



24X7 POWER FOR ALL

A JOINT INITIATIVE OF GOVERNMENT OF INDIA AND GOVERNMENT OF BIHAR



DECEMBER 2015



Government of India



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Minister of State (Independent Charge) for Power, Coal and New & Renewable Energy

Foreword

Electricity consumption is one of the most important indices that decides the development level of a nation. The Government of India is committed to improving the quality of life of its citizens through higher electricity consumption. Our aim is to provide each household access to electricity, round the clock. The 'Power for All' programme is a major step in this direction.

Bihar is one of the low power consuming states at present due to lack of infrastructure and it has to put lot of effort to provide reliable and quality power to all.

This joint initiative of Government of India and Government of Bihar aims to enhance the satisfaction levels of the consumers and improve the quality of life of people through 24x7 power supply. This would lead to rapid economic development of the state in primary, secondary & tertiary sectors resulting in inclusive development.

I compliment the Government of Bihar and wish them all the best for implementation of this programme. The Government of India will complement the efforts of Government of Bihar in bringing uninterrupted quality power to each household, farmer, small & medium enterprise and establishment in the state.



Government of Bihar



Bijendra Prasad Yadav

Energy Minister of Bihar

Foreword

The Government of Bihar has identified Power Sector as primary sector requiring focus of effort and initiative. Our relentless endeavour in the area is bearing fruit in the form of significant qualitative and quantitative improvement in all three arms viz., Generation, Transmission and Distribution. In recent times, we have covered a lot of ground in our avowed goal of achieving total self-reliance in this sector in line with our stated commitment on the event of Independence Day 2012. With the function based restructuring of the Administrative and Executive setup, there has been quantum jump in availability of power in both urban and rural areas as well as revenue collection are better than ever before.

However, there is still a long way to go before we can fulfill our dream of achieving uninterrupted power supply in urban & rural areas along with access of electricity for all.

The Government of Bihar has taken all necessary steps in terms of capacity addition power procurement, strengthening the Transmission & Distribution network, energy efficiency measures, consumer centric initiatives, following best practices in implementation of different ongoing schemes, reduction in aggregate technical & commercial loss and filing of timely tariff petition to make the distribution companies financially viable.

In tune with this, **Power for all (24x7)** programme is a step forward in this direction. It is an excellent platform to assess the actual requirement of power by 2018-19 and formulate an integrated strategy under all three wings of power sector i.e. Distribution, Transmission & Generation.

The Government of Bihar wishes all success to the Power Companies.



Government of India



Government of Bihar

Joint Statement

Bihar is one of state in the country selected for '24x7 Power for All' (PFA) programme. This programme will be implemented by Government of Bihar with active support from Government of India with the objective to connect the unconnected in phased manner by FY 19, ensure 24x7 quality, reliable and affordable power supply to all Domestic, Commercial and Industrial consumers and adequate supply to Agriculture consumers within a fixed time frame.

Government of Bihar is attaching highest priority to power sector and power supply position is been reviewed on periodic basis and is committed to provide full support to all utilities for ensuring quality power supply.

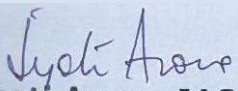
Government of Bihar would ensure that all the necessary steps outlined in the PFA document are taken up in terms of capacity addition, power procurement, strengthening the required transmission and distribution network, encouraging renewables & energy efficiency measures, undertaking customer centric initiatives, reduction of AT & C losses, bridging the gap between ACS & ARR, and following good governance practices in implementation of all central and state government schemes.

Government of India (GoI) would supplement the efforts of Government of Bihar by fast tracking resolution of key issues pertaining to generation, expediting the additional interstate connectivity and ensuring optimum allocations in various distribution schemes, as per the provisions of applicable policies.

It is envisaged to cover the entire state under PFA programme in a phased manner and to provide 24x7 power supply to all connected domestic, industrial and commercial consumers from FY 17 itself and to all un-connected households by FY 19. Adequate supply to Agriculture consumers would also be provided within a fixed time frame.

However Government of Bihar would endeavor to implement the programme much earlier than the above targeted dates.

The central and state governments would meet regularly to review the progress of the programme over the next 4 years and would strive to achieve the objectives of the programme by taking the necessary steps as envisaged in the PFA document.


Jyoti Arora, IAS
Joint Secretary
Minister of Power (GoI)

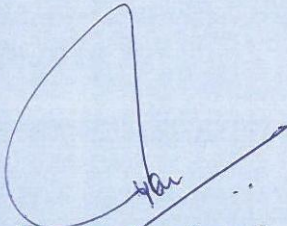

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EXECUTIVE SUMMARY

24x7 Power for All (24x7 PFA) is a Joint Initiative of Government of India (GoI) and State Governments with the objective to make 24x7 power available to all households, industry, commercial businesses, public needs, any other electricity consuming entity and adequate power to agriculture farm holdings by FY 2018- 19.

This roadmap document aims to meet the above objectives for the state of Bihar. Bihar stands at 21st position with approx. 1.6% of total installed capacity in the country. Bihar, being home to approx. 8% of the national population, has inadequate total installed capacity. The per capita consumption of power in Bihar was one of the lowest being 134 Units as against the national per capita consumption of 917 Units during FY 2013-14.

CONNECTING THE UNCONNECTED

In the state of Bihar, there are about 157.5 lakh un-electrified households in rural areas and 3.06 lakh un-electrified households in urban areas as on March 2015. The state is planning to electrify around 140 lakh rural households by FY 2018-19 under the DDUGJY scheme of GoI and through off-grid solutions. The remaining rural households are supposed to be using electricity from nearby electrified households as combined units. Also, 100% urban household's electrification is being planned during the same period.

GROWTH IN DEMAND

In order to achieve the objective of 24 x 7 Supply, the state would see an increase in peak demand from 3,500 MW in FY 2014-15 to 8774 MW in FY 2018-19 with corresponding increase in energy requirement from 22,226 MU in FY 2014-15 to 61,750 MU in FY 2018-19.

The future demand has been arrived by estimating the domestic and non domestic demand separately. Domestic demand has been estimated for urban and rural household consumption taking into account the growth in number of electrified households on the one hand and the growth in average consumption on the other hand. For other than domestic category, growth rate has been considered to be 20% p.a. in view of rapid appetite for growth in industry and commercial activities due to availability of 24x7 assured power. The additional demand for expected agriculture load in the state has also been taken into account while doing the demand estimation.

SUPPLY ADEQUACY

The present power availability in the state is 3704.63 MW. In order to meet the increased demand, the state has already planned additional capacity availability of 6521.30 MW through own generating stations, renewable energy sources, central generating stations and long term/medium term PPAs through competitive bidding in a phased manner by FY 2018-19. However, even with the availability of additional capacity, the state would still be facing a shortfall of 15.02% to 7.76% in terms of Peak demand during FY 2015-16 to FY 2018-19.

There will be surplus (1.4% to 2.5%) in energy availability during FY 2015-16 & FY 2018-19, whereas during FY 2016-17 & FY 2017-18 the state will be facing a shortfall of about 4% in terms of energy availability.

The state will have to progressively plan to tie up additional power on short terms as well as medium term basis to mitigate the gap. Although, the state will be surplus in power in terms of energy availability by FY 2018-19, but the peak shortage will continue.



In addition, the state has also planned new coal based projects of capacity 7960 MW in the state comprising of 1320 MW each at Buxar, Lakhisarai & Pirpainti and 4000 MW UMPP project at Banka which are very important and to be executed expeditiously for meeting the expected power demand of the state beyond FY 2018-19.

ADEQUACY OF TRANSMISSION NETWORK

The state is well served by a network of Inter-state transmission lines at 765 kV, 400 kV and 220 kV levels. The existing ISTS transmission system capacity is adequate to meet the present power requirement up-to FY 2017-18.

In ISTS system, Power grid has to undertaken/ plan a robust transmission system and further strengthening the connectivity of Bihar State Grid with national Grid so as to make it adequate to meet the projected power demand of Bihar by FY 2018-19.

The existing Intra state transmission capacity at 220/132 kV level is 5510 MVA (including 1670 MVA, transformation capacity of adjacent ISTS system) and 6510 MVA at 132/33 kV level.

The Intra state transmission capacity shall increase to 12830 MVA at 220/132 kV level and 13020 MVA by FY 2017-18 at 132/33 KV level. To meet the projected power demand of Bihar (7088 MW) by FY 2017-18 and 8774 MW by FY 2018-19, additional 500MVA capacity addition by FY 2017-18 & 3200MVA capacity addition by FY 2018-19 has been envisaged by BSPTCL at both 220/132 KV level and 132/33 KV level, which shall be adequate to meet the power demand of Bihar. The existing intra-state transmission system with the planned investment of Rs. 12314.12 Crores from FY 2015-16 towards capacity addition would be adequate to meet the requirement as envisaged for 24x7 PFA.

ADEQUACY OF DISTRIBUTION NETWORK

In Distribution sector, many Central sponsored schemes like RAPDRP, RGGVY, BRGF and ADB

funded schemes are under implementation in the state under which many distribution augmentation works are being taken up in the state. Further, the state has proposed a requirement of capital expenditure of Rs. 5827.1 Crores for augmentation of distribution system in rural area under DDUGJY scheme for feeder segregation, providing access to power of all rural households, system strengthening and network up gradation, and Rs 2426.84 Crores under IPDS for augmentation of distribution system in urban areas through a planned capacity addition at 33/11 kV level, DT level and creation of 33 kV, 11kV ABC & Bare lines, U/G cables, LT lines, Electronic consumers meters, Capacitor bank etc. GOI has sanctioned the projects of Rs 5827.23 Crores under DDUGJY and projects of Rs 2109.77 Crores under IPDS for the state of Bihar.

The existing distribution network with all these projected addition through GOI/State scheme (RAPDRP-B, DDUGJY, IPDS, RGGVY, and BRGF) shall be adequate to meet the requirements under projected peak load addition.

Also, the state is committed to improve the loss scenario and AT&C losses are projected to be reduced from 46.63 % to 30.00 % by FY 2018-19 through implementation of various measures. The AT&C losses as mentioned above are inclusive of 3.92% to 3.77% intra state transmission loss during the same period.

FINANCIAL POSITION

Bihar Discoms commenced their operations with a loss of Rs. 1642.41.00 Cr. in FY 2012-13, which increased to Rs. 2124.72 Cr. in FY 2013-14. The primary reason for increasing the loss level from FY 2012-13 to FY 2013-14 despite one tariff hike during this period @6.9% was that the additional revenue has been neutralized by higher quantum of power purchase at comparatively higher cost due to additional requirement and state generation projects did not come up to supply the additional requirement.



However, various measures have to be taken by Govt. of Bihar to bring down the losses of Discoms which may include regular filing of ARR, optimization of power purchase cost, measures to

reduce AT&C losses including reducing theft, achieving 100% metering , billing & collections etc.



Access to electricity on 24X7 basis for all its citizens has become synonymous to cause of social equality. It means much more than merely an act of infrastructure development to any nation and thus this issue has acquired significant dominance on the national as well as state agenda. Endeavour to perk-up the growth in electricity consumption to stay in pace with national/global benchmark therefore are to be taken up with top most priority.

Under the Indian Constitution, electricity is a concurrent subject and distribution of electricity falls under the purview of the respective State Government/State Power Utility. As per Electricity Act 2003, it is the duty of a distribution licensee to develop and maintain an efficient, co-ordinated and economical distribution system in his area of supply and to supply electricity in accordance with the provisions contained in the Act. The State Electricity Regulatory Commission (SERC) shall specify or enforce standards with respect to quality, continuity and reliability of service by licensees. Accordingly, State Electricity Regulatory Commissions (SERCs) have notified the Standards of Performance specifying maximum allowable time for restoration of supply due to forced breakdowns and Supply Code specifying the supply voltages & frequency etc, to be followed by Discoms. SERCs also monitor the performance of distribution companies on the basis of notified Performance of Standards.

OBJECTIVES OF THE 24X7 POWER FOR ALL – JOINT INITIATIVE

To supplement the efforts towards achieving this objective, Government of India and Government of Bihar have taken a joint initiative to provide 24 X 7 power in the state to all consumers. The hours of adequate supply to agriculture consumers will be decided by the state Government. This initiatives aims at ensuring uninterrupted supply of quality power to existing consumers and providing access to electricity to all unconnected consumers by FY 2018-19.

