20 MVA, 132/33kV Transformers with associated bays 4 nos. 33kV line bays
5.	BUXAR	1 no. 132kV Line bays 2x20 MVA,132/33KV Transformers with associated bays,4 no.33kv line bays
6.	TEKARI	1 no. 132kV Line bay 2x20MVA, 132/33kV Transformers with associated bays, 4 nos.33kVline bays
7.	KATRA	2 nos. 132kV Line bays 2x50MVA, 132/33kV Transformers with associated bays, 6nos. 132kV Line bays 6nos. 33kV Line bays

C. Augmentation of Existing Sub-stations (To be implemented by PGCIL)

220 kV substations

1.	Purnea(PG) 220/132 kV S/S EXTN	2nos. 220kV Line bays
2.	Biharsharif 220/132 kV S/S EXTN.	2nos. 220 kV Line bays 1x150 MVA, 220/132kV Transformer with associated bays
3.	Muzaffarpur (Kanti) 220/132 kV S/S/ EXTN.	2 nos. 220kV Line bays 1x100 MVA, 220/132 kV Transformers with associated Bays,1 no. 132kV Line bay
4.	Fathua 220/132kV S/S EXTN.	1x100 MVA, 220/132 kV Transformers with associated Bays, 2x50 MVA, 132/33kV Transformers (Replacement of Existing 3x20 MVA spare transformer to be used elsewhere)
5.	Patna 400/220kV S/S/EXTN.(PG)	Only PLCC is considered

132 kV Sub-stations

1.	Purnea 132/33 KV S/S EXTN.	1x50 MVA, 132/33kV Transformers with associated Bays, 3nos. 33kV Line bays
2.	Darbhanga 132/33 kV S/S EXTN.	2x50 MVA, 132/33kV Transformers (Replaced of existing 2x20 MVA), 6nos. 33kV line bays
3.	Khagaria 132/33kV S/S EXTN.	1no. 132kV Line bay 1x20 MVA, 132/33 kV Transformer with associated bays (spare transformer from other S/S to be used), 2nos. 33kV Line bays

4.	Samastipur 132/33 kV S/S EXTN.	1x20 MVA, 132/33kV Transformers with associated bays (spare transformer from other S/S to be used), 2nos. 33kV Line bays
5.	Chapra 132/33kV S/S EXTN.	1x20 MVA, 132/33kV, Transformers (Replacement of existing 1x12.5 MVA, spare transformer from other S/S to be used), 2nos. 33kV Line bays
6.	Jakkanpur 132/33 kV S/S Extn.	1x50 MVA, 132/33kV, Transformers (Replacement of Existing 1x15 MVA, 3nos. 33kV Line bays
7.	Gaya (Chandauti) 132/33 kV S/S EXTN.	1 no. 132kV Line bays 2x50 MVA, 132/33kV, Transformers (Replacement of existing 2x20 MVA & 1x15 MVA), 6nos. 33kv line bays
8.	Sabour 132/33kV S/S EXTN.	1x50 MVA, 132/33kV Transformer with associated bays,3nos 33kVline bays
9.	Jehanabad 132/33kV S/S EXTN.	1x20 MVA, 132/33 kV, Transformers with associated bays (spare transf. from other S/S to be used), 2no33kV Line bays
10.	Rajgir 132/33 KV S/S EXTN.	1x20 MVA, 132/33 kV Transformer with associated bays (spare transformer from other S/S to be used),2no33kVline bays
11.	Jamalpur 132/33 KV S/S EXTN.	1x50 MVA, 132/33 kV Transformer with associated bays 2nos. 33kV Line bays

12.	Saharsa 132/33 kV S/S EXTN.	1x20 MVA, 132/33 kV Transformer with associated bays (spare transformer from other S/S to be used), 2nos. 33kV Line bays
13.	Bettiah 132/33 kV S/S EXTN.	1x20 MVA, 132/33 kV Transformer with associated bays 2nos. 33kV Line bays
14.	Sultanganj 132/33 kV S/S EXTN.	1x20 MVA, 132/33kV, Transformer with associated bays (Replacement of existing 1x7. 5 MVA spare transf. from other S/S to be used), 2 nos33kVline bays
15.	Sheikhpura 132/33 kV S/S EXTN.	1x20 MVA, 132/33kV, Transformer with associated bays (Spare transf. from other S/S to be used), 2 nos33kVline bays
16.	Bodhgaya 132/33 kV S/S EXTN.	2x50 MVA, 132/33kV, Transformers (Replacement of Existing 2x20 MVA) 6 nos. 33kV line bays
17.	Motihari 132/33 kV S/S EXTN.	1x20 MVA, 132/33kV, Transformer (Replacement of Existing 1x12.5 MVA spare transf. from other S/S to be used) 2 nos. 33kV line bays
18.	Sonenagar 132/33 kV S/S EXTN.	2 nos. 132kV Line bays
19.	Dehri 132/33 kV S/S EXTN.	2 nos. 132kV Line bays
20.	Dumraon 132/33 kV S/S EXTN.	1 no. 132kV Line bays
21.	BEGUSARAI (To be implemented by BSEB) 220/132/33 kV Substation	6 nos. 220kV Line bays 2x100 MVA, 220/132kV& 2x50 MVA, 132/33kV Transformers with associated bays.4 nos132 kV line, 8 nos. 33 kVLine bays