The initiative of 24x7 Power supply to all encompasses mainly the following:

- i. Reliable & quality 24X7 power supply to the existing consumers in a phased manner within a period of three years from the date of commencement of the programme.
- ii. All unconnected households to be provided access to electricity in a time bound manner ultimately by the year 2022. States have the liberty to hasten the process by taking accelerated steps, if required.
- iii. To ensure adequate capacity addition planning & tie ups for power from various sources at affordable price to meet the projected increase in power demand for future.
- iv. Strengthen the Transmission and Distribution network to cater to the expected growth in demand of existing as well as forthcoming consumers.
- v. Monitoring the timely commissioning of various generating plants, transmission and distribution infrastructure to meet the expected growth in demand.
- vi. Put in place a strategy to ensure reduction of AT&C losses as per the agreed loss reduction trajectory and methodology and steps required to be taken at every level of distribution in this regard.
- vii. Overall Power Supply Improvement – To be achieved by undertaking measures such as energy mix optimization, reduction in power operational in-efficiency of state generation plant(s) and optimal fuel procurement policy.
- viii. Financial measures including investment rollout plans and undertaking necessary balance sheet analysis to assess the financial strength/ weaknesses in the utility finances.
- ix. Introduce modern technologies to monitor reliable supply like sub-station automation, providing adequate communication infrastructure, GIS, Reliability, Centralised Network Analysis and Planning tools, SAP driven ERP systems, DMS (Distribution



Management Systems), OMS (Outage Management System), etc.

- x. To take essential measures for meeting the performance standards as laid down by SERC.

An Action plan would be drawn to achieve the above aims and objectives. The plan will be executed by the State Government with the support of Government of India, wherever necessary, as per their approved plans, schemes and policies. This joint initiative of Government of India and Government of Bihar aims to enhance the satisfaction levels of consumers, improve the quality of life of people, and increase the economic activities resulting into inclusive development of the state.

METHODOLOGY FOR PREPARATION OF THE ACTION PLAN FOR THE 24X7 POWER FOR ALL

Accordingly the methodology adopted to prepare the 'Action Plan' for 24x7 PFA includes inter-alia:

- 1) Projection of average per day consumption of rural and urban households based on respective historical compounded annual growth rates (CAGR) during the past years and considering the aspirational growth perspectives.
- 2) Projection of demand of consumers encompassing commercial, industrial, agricultural and remaining all consumers has been carried out under others category based on past data and historical CAGR recorded for the state during the past years after discussing with state and factoring in the aspirational growth perspectives.
- 3) Assess the power requirement of un-electrified households and draw up a time bound plan for electrification of all households.
- 4) Project the annual energy requirement and maximum demand by aggregating the requirement of all consumer categories and applying an appropriate load factor.
- 5) Prepare a broad plan to meet power demand in future through additional generation capacity proposed in the state and quantum for additional procurement required.
- 6) Assess the financial implications on utilities and per unit implication on tariff for procuring additional energy to meet the energy requirement of all segments of consumers. Assess the adequacy of the network - both inter-state and intra state transmission as well as distribution so as to meet the increased / expected / projected power requirement of all consumer categories of the state.
- 7) Conduct sensitivity analysis on various parameters namely average purchase price of energy, AT&C loss reduction, etc.
- 8) Set monitorable targets to achieve the goal of 24x7 Power for All in a cost effective manner to the consumers of the State.



CHAPTER – 2 : FACTS ABOUT BIHAR



Bihar is the 13th largest state, with an area of 94,163 km² and the 3rd largest by population (as per census 2011) with total population of **103,804,637** (54,185,347 male and 49,619,290 female). Nearly 85% of Bihar's population lives in rural areas. Its population is the fastest-growing of any state. It is bounded by Uttar Pradesh to its west, Nepal to the north, the northern part of West Bengal to the east, and by Jharkhand to the south. The Bihar plain is divided into two parts by the river Ganges which flows from west to east. Bihar has forest area of 6,764.14 km², which is 7.2% of its geographical area. In 2000, southern Bihar was separated from Bihar to form the new state of Jharkhand.

For long, Bihar has lagged behind in development of power sector. Bihar power sector has grown at a very tardy pace as compared to national average. The power shortage and electrification of un-electrified households are also far away from National Average. There are still 1.6 Crore un-electrified households out of total of 2.14 Crore Households in the state.

The brief profile of Bihar State is as follows:

Table-2.1

Brief Profile of Bihar

Sl.No.	Description	
1.	Area	94.2x10 ³ Sq. Km.
2.	Population (Persons as per 2011 census)	10.38 Crores
	- Rural	9.21 Crores
	- Urban	1.17 Crores
3.	Per Capita income (in Rs.)	28774*
4.	No. of Districts	38
5.	State GDP growth rate (2014-15)	17.06%**
6.	Total Rural households (census 2011)	16926968
7.	Total Rural electrified households (census 2011)	1754673
8.	Total Urban households (census 2011)	2013671
9.	Total Urban electrified households (census 2011)	1343762

*www.mapsofindia.com (2012-13)

**Wikipedia

Bihar State Power Holding Company Limited (or BSPHCL), is the apex body holding independent unbundled utilities operational in the state namely:

- 1) Bihar State Power Generation Company Ltd.
- 2) Bihar State Power Transmission Company Limited
- 3) South Bihar Power Distribution Company Ltd
- 4) North Bihar Power Distribution Company Ltd.

The power sector of state is regulated by Bihar Electricity Regulatory Commission (BERC).

CHAPTER – 3: CONSUMPTION PATTERN AND ELECTRIFICATION STATUS

As per Census 2011 data, there were about 189.4 lakh households in the State out of which 169.3 lakhs were in rural areas and balance 20.1 lakhs were in urban areas. Out of 169.3 lakhs rural households only 17.54 lakhs (10.4 %) were electrified and 151.7 lakhs (89.6 %) were un-electrified. In urban areas out of total of 20.1 lakh households 13.43 lakhs (66.8 %) were electrified and balance 6.69 lakhs (33.2 %) were un-electrified. The details are at Annexure-II.

Projection in total number of households in FY 2014-15 based on census figures of 2011 and considering CAGR of the past 10 years has been carried out. However, the data for total number of electrified households in urban and rural areas in FY 2014-15 is based on latest data of the State and the same has been considered for projecting the future household consumption.

The details of households in the State of Bihar based on Census figures and as per GoB are as under:

Table-3.1

Number of Households in Bihar in FY 2014-15

Particulars	2001	2011	CAGR	As projected from Census figures/As per State Data (March 2015)	Remarks
Total Households	13982590	18940629	3.08%	21394814	As per Census Data
Rural Households	12660007	16926968	2.95%	19012414	
Urban Households	1322583	2013671	4.29%	2382400	
Total Electrified Households	1433477	3098435	8.01%	5334722	As per State Data 7,30,000 Rural electrified H/H in the process of being brought to billing cycle
Rural Electrified H/H	649503	1754673	10.45%	3258499	
Urban Electrified H/H	783974	1343762	5.54%	2076223	As per State Data
Total Un-electrified H/H	12549113	15842194	2.36%	16060092	
Rural Un-electrified H/H	12010504	15172295	2.36%	15753915	
Urban Un-electrified H/H	538609	669909	2.21%	306177	

As per Government of Bihar (GoB), presently, there are about 53.34 lakhs electrified households in the State (Rural 32.58 lakhs and Urban 20.76 lakhs). Thus there are a total of around 160.60 lakhs un-electrified household in the state (157.54 lakhs in rural and 3.06 lakhs in urban).

At present, of the total consumption in the state, domestic category of consumers consumes about 40%, industrial 22%, traction 23%,

commercial 10% and balance 5% by other category of consumers. The category wise number of consumers from FY 2009-10 to FY 2014-15 is furnished in Annexure-I.

Load Projection

Based on the urban & rural consumption data provided by GoB, present per household consumption have been assessed as 1.42 units/day in rural area and 4.28 units/day in urban area as shown below –

Table-3.2**ESTIMATION OF EXISTING PER HOUSEHOLD CONSUMPTION**

Sl. No.	Particulars/States → ↓	Unit	As per Census/ State data
1	Total Households in State	Nos.	21394814
2	Total Urban Households	Nos.	2382400
3	Total Rural Households	Nos.	19012414
4	Total Electrified Households	Nos.	5334722
5	Total Electrified Households - Urban	Nos.	2076223
6	Total Electrified Households - Rural	Nos.	3258499
7	Balance Un-electrified Households	Nos.	16060092
8	Balance Un-electrified Households - Urban	Nos.	306177
9	Balance Un-electrified Households - Rural	Nos.	15753915
10	Electrification of houses under 12th Plan RGGVY	Nos.	0
11	Annual energy sold in the State during FY 2014-15	MU	10322
12	Annual Domestic energy sold in the State during FY 2014-15	%	47.79%
13	Annual Domestic energy sold in the State during FY 2014-15	MU	4933
14	Annual Domestic energy sold in the State during FY 2014-15(Rural)	MU	1693
15	Annual Domestic energy sold in the State during FY 2014-15(Urban)	MU	3240
16	Average Annual Energy Consumption per household during FY 2014-15	kWh	924.7
17	Average Daily Energy Consumption per household during FY 2014-15	kWh	2.53
18	Daily per household rural consumption	kWh	1.42 (~1.40)
19	Daily per household Urban consumption	kWh	4.28 (~ 4.30)

The daily per household Rural and Urban consumption has been considered for projection of Annual household energy

requirement in the state from FY 2015-16 to FY 2018-19.

CHAPTER – 4 : DEMAND AND SUPPLY SCENARIO

Bihar has been facing very high energy and peaking shortages during the past many years. However, the energy and peaking shortages have reduced during the past six years. The annual energy requirement of Bihar in FY 2009-10 was of the order of 12720 MU against availability of 9837 MU resulting in energy shortage of 23%. Similarly peak demand in Bihar in FY 2009-10 was of the order of 2200 MW against peak met of 1508 MW indicating a peaking shortage of 31% during FY 2009-10. These energy and peaking shortages have reduced and presently during FY 2014-15

the annual energy requirement was about 22226 MU against availability of 18733 MU resulting in energy shortage of 16%. Similarly peak demand in FY 2014-15 was 3500 MW against peak met of 2831 MW indicating peaking shortage of 19%. The reduction in shortages is mainly on account of the fact that increase in availability has outstripped the increase in demand.

The Power Supply Scenario in Bihar from the FY 2009-10 to FY 2014-15 is as under :

Table-4.1

Power Supply Scenario

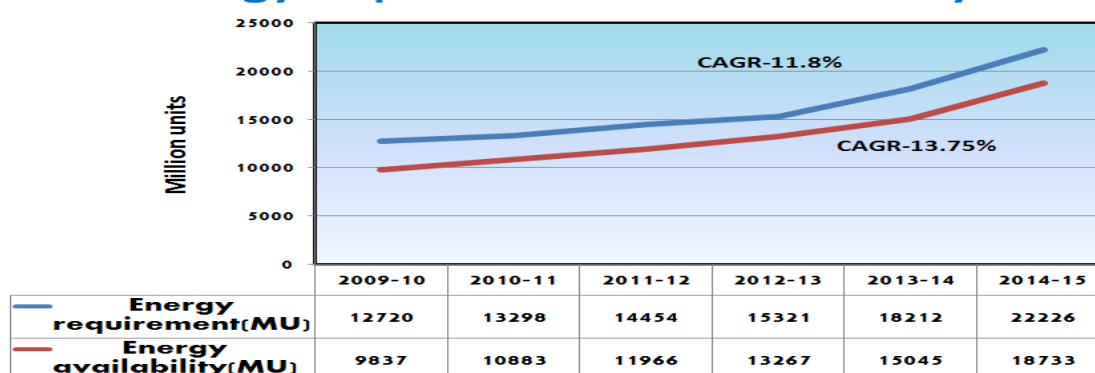
Period/Items	Unit	FY 2009-10	FY 2010-11	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15
Peak Demand	MW	2200	2300	2500	2650	3150	3500
Peak Met	MW	1508	1664	1712	1802	2335	2831
Peak Deficit (-) / Surplus (+)	MW	(-) 692	(-) 636	(-) 788	(-) 848	(-) 815	(-) 669
Peak Deficit (-) / Surplus (+)	%	(-) 31.45	(-) 27.65	(-) 31.52	(-) 32.00	(-) 25.87	(-) 19.11
Energy Requirement	MU	12720	13298	14454	15321	18212	22226
Energy Availability	MU	9837	10883	11966	13267	15045	18733
Energy Deficit (-) / Surplus (+)	MU	(-) 2883	(-) 2415	(-) 2488	(-) 2054	(-) 3167	(-) 3493
Energy Deficit (-) / Surplus (+)	%	(-) 22.66	(-) 18.16	(-) 17.21	(-) 13.41	(-) 17.39	(-) 15.72

Source: GoB/CEA

The energy requirement including all categories of consumers has posted a Compound Annual Growth Rate (CAGR) of 11.8% as against the

energy availability at a CAGR of 13.75% based on data from year FY 2009-10 to FY 2014-15. The scenario is exhibited below:

Energy requirement and availability



Source data: GoB



The base year for the purpose of beginning the future assessment has been considered as year FY 2014-15 which has an aggregated demand of 22.226 Billion Unit (BU).