D. Renovation Works (To be implemented by BSEB)

1. BARIPAHARI 132/33 kV Substation
2. JAKKANPUR 132/33 kV Substation
3. BIHARSHARIF 220/132 kV Substation
4. BODHGAYA 220/132 kV Substation
5. DEHRI-ON-SONE 220/132 kV Substation
6. FATHUA 220/132 kV Substation
7. BARAUNI 132/33 kV Substation
8. SAMASTIPUR 132/33 kV Substation

E. Additional Transmission works (To be implemented by POWERGRID)

I. New Transmission Lines

1. Bettiah – Raxaul 132kV S/C line (on D/C Towers)
2. Darbhanga-Phulparas 132 kV S/C line(on D/C Towers)
3. Supaul-Birpur (Katiya) 132 kV D/C
4. LILO of 132 kV S/C Biharsharif-Hulasaganj at Ekanagar Sarai.
5. Stringing of second circuit of 132 kV D/C Pulparas-Supaul line
6. 40 kms 33 kv lines for Raxaul& Ekanagar Sarai New sub-station.

II. New Sub-Stations

1.	EKANAGAR SARAI New 132/33 kV Substation	2 no.132kV Line bays 2x20MVA, 132/33kV, Transformers with associated bays, 4 no.33 kV line bays
2.	RAXAUL New 132/33 kV Substation	2 no.132kV Line bays 2x20MVA, 132/33kV, Transformers with associated bays,4 no.33 kV line bays

III. Augmentation Of Existing Sub-Stations

1.	Darbhanga 132/33 kV S/S EXTN.	1 no. 132kV Line bays
2.	Phulpras 132/33 kV S/S EXTN.	1 no. 132kV Line bays
3.	Supaul 132/33 kV S/S EXTN.	2 nos. 132kV Line bays
4.	Birpur(Katiya) 132/33 kV S/S EXTN.	2 nos. 132kV Line bays

Scope of Works for Bihar Sub Transmission System Phase II – Part-II

A. Implementation by Power Grid Corporation

New Transmission Lines

1. LILO of Chapra-Siwan 132kV S/C Line at Mushrakh
2. Hazipur (old) – Hazipur (New) 132kV D/C
3. Khagaul-Digha 132kV D/C line(including about 8 km of cable).
4. Jamui-Sheikhpura 132kV S/C line on D/C tower
5. LILO of Bodhgaya-Nawada 132kV S/C line of Wajirganj
6. Banjari-Sasaram 132kV S/C line on D/C tower
7. Dinara-Kudra 132kV S/C line on D/C tower
8. Biharshaarif – Nawada 132kV S/C line on D/C tower
9. Biharshaarif – Sheikhpura 132kV S/C line on D/C tower
10. Stringing of second circuit of Dehri – Durmraon 132 kV line
11. Begusarai-Kusheshwar Sthan 132 kV S/C on D/C towers.
12. LILO of Saharsa –Supaul 132 kV S/C at Saharsa/Madhepura (new)
13. LILO of 2nd circuit (new) of Dehri – Durmraon 132kV D/C at Dinara
14. Sone Nagar-Aurangabad 132 kV D/C
15. LILO of Dehri – Karmanasa 132kV S/C (BSEB line) at Kudra
16. Ara (POWERGRID) – Jagdishpur, 132 kV S/C on D/C tower
17. Stringing of second circuit of Gopalganj-Betia 132kV D/C
18. Kahalgaon-Sultanganj-Lakhisarai 132 kV D/C with high capacity conductor
19. Purnea (400/220kV, POWERGRID) – Saharsa (new) 220 kV D/C
20. Stringing of second circuit of Samastipur-Chapra 132kV line via Hazipupr (New)
21. LILO of SKMCH (Muzaffarpur)-Sitamarhi 132kV S/C line of Runni Saidpur.
22. Arrangement for termination of Hazipur-Muzaffarpur(Kanti), 220 kV DC line at Muzaffarpur (Powergrid)
23. LILO of Begusarai-Samastipur 132kV S/C line of Sarairanjan/dalsingsarai.
24. Jehanabad-Karpi 132kV S/C line on D/C tower
25. LILO of Baripahari – Fatuha 132kV S/C at Harnath.
26. LILO of existing Baripahari – Rajgir 132kV S/C of BSEB at Nalanda.
27. Saharsa/Madhepura (new) –Sonbarsha 132 kV S/C on D/C towers
28. Saharsa/Madhepura (new) –Supaul 132 kV S/C [132 kV S/C on D/C towers from Saharsa/

Madhepura (new) to LILO point of Saharsa –Supaul line and stringing of second circuit of Saharsa –Supaul 132 kV D/C line from LILO point to Supaul.

29. Tekari – Goh 132kV S/C line on D/C tower

33 kV lines

1. Dinara – Kochas 33 kV 2xS/C line with 33 kV bays at both end.
2. 33 kV lines – 300 kms. (20 kms. for each new 132/33 kV sub-station (15 nos.)} excluding Dinara

Reconductoring of existing transmission lines

1. Kahalgaon – Sabour – Sultanganj – Jamalpur – Lakhisarai 132 kV line with high Capacity conductor
2. Gaya (Chandauti)-Sone Nagar 132kV D/C line

New Substation

1.	Mushrakh	2x20MVA, 132/33kV
2.	Wajirganj	2x20MVA, 132/33kV
3.	Sarairanjan/dalsingsarai	2x20MVA, 132/33kV
4.	Runni Saidpur	2x20MVA, 132/33kV
5.	Kusheswar Sthan	2x20MVA, 132/33kV
6.	Digha	2x50MVA, 132/33kV
7.	Dinara	2x20MVA, 132/33kV
8.	Kudra	2x20MVA, 132/33kV
9.	Aurangabad	2x20MVA, 132/33kV
10.	Jagdishpur	2x20MVA, 132/33kV
11.	Saharsa/Madhepura	2x100MVA, 220/132kV 2x20MVA, 132/33kV
12.	Karpi	2x20MVA, 132/33kV
13.	Harnaut	2x20MVA, 132/33kV
14.	Nalanda	2x20MVA, 132/33kV
15.	Sonebarsha	2x20MVA, 132/33kV
16.	Goh	2x20MVA, 132/33kV

Augmentation of existing Substations

1.	Banjari	1x20MVA, 132/33kV
2.	Katihar	1x20MVA, 132/33kV
3.	Ramnagar	1x20MVA, 132/33kV
4.	Lakhisarai	1x20MVA, 132/33kV
5.	Jamui	1x20 MVA, 132/33KV
6.	Hazipur	2x50MVA, 132/33kV

		(replacement of exiting 2x20MVA)
7.	Kataiyya	1x20MVA, 132/33kV
8.	Dehri	1x100 MVA, 220/132kV
9.	Gaighat	1x50MVA, 132/33kV
10.	Baripahari	1x50MVA, 132/33kV
11.	Hathidah	1x20MVA, 132/33kV
12.	Khagaul	1x100MVA, 220/132kV

13. 2 Nos. additional 33 kV bays (2x15 = 30 bays) for termination of 33kV lines from the new 132/33 kV sub-stations (15 nos.) Except Dinara
14. 9 nos. of 20 MVA, 132/33kV transformer (in order to cover the damage of existing transformers to be replaced and reused in other place in Phase-I)

B. Spill over works (To be done by BSEB)

Substations

1.	Hazipur	2x100MVA, 220/132kV

Transmission line

1. Restoration of Ganga river crossing of Fatuha-Hazipur 220kV D/C

C Addition of Works (To be done by POWERGRID)

Transmission lines

1. LILO of 220 kV D/C Sasaram(PG)- Ara(PG) line at Pusauli New S/S.
2. Pusauli New S/S – Dehri 220 kV D/C line
3. Pusauli New S/S – Sasaram 132 kV D/C(S/C strung) line
4. Pusauli New S/S – Mohana(Bhabhua) 132 kV D/C(S/C strung) line
5. Pusauli New S/S – Dinara 132 kV D/C(S/C strung) line
6. Gopalgunj- Dhnha 132 kV D/C(S/C strung) line
7. Lakhi Sarai – Sheikhpura 132 kV D/C(S/C strung) line
8. LILO of 132 kV S/C Darbhanga- Pandaul line at Gangwar New S/S.
9. 40 kms 33 kV line (for 2 no new 132/33 kV Sub-station)

Substations

1.	Pusauli 220/132 kV Substation	6 nos. 220kV Line bays 2x150 MVA, 220/132kV Transf. withassociated bays. 3 nos132 kV line bays.