Demand Estimation Methodology

For the purpose of estimation, power consumers have been broadly classified into the domestic consumers and others (commercial, industrial, agriculture etc.). The demand projection has been done taking into account the demand for 24X7 power supply under following heads:

- a) Demand growth to a targeted value for already electrified households (both Urban and Rural).
- b) Demand growth from electrification of un-electrified households (both Urban and Rural).
- c) Demand from electrification of newly constructed Households (both Urban and Rural).
- d) Demand on account of users other than domestic consumers including agricultural consumers.

Considering the expected rapid growth in electrification in the state in the coming years, all the un-electrified households in urban areas have been considered to be brought under electrification at the rate of 52% & 48% for the consecutive two years (FY 2015-16 & FY 2016-17) while out of 157.53 lakhs un-electrified rural households (As informed by State Government), 140 lakhs households are planned to be electrified by FY 2018-19 in a phased manner till FY 2018-19, while remaining shall be covered during subsequent years.

The assumptions for projection of demand under different categories are described below:

- Based on the urban & rural consumption data provided by GoB, present per household consumption have been assessed as 1.4 units/ day in rural area and 4.3 units/ day in urban area.

- Energy requirement for rural & urban households have been computed based on the latent demand growth observed in past. The daily per household rural consumption is estimated to increase from the current levels of 1.4 units/day to 2.5 units/day by FY 2018-19 and for daily per household urban consumption is estimated to increase from the current levels of 4.3 units/day to 7.0 units /day by FY 2018-19.
- Demand projections for consumers other than domestic have been done after discussions with State officials. 20% constant growth in energy requirement per annum has been taken keeping in view the rapid growth in industrial and commercial activities due to assured power availability.

PROJECTIONS OF ANNUAL ENERGY REQUIREMENT OF THE STATE

The annual energy requirement at consumer level for all types of consumers in the state works out to be around 16.13 BU in FY 2015-16 which is scaling up to around 43.84 BU in FY 2018-19 after considering the following.

a) Demand of already electrified households

The annual energy consumption for existing households works out to be 8.3 BU in FY 2018-19.

b) Demand from electrification of un-electrified households

The 140 Lakhs un-electrified rural households in the state are envisaged to be electrified in a phased manner from FY 2015-16 to FY 2018-19. The remaining rural households shall also be taken up in phased manner afterwards. The annual energy consumption for un-electrified households after electrification works out to 13.6 BU in FY 2018-19.

c) Demand from electrification of newly constructed Household

To account for energy requirement of new houses which are likely to be constructed in the coming years, projection have been done considering CAGR of 4.29% (census of 2001 & 2011) on number of urban households and CAGR of 2.95% in number of rural households based on census data. The projected



consumption of this category works to 3.25 BU in FY 2018-19.

d) Demand on account of users other than domestic consumers.

The annual energy requirement for consumers other than domestic has been calculated after discussion with State officials assuming that such segment of consumers are expected to grow at a constant CAGR of 20% p.a. The energy consumption of category other than domestic consumers works to 11.175 BU in FY 2018-19.

e) Additional Demand on account of agricultural consumer

As per Bihar Government with assured hours of supply, quality, and accessibility of power would begin an era of new electrical pump set connections in Bihar. Presently Bihar agricultural irrigation is mainly based on diesel pump sets. Suitable provision has been made for energy demand which is likely to come up by energizing 14 Lakhs pump sets during the target period. The total energy consumption on this account works to 7.57 BU in FY 2018-19.

The summary of energy calculation during next four years at consumer level is given in the table hereunder:

Table-4.2

SUMMARY OF ANNUAL ENERGY REQUIREMENT PROJECTIONS (in MU)					
Sl. No.	PARTICULARS→ ↓	FINANCIAL YEARS (FY)			
		2015-16	2016-17	2017-18	2018-19
1	Total Annual Energy Requirement including additional energy requirement for existing electrified households	5692	6807	7542	8278
2	Annual Energy Requirement for Electrification of un-electrified Household	2333	5525	9158	13557
3	Annual Energy Requirement for newly constructed Household	514	1246	2150	3252
	TOTAL DOMESTIC	8539	13578	18850	25087
4	Total Annual Energy Requirement including additional energy requirement - Other than Domestic Consumers (with 20% growth P.A.)	6467	7760	9312	11175
5	Additional Agricultural consumers	1128	2739	4888	7573
	GRAND TOTAL	16134	24077	33050	43835

Annual energy requirement at state periphery

The table below shows values of projected energy requirement at the state periphery considering distribution losses and intra-state

transmission loss trajectory as informed by state for the years FY 2015-16 to FY 2018-19. Maximum demand considering 50% feeder segregation to be achieved by the state for agricultural consumers has also been worked out and indicated in the table below:

Table-4.3

ANNUAL ENERGY & PEAK DEMAND REQUIREMENT AT STATE PERIPHERY					
	Unit	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Energy requirement as per demand projections	MU	16134	24077	33050	43835
Distribution losses	%	38.71	34.26	30.18	26.23
Intrastate transmission losses	%	3.92	3.87	3.82	3.77
Energy requirement at state periphery	MU	27398	38100	49215	61750
Peak demand at 0.734 Load Factor	MW	4261	5925	7654	9604
Peak demand at 0.734 Load Factor (Including Agricultural load up-to 50% only)	MW	4112	5588	7088	8774

The load factor of 73.4% has been considered based on the CEA data for the year FY 2014-15.

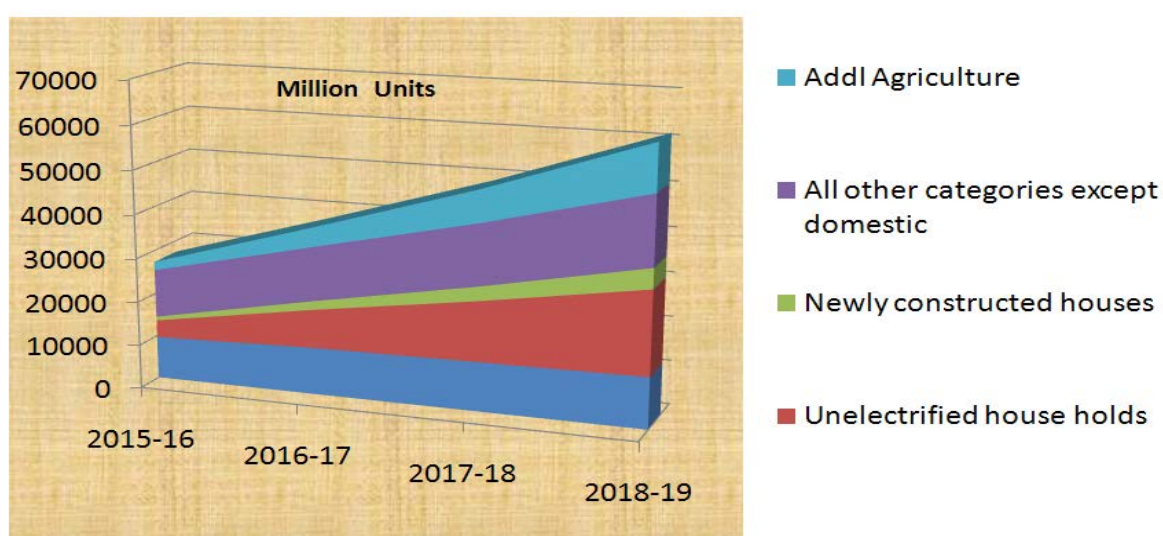
The detailed calculation of energy demand under different categories is given in Annexure-III.

The unrestricted consumption during the terminal year of FY 2018-19, at the consumers end is estimated as 43.8 BU which corresponds to 61.75 BU at State periphery (considering Distribution loss as per loss trajectory and intra state transmission loss as per state data) for all

categories of consumers. The maximum demand requirement of the state is projected to increase to around 8774 MW with 50% agricultural load due to gradual feeder separation by FY 2018-19.

As per projections made in 18th EPS of CEA, the projected energy demand and peak load for the state of Bihar would be 37.0 BU and 6398 MW in FY 2018-19 as against the now calculated energy demand of 61.75 BUs and peak load of 8774 MW in FY 2018- 19.

Projected annual energy requirement at state periphery



As against energy demand of 61.75 BU in FY 2018-19, at the state periphery the energy availability projections from all possible sources as per State Generation Plan by FY 2018-19 works out to 63.30 BU (shown in next chapter) thus, indicating a surplus of 1.55 BU.

A district wise projection of demand based on existing demand profile of Bihar has been given in Annexure-XIV.

The adoption of various energy efficiency measures like energy efficient agriculture/irrigation pump-sets, energy efficient lighting (use of LEDs), adopting demand side management

initiatives like introduction of Time of Day (TOD) tariff etc., or by adopting accelerated AT &C loss reduction targets would also help in reducing the peak demand and energy gap of the state.

However, an assessment of the adequacy of Generation, Transmission and Distribution infrastructure has been made in the subsequent chapters to meet the projected demand of the around ~8774 MW of the state and the same are covered in the subsequent chapters.



CHAPTER – 5 : GENERATION PLAN

The Generation plan will ensure adequate capacity addition planning & tie ups for power from various sources at affordable price to meet the projected increase in power demand for future. The generation plan includes:

- a. Existing Generation
- b. Future Generation Plans (Projects under construction and future projects)
- c. Generation capacity required to meet Peak Demand.
- d. Fuel Requirement
 - Coal requirement based on linkage with CIL
 - Coal Imports to meet shortfall of Coal
 - Issues regarding coal procurement plan
 - Coal requirement based on coal blocks allotted for ongoing projects
 - Allocation of coal linkage/coal blocks for future power projects.

- e. Year-wise capacity addition plan from renewable source (separately for Solar, Biomass, Bagasse etc.)
- f. Action plan of the state
- g. Fund Requirements
- h. GoI/ State Government Interventions

Existing Generation Capacity / Availability of Power (FY 2014 – 2015)

The total generation capacity / availability of power as on March 2015 (for FY 2014-15) for the state of Bihar is 3704.63MW. Out of total 3704.63MW, 83.52% is from Coal based Thermal, 14.16% is from Hydro and balance 2.32 % is from Renewable Energy Sources.

In terms of ownership, Central Sector Allocation has the largest share of 77.84% followed by share of private sector / IPPs which is 14.74%. The share of state sector is about 7.42%. The details of existing generating capacity available for the state of Bihar are shown at in table below.

Table-5.1

Existing Generation Capacity / Availability of Power as on March 2015 (FY 2014 – 2015)

Ownership / Sector	MODE WISE BREAK UP (MW)							Grand Total (MW)
	Thermal				Nuclear	Hydro (Renewable)	Res (MNRE)	
	Coal	Gas	Diesel	Total				
STATE	220	0	0	220	0	55	0	275
PRIVATE / IPPs	460	0	0	460	0	0	86	546
CENTRAL	2414.10	0	0	2414.10	0	469.53	0	2883.63
TOTAL	3094.10	0	0	3094.10	0	524.53	86	3704.63

Future plan for augmentation of generation capacity / availability of power:

As per the Generation Plan of State of Bihar, capacity of 6521.30MW is expected to be added by FY 2018-19 (from new projects as well as from under construction / under R&M projects). Out of this, about 312 MW shall be from non-conventional energy sources and 6209.30 MW

from conventional sources. As such, the total available capacity for Bihar by FY 2018-19 is expected to be 10226MW (9828MW-conventional and 398 MW – Renewable).

Year wise Summary of Generation Capacity / Availability of Power up-to FY 2018-19 are indicated in Table below:

Table-5.2

Particulars	Year wise existing and Likely Capacity to be added (Cumulative) in MW				
	As on March 2015	Proposed			
		FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
State Sector					
• State Thermal	-----	470	720	720	720
• State Small Hydro	55	55	88	88	208
Central Generating Stations Share					
• CGS Thermal	2414.10	2843.17	3346.50	3561.20	3722.40
• CGS Hydro	469.53	469.53	469.53	1344.53	1344.53
IPPs projects –case1	460	460	460	460	960
JV / Partnership (Thermal)	220	534	584	1500	2873
NCE / RNES	86	139	248	398	398
TOTAL	3704.63	4970.70	5916.03	8071.73	10225.93

Detailed break up of capacities likely to be available/added year wise is indicated in Annexure-IV.