2.	Dhanha 132/33 kV Substation	1 no. 132 kV Line bays 2x20 MVA, 132/33 kV Transf. with associated bays. 4 nos33 kV line bays.
3.	Gangwar 132/33 kV Substation	2 no. 132 kV Line bays 2x20 MVA, 132/33 kV Transf. with associated bays.4 nos33 kV line bays
4.	Dehri 220/132 kV Substation Extension	2 no. 220 kV Line bays
5.	Gopalganj 132/33 kV Substation	1 no. 132 kV Line bays
6.	Sasaram 132/33 kV Substation	1 no. 132 kV Line bays
7.	Mohana(Bhabhua) 132/33 kV Substation	1 no. 132 kV Line bays
8.	Dinara 132/33 kV Substation	1 no. 132 kV Line bays
9.	Lakhisarai 132/33 kV Substation	1 no. 132 kV Line bays
10.	Sheikhpura 132/33 kV Substation	1 no. 132 kV Line bays
11.	4 nos. 33 kV bays at other end for 33 kV lines from Dhanha and Gangwar substations.	

Out of Service Transmission System in Bihar over a Long Period of Time

Sl.No.	Description	Date of outage	Reason/Remarks
1.	220 kV Patratu-Bodhgaya T/C ties between BSEB & JSEB		
	i) Line-I	12.6.2005	Conductor Theft
	ii) Line-II	14.6.2005	Conductor Theft
	iii) Line-III	01.1.2002	Tower Collapse
2.	220 kV Bodhgaya-Dehri Line-II	11.02.2006	Due to 220 kV CB problem at Dehri & Bodhgaya end
3.	100 MVA, 220/132 kV ICT-I at Dehri S/S	31.10.2001	Not yet intimated
4.	100 MVA, 220/132 kV ICT-I at Fatuah S/S	22.04.2002	Not yet intimated
5.	220 kV Biharshariff-Bodhgaya D/C	10.5.2006	Tower Collapse
6.	(i) 132 kV Sonenagar-Garwah S/C line between BSEB and JSEB	26.5.2006	Tower Collapse
	(ii) 132 kV Rihand-Sonenagar S/C line between BSEB and UPPCL.		
7.	132 kV Biharshariff-Barhi tie line between BSEB and DVC	31.05.2006	Tower collapse at location No. 149 & 150
8.	Charging of Fatuah-Khagaul line at 220 kV level (presently charged at 132 kV)	Since commissioning of the said line	This will ensure 220 kV closed loop inter-connection of BSEB.

Fund Requirements for Remaining 4 Circles

S.No.	Sub-transmission & Distribution Schemes in Towns	Scheme Cost (Rs. Crores)
1	Biharshariff Town	27.26
2	Arrah town	24.33
3	Buxer Town	14.08
4	Motihari Town	16.03
5	Bettaih Town	14.6
6	Samastipur Town	18.01
7	Begusarai Town(Samastipur Circle)	15.27
	Total	**129.58**

Additional Fund Requirement for Ongoing APDRP Schemes (12 Circles)

	Particulars	Cost (Rs. Crores)
a)	Total Revised Cost sanctioned by MOP	1066.58
b)	Original Cost	854.01
c)	Loan sanctioned by PFC	377.76
d)	Fund diverted by GOI to BSEB	311.26
e)	Balance fund required(a-c-d)	377.56

Details of Capacity Addition (Ongoing Schemes)

Name of the ongoing scheme	Transformation capacity addition	
	No. of Sub-stations	Capacity (MVA)
APDRP		
i. New S/Ss	40	352.80
ii. S/S augmentation	227	454.04
RGGVY		2656.61
ADP	16	160.00
RE State Plan	22	138.60
Total		3762.05

Details of New 33 KV Sub-Stations, Associated 33 KV, 11 KV, Lt Lines and Distribution Sub-Stations

Sl. No.	Particulars	Units	Quantity	Unit Cost		Estimated Cost (Rs crore)
I	Establishment of new 33/11 kV S/Ss	No.	260	2	Rs crore	520
II	**Erection of lines**	ckt kms				
	(i) 33 kV(8 Km per PSS)		2080	4.65	Lacs/ckt km	96.72
	(ii) 11 kV(.5 kmx4 feeder)/PSS		520	2.52	Lacs/ckt km	13.10
	(iii) 11 kV line for 48,200 DT connection @ .5Km per DT		24100	2.52	Lacs/ckt km	968.82
	(iv) LT line @ 1 km per DT		48200	2.06	Lacs/ckt km	992.92
III	**Establishment of Distribution S/Ss(100/63 kVA)100 kVA – 23,400 Nos.63 kVA – 24,800 Nos**	No.	48200	1.77/1/67	Lacs/DSS	828.34
IV	**Installation of Meters on:**	No.				
	(i) 33 kV Feeder		260	0.7	Lacs	1.82
	(ii) 11 kV feeder		1040	0.7	Lacs	7.28
	(iii) Distribution Transformers (DTs)		48200	0.21	Lacs	101.22
	(iv) Consumers					
	(a) Single phase (10,000 meters per block)		2665000	0.01	Lacs	266.50
	(b) Three phase(10 meter /DT)		482000	0.01	Lacs	48.2
	Sub-Total					**3844.92**

Details of Augmentation/R&M Works of Existing 33 Kv Sub-stations, Associated 33 Kv, 11 Kv, Lt Lines and Distribution Sub-Stations

Sl. No.	Particulars	Units	Quantity	Unit Cost		Estimated Cost (Rs crore)
I	**Capacity Augmentation of 33/11 kV S/Ss**					
	(i) 3.15 to 5 MVA	No.	40	17.63	Lacs each	7.05
	(ii) 1.6 to 3.15 MVA	No.	21	11.91	Lacs each	2.50
	(iii) 33 kV bay extension	No.	30	13.63	Lacs each	4.09
II	**New DSS with DT Meter**	No.	1000	3.83	Lacs each	38.3
III	**Capacity Augmentation of Distribution S/Ss** 100 to 200 kVA	No.	1000	2.00	Lacs each	20.00
IV	**R&M Works**					
	(a) 33/11 kV S/Ss	No.	100	1.378	Lacs each	137.8
	(b) Distribution S/Ss	No.	5330	0.85	Lacs each	45.30
	(c) Reconductoring of lines	ckt kms				
	(i) 33 kV		533	7.91	Lacs/ckt km	42.16
	(ii) 11 kV		2665	3.48	Lacs/ckt km	92.74
	(iii) LV		13325	1.79	Lacs/ckt km	238.51
	Sub-Total					**628.45**

Estimates for Installation of Capacitors at 33/11 Kv Sub-stations in Bihar

SL. No	Particulars	Quantity (No)	Total Capacity (MVA)	Capacitor Required (MVAR)	Rate per MVAR (Rs. Lakh)	Amount (Rs crore)
1	33/11 kV S/S capacity (MVA)					
	6	105	630	189	5.6	10.58
	10	125	1250	375	5.6	21.00
	16	95	1520	456	5.6	25.54
	20	80	1600	480	5.6	26.68
	Sub total (1)	405	5000	1500		84.00
2	Circuit Breaker & Panel etc. required for installation of capacitors	405			6.5	26.33
	Grand Total					**110**

Fund requirement for establishment of sub-transmission and distribution system for Buddhist/Cultural circuit

Sl.	Particulars	Bodhgaya	Rajgir	Nalalnda	Vaishali	Kesaria	Lauria	Kumhrar /Patna	Unit Rate (Rs. Lacs)	Total Cost (Rs. Lacs)
1	Transf Capacity Augmentation 2x10 MYA 1x5 MVA	 2	-	-	-	-	 1	-	 150.00 75.00	 300.00 75.00
2	New PSS 2x 5 MVA	-	1	1	1	1	-	-	400.00	1600.00
3	U. Ground Cabling HT (Km.) LT (Km.)	 20 10	 20 10	 10 10	 20 10	 - -	 10 5	 - -	 65.00 60.00	 5200.00 2700.00
4	Over Head Lines HT (Km.) LT (Km.)	 10 10	 10 10	 5 5	 5 5	 5 5	 5 5	 - -	 15.00 7.00	 600.00 280.00
5	Dist. Transformers 200 KVA 100 KVA 25 KVA	 10 25 300	 - 20 200	 - 25 150	 - 25 150	 - - 20	 - - 40	 - - -	 5.00 2.50 0.70	 50.00 237.50 602.00
6	High Mast Lighting (Number)	10	10	10	10	5	3	-	10.00	480.00
7	Street Lighting (Km)	10	10	10	10	5	5	20	10.00	700.00
8	Illumination of Monuments, light & sound prog	L.S	L.S	L.S	L.S	- L.S	- L.S	- - L.S	@100.00 @50.00 @500.00	400.00 100.00 500.00
	TOTAL	3042.50	3010.0	2227.50	2877.50	674.00	1293.00	700.00		13824.50

Phasing of various activities (sub-transmission and distribution system)

Sl. No.	Activity	Short-term	Medium-term	Long-term
1.	Identification of land and land acquisition	▸		
2.	100% metering of consumer, feeder and distribution transformer	▸	▸	▸
3.	Implementation of AMR for high valued customers as a pilot project	-	▸	-
4.	Preparedness for creation of base-line data	▸	-	-
5.	Creation of base-line data including consumer indexing through GIS mapping and asset codification	-	▸	-
6.	Preparation of road map for reduction of losses	▸	-	-
7.	Energy Accounting and Auditing	-	▸	-
8.	Dispersion of funds to power utilities directly for prompt implementation of schemes	▸	▸	▸
9.	Preparedness for Computerization of billing Centres, Collection Centres and service centres.	▸	-	-
10.	Computerization of billing Centres, Collection Centres and service centres.	-	"	-
11.	Opening of appropriate number of accredited test laboratories for meter testing	▸	▸	-
12.	Outsourcing of O&M activities	▸	▸	▸
13.	Completion of APDRP	▸	▸	-
14.	Completion of works other than RGGVY for additional anticipated load such as agriculture, small scale industry, cold storage etc.	▸	-	-
15.	Engagement of rural franchisee	▸		-
16.	Training of manpower	▸	▸	▸