Peaking & Energy Availability to Meet Peak & Energy Demand

Year wise peaking availability has been worked out based on the peaking availability & auxiliary power consumption norms of each plants as per National Electricity Plan (Vol-I) for 12th five year Plan. However 99% contribution (considering 1% withdrawal loss) from capacity added through competitive bidding route (IPP projects-case-I) and 8% from solar installed

capacity has been considered for estimation of availability of Peak demand. Similarly the energy availability in each year has also been worked out based on the PLF & auxiliary power consumption norms of each plant as per National Electricity Plan (Vol-I) for 12th five year Plan and as per the information made available by the State. The availability of peaking capacity and energy availability as worked out up-to FY 2018-19 is shown in Table below:

Table -5.3

Financial Year	Total Capacity (MW)	Estimated Peak availability at State Periphery (MW)	Estimated Energy availability at State Periphery (MU)
FY 2015-16	4970.70	3494	27780
FY 2016-17	5916.03	4510	36684
FY 2017-18	8071.73	6093	47292
FY 2018-19	10225.93	8093	63299

Further, GoB/GOI has planned coal based projects of capacity 7960 MW in the state comprising of Buxar Bijlee (2 X 660MW) at Buxar, *Lakhisarai Bijlee (2 X 660MW) at Lakhisarai, Pirpainti Bijlee (2 X 660MW) at Pirpainti and 4000 MW UMPP project at Banka* (for details refer Annexure-IV) which are very important and are required to be executed expeditiously for meeting the expected power demand of the state beyond FY 2018-19.

Based on the deliberation in the previous text, the scenario in the state emerges as shown in the Table 5.4a below. It could be seen from Table 5.4a that the expected peak demand of Bihar would be about 8774 MW by FY 2018-19 considering the additional energy requirement for providing 24 x 7 power supplies to all in the state. The expected energy requirement at the state periphery for FY 2015-16 is about 27398 MU which is likely to increase to 61750 MU by FY 2018-19. It may also be observed from the table-5.4a that the state will be facing a shortfall of 15.02% to 7.76% in terms of Peak demand

during FY 2015-16 to FY 2018-19. However during the same period there will be a surplus of energy availability during FY 2015-16 and FY 2018-19 whereas during FY 2016-17 and FY 2017-18 there will be a shortfall of about 4% in terms of energy availability. Therefore, the state has to effectively plan through comprehensive power procurement initiatives on short term and medium term and look for procurement of power either through competitive bidding or power exchange or through other sources. At the same time, the deficit in peak & energy demand can be effectively reduced through proper implementation of DSM & Energy efficiency measures in the state. The state is also required to give more preference to Hydro & RES while procuring power in order to improve the hydro-thermal generation mix. This will not only help in eliminating the peak shortage of the state but will also balance the energy supply & demand scenario. The generation mix as per the proposed generation plan of the state is shown in Table- 5.4b.

Table-5.4a

Sl. No.	Power Supply Position	Unit	Year wise Figures			
			FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
1	Estimated Peak Requirement with 50% agriculture load (**) only	MW	4112	5588	7088	8774
2	Estimated Peak / Maximum Demand availability as per State generation Plan	MW	3494	4510	6093	8093
3	Peak demand Surplus(+) / Deficit(-)	MW	(-) 618	(-) 1078	(-) 995	(-) 681
4	Peak demand Surplus/Deficit	%	(-) 15.02	(-) 19.29	(-) 14.04	(-) 7.76
5	Estimated Energy Requirement at State Periphery with 100% agriculture load	MU	27398	38100	49215	61750
6	Estimated Energy Availability at State Periphery as per State generation Plan	MU	27780	36684	47292	63299
7	Energy Surplus(+) / Deficit(-)	MU	382	(-)1416	(-) 1923	1549
8	Energy Surplus (+)/ Deficit (-)	%	1.39	(-) 3.72	(-) 3.91	2.51
(**) – Balance 50% agriculture load will be supplied during off-peak period only						

Table -5.4b

Generation Mix				
Financial Year	Thermal (%)	Hydro (%)	Nuclear (%)	RES (%)
FY 2014-15	83.52	14.16	0.00	2.32
FY 2015-16	86.65	10.55	0.00	2.80
FY 2016-17	86.38	9.42	0.00	4.19
FY 2017-18	77.32	17.75	0.00	4.93
FY 2018-19	80.93	15.18	0.00	3.89

Issues Regarding Coal Procurement Plan:**Coal Requirement:**

Generating Stations in Bihar are required to perform at higher PLF (ideally at 85 to 90 %-gross generation) enabling state of Bihar to take confident strides towards “24x7 Power for All”

for which there should not be any constraint of coal supply. The current coal scenario and the projections for next 5 years have been presented below in Table:

Table- 5.5

Sl. No.	TYPE	Year wise Coal Requirement (Million Tonnes per Annum)				
		FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
1	Domestic Raw Coal Requirement	1.3	7.127	7.127	7.127	7.127
2	Coal Linkage (MTPA)	1.3	6.91	6.332	5.715	5.1775
	2a) 2 x 250 MW BTPS Extension Project (Tapering Coal Linkage (Annual requirement 2.327 MTPA)		2.31	1.732	1.115	0.5775
	Recently Badam Coal Block (North Karanpura, Jharkhand) is allotted to BSPGCL for BTPS (2 x 250 MW) extension project. The block has a mineable reserve of about 90.5 Million metric tonne.					
	2b) BTPS Unit 6 & 7 (2 x 110 MW) – (Annual requirement 1.3 MTPA)		1.1	1.1	1.1	1.1
	2c) MTPS – Stage – I (2 x 110 MW)- (Annual requirement 1.3 MTPA)	1.3	1.3	1.3	1.3	1.3
	2d) MTPS Stage – II (2 x 195 MW)- (Annual requirement 2.2 MTPA)		2.2	2.2	2.2	2.2
3	Materialization	100%	100%	100%	100%	100%
4	Shortfall in Raw Coal as per linkage (MTPA)	-	0.217	0.795	1.412	1.950
5	Additional Coal requirement to be met from Badam captive coal block (MTPA)		0.017	0.595	1.212	1.750
6	Balance requirement, to be met with increased domestic coal supplies or through import.(MTPA)		0.1	0.2	0.2	0.2

The shortfall in fuel from domestic coal linkage needs to be met through import or through additional coal linkage from GoI on a time-to-time basis. Further, in case of any anticipated delay in production from Badam Coal block to meet the coal requirement of 2x250 MW BTPS (as per tapering coal linkage), the same shall be

met through short term import/ linkage or sourcing from domestic market.

For proposed Common Projects (JV) the status with respect to coal linkage / coal requirement is as given below in Table-5.6:

Table-5.6

Name of the project	Coal block allotted or linkage available	Total allotment quantity or Linkage Quantity	Annual Coal Requirement
Bijlee (2x 660 MW), Chousa	Deocha Pachami Coal Block	162 Million Tonnes	6.25 Million Tonnes per year
Lakhisarai Bijlee (2x 660 MW), Kajara	Deocha Pachami Coal Block	162 Million Tonnes	6.25 Million Tonnes per year
Pirpainti Bijlee (2 x 660 MW), Bhagalpur	Deocha Pachami Coal Block	162 Million Tonnes	6.25 Million Tonnes per year
Nabinagar Power Generation Co. Ltd. Stage – I (3 x 660 MW)	Coal Linkage with CCL , North Karanpura	Long term coal linkage by MOC vide letter dated 03.11.2010 (11.08 MTPA)	11.25 Million Tonnes per year
Nabinagar Power Generation Co. Ltd. Stage –II (3 x 660 MW)	NTPC has applied for allotment of Coal Block.		10.33 Million Tonnes per year

NOTE: For Deocha Pachami Coal block, Joint Venture Company had to be formed for development of coal block. JV agreement for development of coal block has already been signed on 07.01.2015.

In addition to above, Ministry of Coal (MoC) vide DO letter dated 08.04.2015 has recommended Pirpainti/ Baharat coal block for 4000MW UMPP at Banka, Bihar.

ACTION POINTS FOR THE STATE

To complete the under construction and proposed generating capacities of State and to monitor the Central Sector & Private Sector Projects as per following Roll out Plan (Table-5.7):

Table-5.7

Particulars	Power for All – Roll Out Plan (MW)				
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total
Generation (State Sector Under Construction / R&M)	470	283	----	120	873
NCE / RNES	53	109	150	-----	312
JV Projects	314	50	916	1373	2653
Central Sector	429.07	503.33	1089.70	161.2	2183.3
Private Sector	-	---	----	500	500
TOTAL	1266.07	945.33	2155.7	2154.2	6521.3

The state is required to :

- Take up the matter of coal linkage / environment clearance with Ministry of Coal

and MoEF for the ongoing and future projects as per requirement.

- To firm up plan to meet additional requirement of power by FY19 & beyond.



Also to procure more power, if required, from the market through competitive bidding to meet the demand for providing 24x7 power in the state.

- To improve the generation mix (Thermal Power & Hydro Power ratio) through more tie up from hydro & renewable sources.
- To Expedite commissioning of future projects (, Lakhisarai, Pirpainti, Nabinagar Stage-II) so as to achieve CODs of at least respective 1st units by the end of FY 2019-20.
- To firm up plan to reduce the peak demand through demand side management and energy efficiency measures.
- To firm up plan to meet the shortfall in fuel either through domestic coal linkage from GoI or through e-auction on a time to time basis.
- GoB is requested to release Rs.198.60 Crores for new ash dyke land (Govt. & Private Land) for Barauni 2 x 250 MW Extension Project.

POWER PURCHASE PLANNING

The state will work towards institutionalizing and strengthening the power purchase cell, which will focus on the short/medium/long term power purchase planning and work on the procurement of power on cost effective basis.

The cell may also work on the monthly power availability from already tied up sources (on the basis of annual schedules provided by the sources) and accordingly work out the requirement for tying up power on RTC basis through competitive bidding route keeping into consideration the huge seasonal variation in availability of energy from renewable and hydro sources across the year. In this regard power management cell has already been constituted under BSP (H) CL.

Government of India intervention required –

- GoI is requested to allocate 85% of installed capacity of Lakhisarai & Pirpainti Projects

- (2x660 MW each) to Bihar to meet the increasing demand of the state. In this connection Chief Secretary, GoB has already made a request to MOP, GoI vide letter dated 03.09.2014.
- MoP, GoI may take up the issue with NTPC for reduction of power purchase cost from NTPC Barh Project considering uniform policy in loading of imported coal to different units of NTPC. Further, the grant component of BRGF / RSVY fund provided for R&M of KBUN should not be considered while fixing Power Purchase Cost of KBUN towards interest on loan, Return on equity, and depreciation.
- MoP, GoI may fast track the proceedings for development of 4000 MW UMPP at Banka-Bihar. In this connection immediate formation of SPV shall be done by PFC in order to carry out project development activities & subsequent selection of developer through competitive bidding.
- MOP, GoI may take up with BHEL for timely completion of KBUNL & BTPS projects in the state.
- Bihar is one the lowest rung of power availability in India and is facing chronic shortages of Power and Energy. The deficit is bound to grow further subsequent to the expiry of allocation of power from Dadri I & II on 31.03.15 and 31.08.15 and Medium Term PPA with Adani on 31.12.2015. In view of this MoP, GoI is requested to allocate untied cheaper power to Bihar in order to circumvent the power crisis the state is facing since long as well as to meet the increasing demand of power due to proposed implementation of 24X7 PFA scheme.

Fund Requirement:

The detail of estimated fund requirement year wise of the State Sector Projects and JV Projects where state is a partner is summarized in Tables-5.8 & 5.9 below:



a) For State Sector Projects:

Table-5.8

Type	Total Cost of Project (Rs. Cr.)	Expenditure up to March 2015	Year wise Fund Requirement (Rupees in Cr.)				Tie Ups for Fund
			FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	
Projects under construction / execution							
BTPS (2x 250 MW)- Thermal	3707	3343	300	64	----	-----	PFC + HUDCO + CBI + Canara Bank
Projects under R&M							
BTPS (2x110 MW)- Thermal	581	500	81	----	-----	-----	Under RSVY / BRGF
Total	4288	3843	381	64	-	-	

b) For JV Sector Projects (Where State is Partner)

Table -5.9

Type	Total Cost of Project (JV Sector) (Rs. Cr.)	Share of state in total cost	Expenditure by State up to March 2015	Year wise Fund Requirement by State (Rs. in Cr.)				Tie Ups for Fund
				FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	
Projects under construction / execution								
KBUNL (2 x 195 MW) - Thermal	3346.7	351.5 (Equity) 35% share of 30% equity funding	331.2	20.2	----	----	----	
Nabinagar (3 x 660 MW) – 50% Share – Thermal – Stage - I	15131.7	2269.8 (Equity) 50% share of 30% equity fund	511.2	800.0	600.0	358.3	-----	
Future Projects								
LakhisaraiBijlee (2 x 660 MW), Kajara	9240.0 (DPR value)	720.7 (Equity) 26% share of 30% equity fund	-		72.1	144.1	144.1	
PirpaintiBijlee (2 x 660 MW), Bhagalpur	9240.0 (DPR value)	720.7 (Equity) 26% share of 30% equity fund			72.1	144.1	144.1	
Total	36958.4	4062.7	842.4	820.2	744.2	646.5	288.2	

The present peak power demand and energy requirement for the state of Bihar is of the order of 3500 MW and 22226 MU respectively (for FY 2014-15). The Power demand in the coming years shall increase significantly due to various factors i.e. rural electrification, increase in agriculture consumers, increase in demand of existing consumers due to application of various appliances, agricultural, commercial, industrialization etc. in the state. Considering all the above factors into account and with an objective to provide 24x7 power supply to all, the expected power demand of Bihar by FY 2018-19 shall be of the order of 8774 MW with annual energy requirement of 61750 MU (including 100 % agricultural load).

As per 18th EPS report of CEA, the projected peak power demand and energy requirement for the year FY 2014-15 was 3774 MW and 23471 MU respectively.

To meet this growing demand, a robust & reliable Inter-state & Intra-state transmission network is required. For this, existing transmission system shall be strengthened both at Intra state level as well as Inter-state level with proper planning to cater the demand in a reliable manner considering 24 X 7 Power for All. The Inter-state transmission system which is responsible for wheeling of allocated power from various Inter State Generating Stations (ISGS) located within state as well outside state shall be strengthened for smooth and reliable transfer of power to Intra state system considering the growing demand of the state of 8774 MW by FY 2018 -19.

Inter State Transmission System (ISTS)

Presently about 7829 ckt km EHV transmission line comprising of 765 KV (543 ckt km) 400 KV (7286 ckt km) and 13 nos. of Grid sub-stations (2 no. 765/400/220 KV, 4 nos. 400/220 KV, 4 nos. 400/132 KV, 2 nos. 220/132 KV & 1 no. 400 KV HVDC Sub-station) with total transformation capacity of 12300 MVA are existing in Bihar under Inter-state Transmission system. In Bihar, two nos. central sector Generating stations i.e.

Kahalgaon-I (840 MW), Kahalgaon-II (1500 MW) & Barh-II (1x 660 MW), with a cumulative generation capacity of 3000 MW are existing. Out of this 934.9 MW is being allocated to Bihar and remaining 2065.1 MW is being evacuated by ISTS. The details of Inter-state transmission system, to transfer the power from these existing inter-state generating stations (ISGS) are listed below:

Kahalgaon Thermal Power plant:

- Kahalgaon – Farakka 400KV 2 x D/C (Twin Moose)
- Kahalgaon – Maithon 400KV D/C (Twin Moose)
- Kahalgaon – Lakhisarai - Biharsharif 400KV D/C (Twin Moose)
- Kahalgaon – Banka - Biharsharif 400KV D/C (Twin Moose)
- Kahalgaon– Barh 400KV D/C (Quad Moose)

Barh I & II Thermal Power plant:

- Kahalgaon – Barh 400KV D/C (Quad Moose)
- Barh - Patna 400KV 2 x D/C (Quad Moose)
- Barh - Gorakhpur 400KV D/C (Quad Moose)

For import of Bihar share of power from central sector generations/ others outside Bihar, a strong reliable ISTS network has been established. Major 765 KV & 400 KV transmission lines connecting Bihar to other state is listed below:

From UP:

- Balia - Gaya 765KV S/C (Quad Bersimis)
- Fatehpur – Sasaram ER Gaya 765KV S/C (Quad Bersimis)
- Fatehpur – Sasaram ER 765KV S/C (Quad Bersimis)
- Balia –Bihar sharif 400KV D/C (Quad Bersimis)
- Sarnath - Sasaram – NR 400KV S/C (Twin Moose)
- Allahabad – Sasaram-NR 400KV S/C (Twin Moose)
- Balia - Patna 400KV D/C (Quad Moose)
- Balia - Patna 400KV D/C (2nd) (Quad Bersimis)



- Gorakhpur – Barh 400KV D/C (Quad Moose)
- Gorakhpur – Muzaffarpur 400KV D/C (Quad Moose)
- Sahupuri – Karmanasa 132KV D/C

From Jharkhand:

- Koderma - Biharsharif 400KV D/C (Twin Moose)
- Koderma - Gaya 400KV D/C (Quad Moose)
- Sultanganj - Deoghar 132 KV D/C
- Lalmatia - Kahalgaon 132 KV S/C
- Lalmatia – Sabour 132 KV S/C
- Barhi - Biharsharif 132 KV S/C
- Barhi – Rajgir 132 KV S/C
- Tenughat - Biharsharif 400 KV S/C (charged at 220KV)

- Japla – Sonenagar 132 KV S/C

From West Bengal:

- Farakka - Kahalgaon–400KV 2 x D/C (Twin Moose)
- Maithon - Kahalgaon 400KV D/C (Twin Moose)
- Maithon - Gaya 400KV D/C (Quad Moose)
- Malda – Purnea 400KV D/C (Twin Moose)
- Siliguri – Purnea 400KV 2 x D/C line, One via Kisanganj (Kisanganj S/S under construction)

The existing Inter-state transformation capacity at 400 KV level is 5680 MVA having 10 nos. of Grid substations. The existing ISTS Grid substations in Bihar are as mentioned below:

Table-6.1

Details of existing Grid sub-station (ISTS):

SL No.	Name of GSS	Voltage Ratio	No. of Transformers	MVA capacity	Total Transformer capacity(MVA)
765 kV GRID SUBSTATION					
1	765 KV Sasaram	765/400	3	500	1500
2	765 KV Gaya	765/400	9	500	4500
Total					6000
400 kV HVDC GRID SUBSTATION					
1	Sasaram (Puasauli)	400 KV back to back Converter Transformer	2 *3	234	1404
Total					1404
400 kV GRID SUBSTATION					
1	New Purnea	400/220 kV	2	315	630
2	Muzaffarpur	400/220 kV	2	315	630
3	Patna	400/220 kV	2	315	630
4	Biharsharif	400/220 kV	3	315	945
5	765 KV Sasaram	400/220 kV	2	315	630
6	765 KV Gaya	400/220 kV	2	1x 315 + 1 x 500	815
7	Banka	400/132 kV	2	200	400
8	Lakhisarai	400/132 kV	2	200	400
9	Kahalgaon	400/132 kV	2	400	400
10	Barh	400/132 kV	1	200	200
Total					5680
220 kV GRID SUBSTATION					
1	Purnea	220/132kV	3	1x100 +2 x 160	420
2	Ara	220/132 kV	2	100	200
Total					620

To facilitate the drawl of power by Bihar and to meet projected peak load of 8774 MW by FY 2018-19, a robust inter-state transmission system (ISTS) shall be planned. The present ISTS system capacity at 400 KV level is 5680 MVA and it shall be increased to 9690 MVA by FY 2016-17 after implementation of ongoing schemes covered under 12th plan. Considering the capacity addition of 3000 MVA transformation capacity at 400 KV level by BSPTCL by 2017-18, the total transformation capacity shall be 12690 MVA at 400 KV level, which shall be adequate to cater the projected peak power demand of Bihar as 7088 MW by FY 2017-18.

To cater the projected peak power demand of Bihar of 8774 MW by FY 2018-19, the existing ISTS system shall be strengthened.

The ongoing ISTS projects covered under 12th plan are indicated below. :

On-going ISTS projects:

Under Implementation

- High Capacity Power Transmission corridor –III (HCTPC-III)
 - Kishanganj– Patna 400 KV D/C line 351 km
 - 2 x 500 MVA, 400/220KV GSS Sub-station at Kishanganj

Expected to be commissioned by December' 2015.

- High capacity Power transmission corridor-II (HCTPC-II).
 - Gaya- Varanasi 765 KV S/C (Quad) line 246 km
 - Gaya- Ranchi 400 KV D/C via Jharkhand Pool (Quad Moose) line 100 km

Expected to be commissioned by Dec-2015.

- Eastern Region Strengthening Scheme –V (ERSS-V).
 - Purnea - Rajarhat 400 KV D/C line via Farakka & Gokarna - 380 km

- LILO of Subhasgram – Jeerut 400 KV S/C line at Rajarhat

Expected to be commissioned by April' 2016.

- Eastern Region Strengthening Scheme –IX (ERSS-IX)
 - Muzaffarpur 1x500 MVA, 400/220 KV additional Transformer
 - Arrah 1x160 MVA, 220/132 KV additional Transformer

Expected to be commissioned by February' 2016.

- Eastern Region Strengthening Scheme –XII (ERSS-XII)
 - Patna: Replacement of 2x315 MVA by 2x500 MVA
 - New Purnea: Replacement of 2x315 MVA by 2x500 MVA
 - Pusauli/Sasaram: Replacement of 2x315 MVA by 2x500 MVA
 - Purnea: Replacement of 1x100 MVA (3rd) by 1x160 MVA

Expected to be commissioned by November' 2016.

- Eastern Region Strengthening Scheme –VI (ERSS-VI): (under TBCB)
 - New Substations
 - Motihari 400/132 KV: 2x200 MVA
 - Darbhanga 400/220 KV: 2x500 MVA
 - Transmission Line
 - Muzaffarpur - Darbhanga 400 KV D/C (Triple snowbird)
 - LILO of Barh – Gorakhpur 400KV D/C at Motihari (Quad Moose)

Expected to be commissioned by FY 2016-17 (Approximate cost 650 Cr.)

The details of year wise ongoing New/augmentation on existing sub-stations are as follows: (Only new and capacity augmentation has been mentioned).



Table-6.2

Project	Voltage Level	Unit	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Inter-State Transmission Network	765/400 kV	No./MVA	-	-	-	-	-
	400 /220 kV	No./MVA	-	2/1500	4/2110	-	-
	400/132 kV	No./MVA	-	-	1/400	-	-
	220/132 kV	No./MVA	-	1/160	1/60	-	-

Details of Planned Inter-State Transmission system

- Nabinagar-I (4x150MW) Transmission scheme
 - Nabinagar-I -Sasaram 400KV D/C (Twin Lapwing) Line commissioned, Generation project expected by Dec-2015.
- Nabinagar-II (1980 MW)Transmission scheme
 - Nabinagar-II – Patna 400 KV D/C (Quad) line 170 KM
 - Nabinagar-II – Gaya 400 KV D/C (Quad) line 100 KM
 - Gaya GSS: 1x1500 MVA, 765/400KV Transformer

Expected to be commissioned by March' 2017.

- North Karnpura STPP (1980 MW) Transmission scheme

- North Karnpura- Gaya 400 KV D/C(Quad) line 102 km

- North Karnpura- Chandwa (Jharkhand Pool) 400 KV D/C (Quad) line

Commissioning schedule matching with generation project in Oct-2017.

- Tilaiya UMPP (4000MW)
 - Tilaiya UMPP – Gaya 765 KV S/C line 100 km
 - Tilaiya UMPP – Balia 765 KV D/C line 40 km
 - LILO of one circuit of Tilaiya – Balia 765 KV D/C at Gaya, 55 km

Commissioning schedule matching with generation project.

The details of proposed physical plan of new sub-station/Transmission lines are as follows:

Table-6.3

Project	Voltage Level	Unit	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19*
Inter-State Transmission Network	765 kV	No./MVA	-	-	1/1500	-	-
		ckt. km.	-	-	-	-	-
	400 kV	No./MVA	-	-	-	-	-
		ckt. km.	-	-	540	204	-
	220kV	No./MVA	-	-	-	-	-
		ckt. km.	-	-	-	-	-
	132 kV	No./MVA	-	-	-	-	-
		ckt. km.	-	-	-	-	-

Note : 1. 765 W D/C Tilaiya – Gaya & LILO of Tilaiya-Balia line has not been considered.



Inter and Intra state Transmission plan for evacuation of power from existing and upcoming Renewable Energy sources. Balancing Infrastructure envisaged for integration of large scale renewable.

The existing renewable energy generation of Bihar is of the order of 139 MW which shall increase up to 398 MW by FY 2018-19. The power evacuation from renewable generation shall be evacuated at distribution level of 33 kV & 11 kV from existing 33/11 KV PSS for small scale scattered generation. For bulk capacity renewable generation, power evacuation shall be through 132/33 KV GSS which is networked with transmission system. Every revenue sub-division has been envisaged with 132/33 KV GSS under state plan for Intra-state transmission system, which shall take care power evacuation from these renewable generations.