A - Small Hydro Power Projects under Construction

Sl. No.	SHP	Village	Block	Distt.	Head (m)	Discharge (cumec)	Installed Capacity (unitsXkw)	Estimated cost (Rs. in Lakhs)	Loan amount sanctioned by NABARD (Rs. in Lakhs)
1.	Triveni Link Canal	Valmikinagar	Bagaha	West Champaran	4.49	70.85	1x1500	1347	608
2.	Nasariganj	Nasariganj	Nasariganj	Rohtas	4	34.28	2x500	568	421
3.	Jainagara	Jainagara	Nokha	Rohtas	4.18	29.75	2x500	531	404
4.	Shirkhinda	Shirkhinda	Nokha	Rohtas	3.5	23.2	2x350	487	347
5.	Sebari	Sebari	Nasariganj	Rohtas	4.5	25.8	2x500	568	399
6.	Tejpura	Tejpura	Obra	Aurangabad	4.25	41	2x750	675	497
7.	Arwal	Arwal	Arwal	Arwal	3.2	18.12	1x500	318	222
8.	Belsar	Belsar	Arwal	Arwal	3.25	35.8	2x500	570	401
9.	Rampur	Rampur	Dinara	Rohtas	3	9.97	1x250	222	153
10.	Walidad	Walidad	Arwal	Arwal	3.9	28.9	1x700	372	260
11.	Amethi	Amethi	Sanjhauli	Rohtas	4	14.5	1x500	324	226
12.	Dehra	Dehra	Obra	Aurangabad	2.5	46.4	2x500	584	410
13.	Sipaha	Sipaha	Daudnagar	Aurangabad	3.2	36.3	2x500	543	381
14.	Natwar	Natwar	Dinara	Rohtas	4	7.3	1x250	214	148
15.	Paharma	Paharma	Gorari	Rohtas	4.7	24.7	2x500	555	390
16.	Rajapur	Raniganj	Birpur	Supaul	3.6	7.3	2x350	347	242
						Sub-total	13600 i.e.13.6 MW		

B - Additional Small Hydro Projects under construction (as informed by BSHPC on 14-6-2007)

S.no.	Name of the project	District	Installed Capacity (KW)
1	Dhoha	West Champaran	2x1000
2	Katanya	West Champaran	2x1000
3	Mathauli	West Champaran	2x400
4	Triveni Link Canal (2nd Unit)	West Champaran	1x1500
		Sub-total	**6300 KWSay 6.3 MW**
		Total (A+B)	**19.9 MW**

Balance Sheet of Bihar State Electricity Board

(Figures in Rupees)

Particulars	As on 31st March, 2005		As on 31st March, 2004	
NET ASSETS				
Net Fixed Assets				
Gross Block	24,09,63,91,311		22,90,37,24,594	
Less: Accumulated Depreciation	17,08,90,83,154		15,91,99,53,754	
Net Fixed Assets		7,00,73,08,157		6,98,37,70,840
Capital Expenditure in Progress		4,64,57,46,624		2,71,05,89,396
Assets not in use		3,60,83,009		3,60,83,009
Deferred Costs		-		-
Intangible Assets		-		-
Investments		3,83,73,52,316		1,85,95,92,655
Net Current Assets				
Total Current Assets	40,44,63,00,390		38,49,82,14,259	
Less:				
Total Current Liabilities:				
(i) Security Deposits from Consumers	36,12,75,813		26,22,14,009	
(ii) Other Current Liabilities	35,07,27,06,011		36,22,89,51,826	
Total Current Liabilities (i + ii)	35,43,40,81,824		36,49,11,65,835	
Net Current Assets		5,01,23,18,566		2,00,70,48,424
Subsidy Receivable from State Govt.		38,29,14,81,440		30,25,54,81,440
NET ASSETS		58,83,02,90,112		43,85,25,65,764
FINANCED BY:				
Borrowings for Working Capital		2,41,15,48,471		91,34,48,471
Payments due on Capital Liabilities		15,67,97,14,928		9,39,63,99,541
Capital Liabilities		2,28,86,32,278		1,94,70,77,607
Funds from State Government		39,43,49,32,690		32,59,33,74,622
Contributions, Grants and Subsidies towards cost of Capital Assets		1,42,21,28,073		86,58,61,198
Reserves and Reserve Funds		40,906		30,327
Surplus(+)/Deficit(-)		-2,40,67,07,234		-1,86,36,26,002
TOTAL FUNDS		**58,83,02,90,112**		**43,85,25,65,764**

Resolutions Adopted by the Chief Ministers' Conference on Power Sector Held on 28th May 2007

Following are the Resolutions passed by the Chief Ministers Conference on Power, held under the Chairmanship of the Prime Minister, Dr. Manmohan Singh.