Renewable Energy Management centers proposed for Real time monitoring of Generation from RE sources:

Presently Renewable Energy Management center is not in place. BSPTCL has proposed a scheme for monitoring of data online & communication of data in real time basis and energy accounting & audit, which shall include generation data from Intra-state generating station as well as from renewable energy generation projects. The proposal is sent to Member (GO&D). CEA, New Delhi. After approval of proposal by CEA, the scheme will be executed within a period of (2) years.

Adequacy to meet Power Transfer requirement of the state till 2019

The present ISTS system transformation capacity at 400 KV level is 5680 MVA and it shall be increased to 9690 MVA by FY 2016-17 after implementation of ongoing schemes covered under 12th plan which has been envisaged considering power demand of Bihar up to FY 2016-17.

In addition to above, under the state sector, three 400/220 KV sub-stations have been planned by BSPTCL, Bihar at Fatuha, Gaighat & Bihta, each with a transformation capacity of 2 x 500 MVA. Each of this sub-station shall be linked with ISTS network. Thus, an additional 3000 MVA transformation capacity at 400 KV would be available to draw power from ISTS system. With this the total ISTS transformation capacity at 400 KV level would be 12690 MVA by FY 2017-18.

Assuming that Bihar would meet about 500 MW of its demand of 7088 MW by FY 2017-18 & 8774 MW by 2018-19 from state sector generations at 220 KV & 132 KV (Barauni – 210 MW, Kanti-220 MW, Kanti Extn- 390 MW, Hydro- 45 MW) about 6588 MW (8235 MVA) and 8274 MW (10343 MVA) in FY 2017-18 & FY 2018-19 would need to be met from ISTS system at 400 KV level with transformation capacity of 12690 MVA by FY 2017-18 (Considering 3000 MVA capacity addition by BSPTCL at 400 KV level by FY 2017-18).

Considering 80% loading on transformer and overall diversity factor of 1.2, minimum transformation capacity required at 400 KV level shall be 1.5 times of existing capacity i.e. 12353 MVA by FY 2017-18 and 15514 MVA by FY 2018-19.

With transformation capacity of 12690 MVA at 400 KV by FY 2017-18 & FY 2018-19, the ISTS system shall be adequate to cater the power demand of Bihar by FY 2017-18. However, it will not be sufficient to cater the projected power demand of Bihar beyond FY 2017-18.

To cater the 8274 MW balance power demand of Bihar by FY 2018-19, the existing Inter-state transmission system has to be strengthened. For this additional GSS / transformation capacity augmentation as well connecting transmission lines shall be planned to take care the power requirement for 24 x 7 power for all for Bihar.



For assessing the ISTS system as well as Intra-state transmission system requirement beyond FY 2017-18 up to FY 2018-19 a detailed power system study has to be carried out considering projected loads and generation of the entire state. For this BSPTCL has requested Power Grid to carry out the study. Based on the study detailed schemes for transmission system requirement i.e. GSS capacity, location,

transmission lines shall be evolved and finalized.

The year wise generation addition, total available capacity vis-a-vis transmission system available at 400 kV level for Bihar is tabulated as under:

Table-6.4

Financial Year	Generation Within Bihar (MW)			Inter state (ISGS) – Generation outside Bihar (MW)		Total Available capacity (in MW)	Peak Power Demand of Bihar (MW)	Minimum Transformation capacity required at 400 KV (MVA)**	Available Transformation System capacity existing/Planned at 400 kV level through (400/220 kV & 400/132 kV transformation)
	Addition	Total	Bihar share	Addition	Total				
2014-15	-	3361	1296	-	2409	3705	3500	5625	5680
2015-16	2723	6084	2828	(266)	2142	4971	4112	6773	7180
2016-17	2212	8296	3954	(180)	1962	5916	5588	9540	9690
2017-18	1470	9766	5020	1090	3052	8012	7088	12353	12690*
2018-19	2100	11866	6513	661	3713	10226	8774	15514	12690*

* Including 3000 MVA, 400/220 KV transformation capacity of BPSTCL planned to be commissioned by FY 2017-18.

** Minimum transmission capacity at 400 kv level = Peak power demand to be drawn at 400 KV (in MW /0.8) x 1.5.

As such, the existing and planned ISTS System is adequate to meet the projected peak demand of Bihar only up to FY 2017-18. However, beyond 2018 the existing ISTS System is not adequate to meet the projected peak demand of Bihar. To meet the projected peak demand of Bihar by FY 2018-19, the Inter State Transmission System shall be strengthened to cater the power demand for 24 x 7 Power for All for Bihar.

Action Plan – CTU

- The existing ISTS system shall be strengthened to take care of the projected peak demand of Bihar of 8774 MW by FY 2018-19. For this a power system study shall be conducted considering all the ISTS system within state as well Intra-state

network with projected load and generation condition to finalize the transmission network infrastructure of Bihar.

- Based on the study various GSS, transmission lines etc. at suitable location shall installed to take care the projected demand by FY 2018-19 for 24 x 7 power for all on priority basis.
- Financial tie up for required infrastructure shall be timely arranged/tied up with funding agencies.
- Ongoing schemes and proposed works shall be implemented as per schedule



Intra State Transmission System:

The transmission network that presently caters to the load demand across the State is as follows (as on January' 2015).

- 99 Nos. of EHV sub-stations with 3750 MVA at 220/132KV level & 6510 MVA at 132/33KV level along with 8929.35 ckt km of associated Transmission lines (400KV – 75 km, 220 KV- 1787 km & 132 KV- 7067.35 km) are part of the Intra state Transmission system of the state.
- 12 Nos. of 220/132 kV grid substations (Khagaul, Sipra, Fatuha, Biharsarif, Bodhgaya, Dehri, Pasauli (new), Hajipur,

Gopalganj, Darbhanga, Begusarai, Madhepura) with 3750 MVA capacity & 1787 ckt km associated 220 KV line & 75 ckt km 400 KV line charged at 220 kV.

- Adjacent ISTS GSSs i.e Ara, Banka, Purnea, Lakhisarai & Kahalgaon) having 1760 MVA at 220/132 KV & 400/132 KV level.
- 97 Nos. of 132/33 kV grid substations with 6510 MVA capacity and 7067.35 ckt km of associated lines.

(Out of total 99 nos. Grid sub-stations, 2 are at 220/132 kV level, 10 nos. are at 220/132/33 level and rest all are at 132/33 kV level.)

Existing Intra state GSS and adjacent ISTS GSS utilized by BSPTCL are as given below:

Table- 6.5

SYSTEM	220/132 KV GSS		132/33 KV GSS	
	(Nos.)	(MVA)	(Nos.)	(MVA)
BPSTCL SYSTEM	12	3750	97	6510
ADJECENT ISTS SYSTEM	5	1760		
Total	17	5510	97	6510

Note: Detailed List of existing 400 KV, 220 KV & 132 KV substations and transmission lines is enclosed as Annexure-VI.

Details of Ongoing / Planned Intra-State Transmission system.

The ongoing strengthening program of existing Intra state transmission system under implementation is as per 12th plan planning i.e. up-to FY 2016-17. After implementation of this plan the existing transformation capacity shall increase to 3000 MVA at 400/220KV level, 12830

MVA at 220/132 KV level and 13020 MVA at 132/ 33 KV level.

After the implementation of ongoing /planned schemes total 53 nos. new Grid substations shall be added in Bihar, out of which 3 nos. shall be at 400/220 KV level, 18 nos. are at 220/132/33 KV level and 32 nos. at 132/33 KV level.



The year wise proposed physical plan of new sub-station/augmentation & Transmission lines are as follows:

Table-6.6

Project	Voltage Level	Unit	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Intra-State Transmission Network	400/220kV	No./MVA	-	-	-	3/3000	-
	400KV	ckt. km.	-	-	-	210	-
	220/132kV	No./MVA	-	7/3480	7/2240	4/1600+500*	3200*
	220KV	ckt. km.	-	1611	860	290	-
	132/33 kV	No./MVA	-	39/5360	7/750	3/400+500*	3200*
	132KV	ckt. km.	-	2444.83	550	190	-

* **Projected transmission capacity in MVA**

The details of ongoing/ planned Intra-state transmission system are enclosed as Annexure-VII.

The year wise peak power demand of state, vis-a-vis transmission system available at 220/132kV & 132/33 KV level for Bihar is tabulated as under:

Adequacy to meet Power Transfer requirement of the state till 2019

Table- 6.7

Financial Year	Peak power demand at Distribution level (MW)		Minimum Transformation capacity required at GSS (MVA)**	Transmission System existing/Planned at 220 /132 kV level (MVA)		Transmission System existing/Planned at 132/33kV level (MVA)		Transmission System existing/Planned at 400/220kV level (MVA)	
	Addition	Total		Addition	Total	Addition	Total	Addition	Total
2014-15		3500			5510		6510		-
2015-16	612	4112	7710	3480	8990	5360	11870		-
2016-17	1476	5588	10478	2240	11230	750	12620		-
2017-18	1500	7088	13290	1600 + 500*	13330*	400 + 500*	13520*	3000	3000
2018-19	1686	8774	16451	3200*	16530*	3200*	16720*		3000

* Projected additional transmission capacity in MVA

** Minimum transformation capacity in MVA = Peak power demand at distribution level (in MW /0.8) x 1.5.

As such, the existing and planned Intra-state transmission system is adequate to meet the projected peak demand of Bihar up to FY 2016-17. However, beyond 2017 to cater the projected peak demand of 7088 MW by FY 2017-18 & 8774 MW by FY 2018-19, the Intra-state transmission System shall be strengthened to provide the uninterrupted and reliable power supply for 24 x 7 to all in the state of Bihar.

For assessing the Intra state transmission system requirement beyond 2017 up to FY 2018-19 a detailed load flow study has to be carried out considering projected loads and generation of the state. For this BSPTCL has asked Power Grid to carry out the study. However, based on the projected peak demand of Bihar for FY 2017-18 as 7088 MW & for FY 2018-19 as 8774 MW a tentative Intra-state capacity enhancement of 500



MVA by FY 2017-18 and 3200 MVA by FY 2018-19 both at 220/132 KV as well as 132/33 KV level with associated lines with has been envisaged by BSPTCL.

Year wise fund requirement for development of Planned Transmission system:

Total estimated investment of about Rs. 6206.67 Crores from FY 2015-16 to FY 2016-17 has been envisaged for intra state system. The estimated investment for the year FY 2017-18 and FY 2018-19 has been envisaged of the order of Rs. 6107.45 Cr. as a preliminary assessment.

This assessment is based on the projected peak demand of Bihar for FY 2017-18 as 7088 MW and for FY 2018-19 as 8774 MW, a tentative Intra-state capacity enhancement as 500 MVA by FY

2017-18 and 3200 MVA by FY 2018-19 at both 220/132 KV as well as 132/33 KV level with associated lines with has been envisaged by BSPTCL. Based on the preliminary assessment, BSPTCL has tentatively envisaged Rs 800 Cr for transmission capacity enhancement of 500 MVA to take care the demand of FY 2017-18 and Rs 5120 Cr for transmission capacity enhancement of 3200 MVA to take care the demand of FY 2018-19.

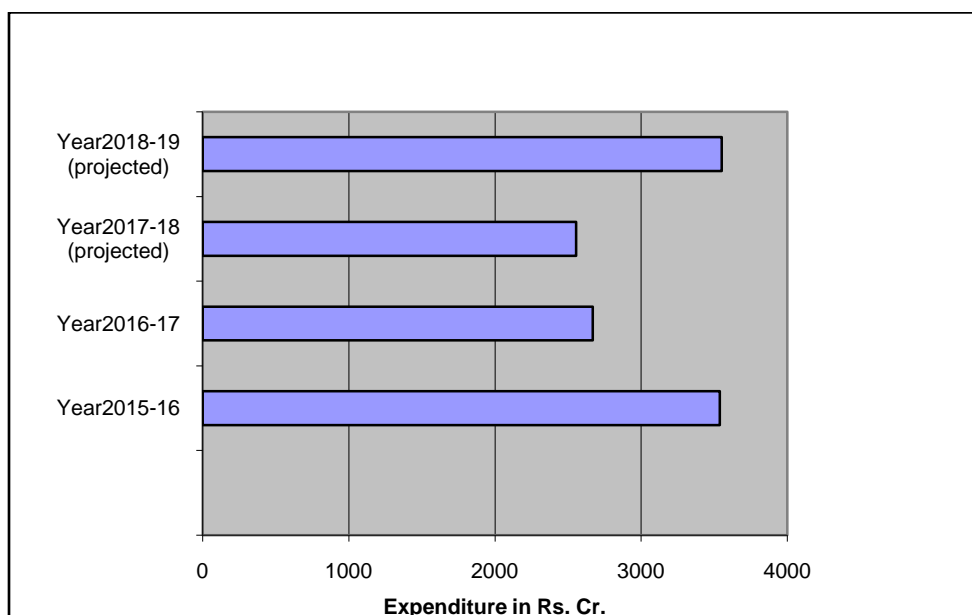
(Details of year wise investment plan for transmission infrastructure for FY 2014-15 to FY 2018-19 are enclosed as Annexure –VIII).

Year wise details of Physical targets and proposed investments

Year wise funding for approved /sanctioned Transmission plan for implementation under 12th plan & New Proposals is furnished in the Table-6.8 below:

Table/Graph-6.8

Year wise Funding for Transmission Plan approved/ Sanctioned for implementation under 12th Plan



Action Plan – BSPTCL (STU)

- The ongoing scheme needs to be implemented as per schedule for ensuring 24x7 power supply to all in the State.
- For planning of Intra-state transmission system beyond FY 2016-17 a detailed power system study shall be done on urgent basis. PGCIL may be requested to conduct the study on priority basis so that transmission schemes could be freezed and implementation process could start for ensuring 24x7 power supply in State.
- Financial tie up for approved infrastructure shall be timely arranged/tied up with funding agencies and State Govt. shall be requested to provide equity support, if required.

- The capital outlay required in the next five years would be substantial and it's difficult to be met by Bihar Transmission Company on their own to cater the extra demand due to 24X7 power supply to all.
- Some of the STU lines / sub-stations may be considered to be implemented through TBCB route.

State Government intervention

The proposed transmission system up-to FY 2018-19 needs to be implemented as per schedule for ensuring 24x7 powers supply in the state.

The state government shall provide all necessary help to STU for installation of new GSS with associated transmission line and augmentation of existing system to provide 24x7 power to all in Bihar.



Distribution system of Bihar State is being served by two distribution companies i.e. Northern Bihar by North Bihar Power Distribution Company Limited (NBPDC) & Southern Bihar by South Bihar Power Distribution Company Limited (SBPDC). These companies are serving about 54.00 lakhs of electricity consumers including about 53,000 agriculture consumers during FY 2014-15.

All categories of consumers in the state are given rotational supply according to the availability of power with few hours of load shedding for all consumers. At present, Agricultural Pump sets are connected with rural feeders in most cases and there is no separate agriculture feeder in the state. For Rural/ Agriculture consumers in SBPDC, the power supply is given for 16.55 hours and for NBPDC, the power supply is given for 14.52 hours on daily basis.

As per census 2011, there are 39073 inhabited villages in the state and out of which 35352 villages are electrified. The electrification of 2901 un-electrified villages and 45936 UE habitations have already been covered under DDUGJY scheme of GOI and are planned to be completed by FY 2017-18 (Detail break-up in Annexure-XIII). The remaining 820 villages are not viable to be connected with the grid and shall be covered under off grid / DDG schemes of DDUGJY or various schemes of MNRE.

As per Government of Bihar (GoB), as on 01st April 2015 there are about 214 Lakhs households in the State (Rural 190 lakhs and 23.82 urban H/Hs). There are 53.34 lakhs Electrified households, out of which 32.58 lakhs electrified households are in rural area and 20.76 lakhs electrified households are in urban area. There are still around 160.50 lakhs un-electrified households in the state (157.0 lakhs are in rural area and 3.06 lakhs are in urban area) as on 1st April 2015.

Considering the expected growth rate of access of electricity in the state in the coming years, all the un-electrified households, in urban & rural areas have been planned to be electrified at the rate of 25% per year for the consecutive four years (As informed by State Govt.) by FY 2018-19.

Govt. of Bihar would also identify the remote households out of these un-electrified households and would make a program for electrification of these remote HHs through DDG scheme of DDUGJY or through MNRE schemes.

Existing Distribution System

At the end of 31st March' 2015, the distribution network of Bihar consists of 110758 ckt km low tension lines, 2200 Nos of 11 kV feeders with 49650 circuit km network & 495 Nos of 33 kV lines with 7930.28 circuit km network.

There are 624 Nos of 33/11 kV Power substations and 100842 Nos of 11/0.4 kV distribution substations. The total transformer capacities at 33 kV and 11 kV levels are 7466.15 MVA and 7066.93 MVA respectively. LT to HT ratio at present is 1:0.45. The distribution system has suffered in the state a lot due to lack of maintenance and supervision resulting into increase in frequent unscheduled breakdowns and tripping in the system. To provide quality 24x7 power supply to rural areas, there is an urgent need to augment/strengthen the rural & mixed 11KV feeders, which are 1121 & 340 in numbers respectively, as well as to improve the infrastructure of the 33 KV substations which are 624 in numbers. Similarly, system strengthening has to be carried out in urban areas also to provide reliable & quality power to the consumers.



Table-7.1

The Category wise detail for FY 2013-14 has been shown in below Table:

Domestic	Commercial	Industrial LT	Industrial HT	Public lighting	Traction	Agriculture	Public water works
Category wise No of consumers (Nos)							
4698332	301634	20050	1551	419	19	53332	1236
92.55%	5.94%	0.39%	0.031%	0.008%	0.000%	1.051%	0.024%
Category wise Energy consumption (MUs) as on 31 st march 2014							
3281	819	1835		46	1881	322	59
39.80 %	9.94 %	22.26 %		0.55 %	22.82 %	3.91 %	0.72 %

DISTRIBUTION SCHEMES UNDER IMPLEMENTATION

R-APDRP

Government of India has launched Restructured-Accelerated Power Development and Reforms Programme (R-APDRP) in 2008 as a central sector scheme to encourage energy audit and accounting through IT intervention and to reduce the AT&C losses up to 15%. The Focus of R-APDRP Scheme is on actual demonstrable performance to be shown by utilities in terms of sustained AT&C loss reduction. Projects under the scheme are being taken up in two Parts:- Part-A includes the projects for IT applications for energy accounting / auditing, GIS, consumer indexing, SCADA & IT based consumer service centres, etc. and Part-B includes regular distribution strengthening projects including separation of agricultural feeders from domestic and industrial ones and High Voltage Distribution System (HVDS), etc.

The scheme of R-APDRP as approved by CCEA for continuation in 12th and 13th Plans has been

subsumed on 3rd December, 2014 for in the newly launched **Integrated Power Development Scheme (IPDS)** as a separate component relating to IT enablement of distribution sector and strengthening of distribution network for urban area. Under State Part-A(IT) of R-APDRP in Bihar, 71 towns were eligible and projects with estimated cost of Rs 195 Crores have been approved for the state of Bihar in December' 2009 and Rs 107.62 Crores have been disbursed till date. Part-A SCADA project for one town has also been sanctioned at an estimated cost of Rs. 18.5 Crores in August' 2012 and out of which Rs. 1.5 Crores has been disbursed.

Under State Part-B of R-APDRP, 64 towns were eligible and projects at an estimated cost of Rs. 1279.52 Crores have been approved for the State of Bihar. The scope & achievement of this scheme is given at Annex-IX.



RGGVY

Rajiv Gandhi Grameen Vidyutikaran Yojna (RGGVY) was launched by Government of India during 10th plan period in 2005 for providing access to electricity to all rural households in the country. The scheme has been subsumed in newly launched Deen Dayal Upadhyaya Grammen Jyoti Yojna (DDUGJY) in Dec 2014.

At present, the un-electrified villages/ habitations & households in the state are being electrified under RGGVY scheme of Govt of India. Under this scheme electricity connections are being provided for the rural households in the habitations with population of more than 100 only. The status of the scheme is as under:

SBPDCL

RGGVY 11th Plan Phase-II

The scheme was approved at an estimated cost of Rs. 2350.6 Crores. Till date, expenditure of 572.85 Crores had already been done for 7 districts of Bihar. The prime focus of this scheme is to provide electricity connection to 18.27 lakhs BPL households, out of which electricity connection of around 1.04 lakh BPL households has already been released. The remaining electricity connections of around 17.22 lakh BPL are expected to be completed by December' 2015.

RGGVY 12th Plan

The scheme was approved at an estimated cost of Rs.1560.28 Crores for providing access to Electricity in remaining 10 districts of SBPDCL. Till date expenditure of 39.66 Crores has been already done. The prime focus of this scheme is to provide electricity connection to 13.19 lakhs BPL households besides improving sub transmission & distribution network in rural areas.



NBPDCL

RGGVY 11th Plan Phase-II

The scheme was approved at an estimated cost of Rs. 1188.41 Crores for PHASE II. Till date expenditure of 477.5 Crores has been already done in 11th plan phase-II. The prime focus of this scheme is to provide electricity connection to 11.77 lakhs BPL households, out of which, electricity connection to around 0.92 lakh BPL households has already been released. The remaining electricity connections of around 10.85 lakhs BPL households are expected to be completed by December 2015.

RGGVY 12th Plan

The scheme was approved at an estimated cost of Rs 3806.62 Crores for providing access to Electricity in remaining districts of NBPDCL. Till date, expenditure of 165.1 Crores has been already done. The prime focus of this scheme is to provide electricity connection to 41.67 lakhs BPL households besides improving sub- transmission & distribution network in Rural areas.

The scope & achievement of RGGVY scheme is given at Annexure- X.

ASIAN DEVELOPMENT BANK (ADB) PROJECTS:

NBPDCL

The ADB funded work under distribution system of NBPDCL are in two packages, Package-B (Reconstruction & Modernization Distribution in Motihari and Bettiah Town) and Package-D (Reconstruction & Modernization Distribution at Samastipur & Begusarai Towns) for strengthening of distribution system. Augmentation of power transformer, installation of additional DSS, R&M of existing PSS, Reconductoring of existing HT and LT lines, Consumer metering and construction of new line and PSS are to be done in this scheme.

24X7 POWER FOR ALL (BIHAR)

Package B of this Project was approved at an estimated cost of Rs. 34.48 Crores and was awarded to M/s A2Z Maintenance & Engineering Services Ltd.(Contract Agreement signed on 18.04.12).The proposed work includes 33/11 kV New substation,33 kV, 11 kV & LT lines and Metering (Feeder & Consumer) in Motihari & Bettiah Town.

Package C of this Project was approved at an estimated cost of Rs. 56.29 Crores awarded to M/s A2Z Maintenance & Engineering Services Ltd. (Contract Agreement signed on 20.07.12.The proposed work shall includes 33/11 kV substation,33 kV,11 kV & LT lines & Metering (Feeder & Consumer) in Samastipur & Begusarai Towns.

SBPDCL

The ADB funded work under distribution system of SBPDCL are in two packages, Package-A (Reconstruction & Modernization Distribution Biharsharif Town -Nalanda Circle) and Package-D (Reconstruction & Modernization Distribution Ara & Towns-Bhojpur Circle) for strengthening of distribution system. Augmentation of power transformer, installation of additional DSS, R&M of existing PSS, reconductoring of existing Ht and LT lines, consumer metering and construction of new line and PSS are to be done in this scheme.

Package A of this project was approved at an estimated cost of Rs. 38.16 Cr. The proposed work is Reconstruction & Modernisation of Distribution system in Biharsarif Town in Nalanda circle.

Package-D of this project was approved at an estimated cost of Rs. 49.01 Crores. The proposed work is Reconstruction & Modernisation of Distribution system in Ara & Towns in Bhojpur circle.

The details of the scope and achievement of ADB projects are at Annex-XI.

Backward Region Grant Fund (BRGF)

The Backward Regions Grant Fund (BRGF) of Govt of India is designed to redress regional imbalances in development. The fund provides financial resources for supplementing and converging existing developmental inflows into identified backward districts, so as to bridge critical gaps in local infrastructure and other development requirements that are not being adequately met through existing inflows and to facilitate participatory planning, decision making, implementation and monitoring, to reflect local felt needs. It also helps to improve the performance and delivery of critical functions of Govt. This is a fully sponsored grant Scheme by Govt. of India for extremely backward regions of Bihar. The scheme is divided into three parts BRGF Scheme Phase-I, BRGF Phase-II and BRGF Phase-II Part-C. The estimated cost of the above schemes is 4980.56 Crores. Till 31st March 2015, the expenditure incurred is around 903.75crores.

The scope & achievement of this scheme is given at Annexure- XII.