1. The Conference recognizes the vital importance of the power sector in the development of the economy which is on a trajectory of high growth and resolves that a time bound closely monitored action programme for accelerated capacity addition, drastic loss reduction, achievement of the rural electrification targets set out under Bharat Nirman, and promotion of efficient energy and Demand Side Management, be put in place at the Centre and in the States.

2. The Conference acknowledges that electricity is a concurrent subject. The States and the Centre shall jointly endeavour to provide access to electricity to all. The States are conscious of their primary responsibility of ensuring availability and distribution of electricity. The continued proactive initiatives of the Union Government in coordinated planning, supplementing generation through Central Public Sector Undertakings, inter-state and inter-region transmission, rural electrification, providing financial assistance through various programmes and institutions, and in guiding the reforms process, along with the proactive stance of the States, are vital to achieve this objective.

3. The Conference acknowledges that the Bharat Nirman targets for rural electrification have to be met in order to ensure that rural India has adequate access to electricity; and resolves that the Central Government would, through the Rajiv Gandhi Grameen Vidyutikaran Yojana, continue to assist the State Governments help expand their rural networks and extend household connections to BPL families as set out under Bharat Nirman. The Government of India, in discharge of its statutory functions under the Electricity Act, would extend all possible financial and techno-managerial support. The States would urgently formulate clear, cost effective and comprehensive rural electrification plans which would address the concerns of sustainability, availability, affordability and delivery of power. The States should also develop appropriate revenue and franchisee models that may use system improvements to meet the requirements of the rural areas and disadvantaged groups, particularly wherever it is a better alternative to existing arrangements. The Centre shall support the States in their commitment and take into account the special requirements of different States.

4. The Conference noted with concern that the country is presently facing serious peaking and energy shortages, and resolves that the States and the Centre would vigorously

pursue the capacity addition programmes so as to create capacities in line with the rapid growth of demand of electricity and eliminate shortages within the 11th Plan to ensure the goal of "Power for all by 2012". The Centre and the States would ensure timely placement of orders by December 2007 for all projects intended to give benefits during the 11th Plan and ensure regular monthly project monitoring for their timely commissioning along pre-determined milestones. The Centre would set up a National Power Project Management Board for monitoring the timely commissioning of the unprecedented capacity addition and associated transmission projects. The States would also set up similar dedicated apparatus. Immediate steps would also be taken to expedite the development of hydro power and renewable sources. The Centre would continue to ensure the timely development of inter-state and inter-region transmission lines, with active facilitation by the States. Matching sub-transmission and distribution networks would be created by the States to synchronise with the capacity addition. The States supported the initiative of the Centre to set up Ultra Mega Power Projects (UMPPs). The Centre would also develop the necessary transmission network for UMPPs. The States would continue to effect further improvement in the PLF of their existing generating stations. The Government of India would facilitate the timely and adequate availability of coal and gas for the generating plants at reasonable and competitive prices within the existing legal framework. The linkage from coalfields will be locationally rationalized, to the extent possible.

5. The Conference recognizes that an estimated captive generating capacity of about 20,000 MW is being sub-optimally utilized in a phase of critical power shortage; and resolves that no generating capacity would be left idle. The States would facilitate captive power plants to provide spare generating capacity to the grid and strive to do away with restrictive levies, duties and regulations in a time-bound manner.

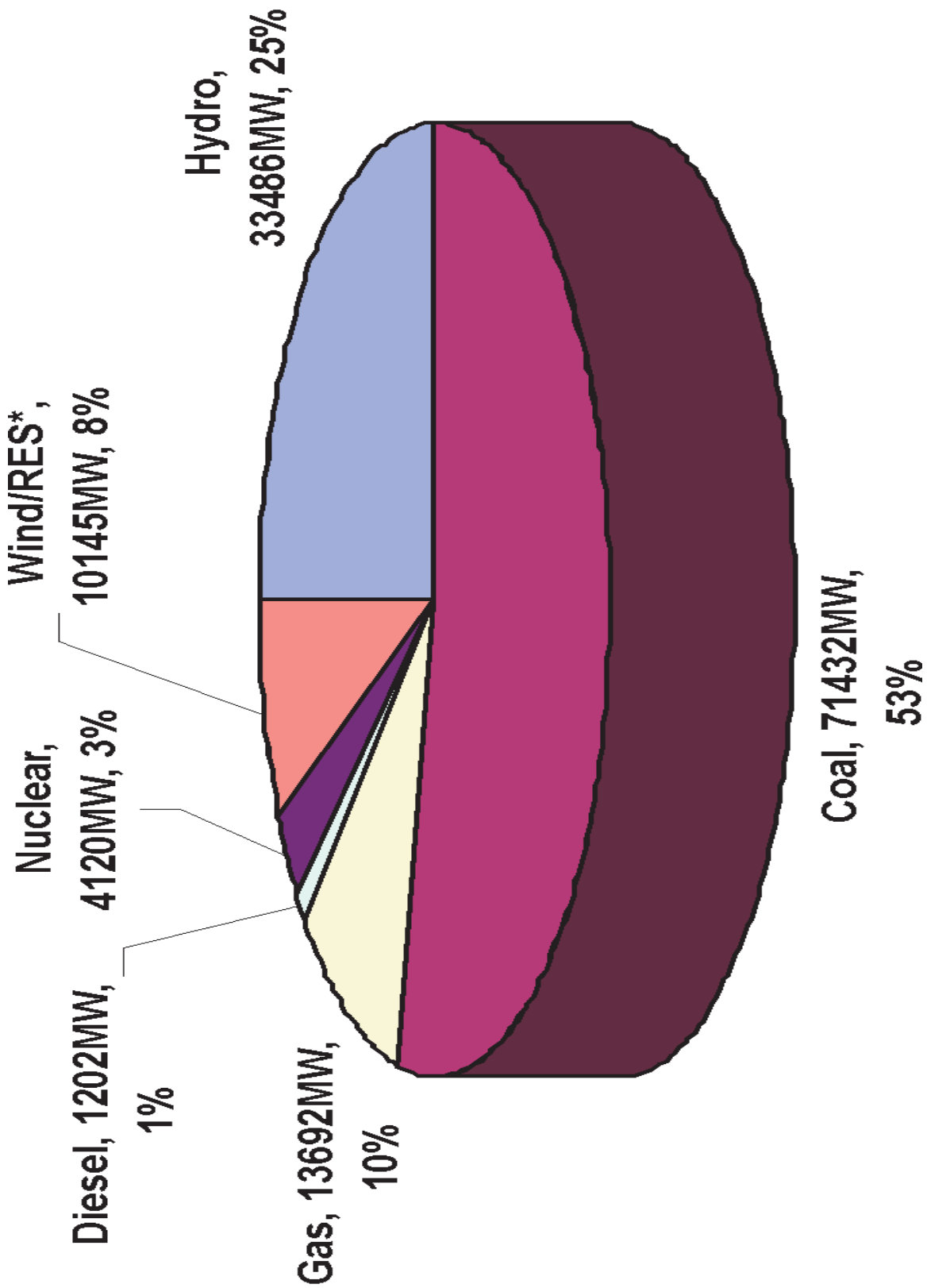
6. The Conference further resolves that the States commit themselves to operationalising open access in the transmission and distribution sectors and resolve to issue policy directives to regulators, if necessary, to appropriately restructure cross subsidy surcharge, wheeling charges and other charges, with a view to augment the quantum of power flowing into the grid in the prevailing environment of shortages.

7. The Conference recognizes that the operationalising of open access and competition in the supply of electricity to consumers would improve the supply position, help lower the tariffs and attract much needed investment in capacity addition; and resolved that the Centre and the States would unshackle generation, transmission and distribution to enhance the availability of electricity and its unhindered movement to consumers. The Centre and the States would also issue any necessary policy directives to any undertaking or regulator to this end, in the interest of consumers, within and outside the concerned State.

8. The Conference recognizes that the current level of AT&C losses constitute a grave threat to the viability of the power sector and the distribution segment, which is currently losing about Rs. 47,000 crores per annum, is the weakest link in the power system; and resolves that the States commit themselves to achieve and sustain drastic reduction in the overall AT&C losses through the next five years, and at least to a level of 15% in the APDRP project areas as has been demonstrated by the participating States in 163 towns and cities. Towards this end, the States with appropriate assistance from the Centre would establish the necessary baseline data and IT applications for energy accounting and auditing, besides ensuring a resolute elimination of electricity theft, which is negating various investments and initiatives for power sector reforms. It is further reiterated that where free or subsidized power is provided to a section of consumers, the State Government shall ensure upfront payment of the same to the utilities.

9 The Conference recognizes that there is a very significant potential of saving electricity through its efficient use; and resolves that States and the Centre should focus on Demand Side Management measures and ensure such interventions as would provide immediate results for saving electricity. These interventions could include bulk procurement and distribution of CFLs.

10. To periodically review the implementation of the resolutions adopted in the conference, it is decided to set up a Standing Group of Power Ministers under the Chairmanship of the Union Power Minister to meet once a quarter in a year.


Hydro, 33486MW, 25%
Wind/RES*, 10145MW, 8%
Nuclear, 4120MW, 3%
Diesel, 1202MW, 1%
Gas, 13692MW, 10%
Coal, 71432MW, 53%