GOI SCHEMES SANCTIONED AND UNDER IMPLEMENTATION: The summary of GOI sponsored schemes are summarized below-

Table- 7.2

Year wise amount disbursement for GoI Schemes already Sanctioned and under implementation Cost (in Rs Crores)							
	Up to 31 st March 2015	FY 2015- 16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
RGGVY 11 th plan phase-II	1050.35	2488.66				3539.07	Sanctioned
RGGVY 12 th plan	204.76	2581.07	2581.07			5366.9	Sanctioned
RAPDRP- Part- A-71 towns for IT enablement under RAPDRP – Part A (For towns with population more than 30,000)	17.15	177.85				195	Sanctioned
RAPDRP Part A – SCADA projects for 01 town	1.5	13.5	1.5	1.5	0.5	18.5	Sanctioned Rs 18.5 Crores and Rs 1.5 Crores disbursed to Discoms
RAPDRP- Part-B – 64 towns	362.03	917.49				1279.52	Sanctioned
Special Plan(BRGF)	903.75	1900.81	2100.54	75.46		4980.56	Sanctioned Rs. 4980.56 Crores
Total sanctioned GOI schemes	2670.82	8126.04	4683.11	76.96	0.5	15557.43	

Proposed GOI schemes in Rural and Urban Areas

A. Deendayal Upadhyaya Gram Jyoti Yojna” (DDUGJY)

Government of India has launched Deendayal Upadhyaya Gram Jyoti Yojna” (DDUGJY) on 3rd December, 2014 for

- Separation of agriculture and non-agriculture feeders facilitating judicious restoring of supply to agricultural & non-agriculture consumers in the rural areas.
- Strengthening and augmentation of sub-transmission & distribution infrastructure in

rural areas including metering of distribution transformers/feeders/consumers.

- Rural electrification for completion of the targets laid down under RGGVY for 12th and 13th Plans by carrying forward the approved outlay of RGGVY to DDUGJY.

The components at (i) and (ii) of the above scheme will have an estimated outlay of Rs. 43033 Crores including a budgetary support of Rs. 33453 Crores from Government of India during the entire implementation period.

As already mentioned , the scheme of RGGVY as approved by CCEA for continuation in 12th and 13th Plans has been subsumed in this scheme as a separate rural electrification component for which

24X7 POWER FOR ALL (BIHAR)



CCEA has already approved the scheme cost of Rs. 39275 Crore including a budgetary support of Rs. 5447 Crore. This outlay will be carried forward to the new scheme of DDUGJY in addition to the outlay of Rs. 43033 Crores. REC is the nodal agency for the operationalization of DDUGJY in the Country.

B. Integrated Power Development Scheme” (IPDS)

The Central Government has sanctioned “Integrated Power Development Scheme” (IPDS) on 3rd December, 2014 for urban areas for:

- (i) Strengthening of sub-transmission and distribution networks in the urban areas.
- (ii) Metering of distribution transformer/feeders/consumers in the urban areas.
- (iii) IT enablement of distribution sector and strengthening of distribution network for completion of the targets laid down under R-APDRP for 12th and 13th Plans by carrying forward the approved outlay of R-APDRP to IPDS.

The components at (i) and (ii) above have an estimated outlay of Rs. 32,612 Crores including a budgetary support of Rs. 25,354 Crores from Government of India during the entire implementation period.

The scheme of R-APDRP as approved by CCEA for continuation in 12th and 13th Plans has been subsumed in this scheme as a separate component relating to IT enablement of distribution sector and strengthening of distribution network [component (iii) above], for which, CCEA has already approved the scheme cost of Rs. 44,011 Crores including a budgetary support of Rs. 22,727 Crores. This outlay is to be carried forward to the new scheme of IPDS in addition to the outlay indicated above. PFC is the nodal agency for the operationalization of IPDS in the country.

DISTRIBUTION REQUIREMENT FOR RURAL AREAS

To provide 24x7 power supply in the rural areas, Govt. of Bihar has finalized the following requirement of infrastructure for augmentation of rural infrastructure in the state-

Table-7.3

Sl. No.	Item	Unit	NBPDCL	SBPDCL
A	New 33/11 KV PSS :			
1	2X10 MVA	No	10	
2	2X5 MVA	No	161	117
3	33 kV New line	ckm	2528	1594.8
4	33 kV bay Extension	No		58
5	33 kV railway crossing	No	31	32
6	11 kV line with ACSR conductor	Km	4328	2340
7	11 kV railway crossing	No	73	32
B	Feeder separation(Existing PSS)			
1	Main line with ACSR Rabbit conductor	Ckm	4382.2845	888
2	Spur line 11 kV with ACSR Weasel conductor	Ckm		1950
3	New 11 kV line by 185 sq mm AB cable	Km		17.76
4	11 kV bay Extension	No	89	173



Sl. No.	Item	Unit	NBPDCL	SBPDCL
5	25 KVA DSS	No	12470	8700
6	New LT Line for New DTs	ckm		3480
C	Feeder separation(UPCOMING PSS)	Km		
1	Main line with ACSR Rabbit conductor	Km	4124.19	1170
2	Spur line 11 kV with ACSR Weasel conductor	no		2726
3	New 11 kV line by 185 sq mm AB cable	MVA		23.4
4	11 kV bay Extension	Nos.	2	234
5	25 KVA DSS	Nos.	13597	11700
6	New LT Line for New DTs	ckm		4680
D	Feeder separation(Proposed PSS)			
1	Main line with ACSR Rabbit conductor	Nos.	5284.64	790
2	Spur line 11 kV with ACSR Weasel conductor	MVA		1738
3	New 11 kV line by 185 sq mm AB cable	Nos.		15.8
4	11 kV bay Extension	Nos.		158
5	25 KVA DSS	Nos.	16284	7900
6	New LT Line for New DTs	ckm		3160
E	Strengthening of Consumer metering			
1	Single phase consumer metering	No	579938	262994
2	Three phase consumer metering	No	6011	43022
	Estimated Cost		Rs 3394.10 Cr	Rs 2433.13 Cr

Note: The clubbed proposal of each new DT comprises of one no of 25 kVA DSS with 400 meter associated LT LINE.

DISTRIBUTION REQUIREMENT FOR URBAN AREAS

To provide 24x7 power supply in the Urban areas, Govt of Bihar has finalized the following requirement of infrastructure for augmentation of urban infrastructure in the state-

Table-7.4

Sl. No.	Description		1 st DPR SBPDCL	NBPDCL	2 nd DPR SBPDCL
1	33/11 KV PSS :				
A	New				
	i)2X10MVA	NO/MVA	27/410	35/530	27/480
	ii)2X5MVA	NO/MVA			
B	Additional P T(10MVA)	NO/MVA	22/200	18/200	
C	PT Capacity Enhancement(5 TO 10 MVA)	NO/MVA	55/275	11/55	
2	33/11 KV PSS : R&M	Nos.	12	1	
3	33 KV feeders				
A	New	Ckm	497	366	
B	33 kv line bifurcation	Ckm			257
C	33 kv line augmentation	Ckm	295	361	
D	33KV BAY	NO	31		1
4	11 KV feeders-				
A	New	Km	722	596	239
B	11 KV Bifurcation	Km			
C	11 KV Augmentation	Km	281	343	
D	11 KV BAY	NO	70		25



Sl. No.	Description		1 st DPR SBPDCL	NBPDCL	2 nd DPR SBPDCL
5	Distribution Transformer-New	MVA	299	462	31
A	500 KVA	Nos.	2465	2629	207
B	315 KVA	Nos.			
C	200 KVA	Nos.			
D	100 KVA	Nos.			
6	Distribution Transformer-R&M	Nos.		669	
7	Capacity enhancement of LT sub-station	MVA	138	140	12
A	200 - 315 KVA	Nos.	1279	1207	101
B	100 - 200 KVA	Nos.			
C	63 -200 KVA	Nos.			
D	25 - 200 KVA	Nos.			
E	25 - 100 KVA	Nos.			
F	63 -100 KVA	Nos.			
8	LT Line :				
A	New Feeder	Km	969	915	
B	LT Line Feeder Bifurcation	Km			
C	LT Line Augmentation	Km	556	456	
9a	HVDS 100 kVA	Nos		370 nos/26 MVA	
B	HVDS 63 kVA	Nos			
10	Capacitor Bank(3 MVAR & 1.5 MVAR)	NOS	21	111	
11a	Aerial Bunched Cables 11 KV	Km	2420	1697	299
B	Aerial Bunched Cables LT	Km			
12a	Under-ground cables 33 KV	Km	317	77	115
B	Under-ground cables 11 kv	Km			
13	Solar Panels with Net metering (in Govt establishment)	Nos./KW	715	936	
14	Metering - Feeder/Boundary Point/DT/Consumer				
4	Metering - Feeder/Boundary Point/DT/Consumer				
A	Boundary Meter	Nos	478	117934	1
B	33 KV Feeder Meter	Nos	115360		
C	11 KV Feeder Meter	Nos			
D	D T Meter	Nos			
E	Single Phase Meter	Nos			
F	Single Phase Service wire(2cx10)	Km			
G	Three Phase Meter	Nos			
H	Three Phase Service wire (3.5C, 25sq.mm)	Km			
I	Single Phase Prepaid / smart meters in Govt. establishment	Nos			
J	Single Phase Prepaid / smart meters in Govt. establishment	Nos			

Estimated Cost Rs. 2109.77 Cr

SANCTION OF DDUGJY AND IPDS PROJECTS BY GOI

GOI has sanctioned the above projects of Rs 5827.23 Crores under DDUGJY and projects of Rs 2109.77 Crores under IPDS for the state of Bihar.



C. INFORMATION TECHNOLOGY INITIATIVE.

IT enabled services cover the towns with less than 30 thousand population and in rural areas which were not covered under RAPDRP- Part-A.

Under RAPDRP Part-A, all towns of Bihar were covered with population of more than 30,000 for IT enabled services. In order to implement RAPDRP scheme in the entire state irrespective of the coverage of Sub Division / Town of more than 30,000 population, it was considered that all modules under Part-A of RAPDRP would also be implemented in the towns of population of less than 30 thousand as well as in rural areas.

As per the sanctioned scheme for towns, State Data Centre is to be established at Patna City and all the requisite software viz. application software, Data Base software and the requisite hardware will be installed through RAPDRP funding. It is pertinent to mention that sizing of the Software and Hardware were considered taking into account that the consumers and sub divisions of entire state will be served through the state Data Centre, if the scheme is implemented in entire Bihar. Discoms have to bear only the cost of field activities like GIS based network and asset mapping, sub station metering, etc. for the areas which are not covered under RAPDRP to achieve the following objectives:

1. IT enablement of entire Discom.
2. Parity in business Process in entire Discom.
Even in some cases only part of subdivision has been covered under R-APDRP. Under such circumstances it would be difficult to maintain the parity in business process within one sub-division if scheme is not implemented entirely.
3. Facilitate all the consumers of all Discoms with the benefits of RAPDRP scheme.

4. Avoid future fragmentation, which may take place if the scheme is not implemented in entire Discom.

5. Adoption of common technology with Integration of entire System.

State of Bihar is launching R-APDRP program Part-A, inviting IT Implementation Agency for covering non R-APDRP towns. However, the Implementation progress has been very slow and project is yet to go-live.

For last five years, IT Implementation Agencies (ITIA) were not able to implement critical components of the IT infrastructure like Customer Relationship Module, Billing System, Automatic Meter Reading, Web Self Service, Security, MIS, Centralized Call Centre, etc. successfully. Other critical diagnostic tools such as energy audit, Inventory management system, Geographical Information System are yet to be implemented.

For taking benefits of the huge investment already made under RAPDRP and meeting the program objective, GoB shall focus on addressing the critical gaps in the existing system and ensure for an early implementation for both RAPDRP & NON-RAPDRP towns otherwise the infrastructure such as hardware, servers may soon be out dated and out of warranty.

D. Reduction of AT&C losses

Reduction in AT&C losses have been achieved from FY 2011-12 (59.2%) to FY 2013-14 (46%) through no of steps like feeder renovation program, Feeder metering, DTR metering, consumer metering etc. AT & C loss during FY 2014 -15 is 46.63 % and further target in forthcoming years is as follows:



Table-7.5

Year	AT&C loss Trajectory for both
2014-15	46.63%
2015-16	42.63%
2016-17	38.13%
2017-18	34.00%
2018-19	30.00%
2019-20	27.00%
2020-21	24.00%
2021-22	21.00%

The State Govt. has initiated measures for making 100% metering, billing, and revenue collection a pre-requisite for all the Discoms. State Govt. proposes to undertake the following works for reduction of AT&C losses –

- (i) Targeting at least 85% of consumers with running meters and their regular meter reading.
- (ii) Collection of energy bills from consumers in time with segregated responsibilities against JEE, AEE & EEE of Supply Divisions, Sub-divisions and Sections.
- (iii) Appointment of Rural Revenue Franchisee for meter reading, bill distribution and collection from rural consumers.
- (iv) Cent-percent meter reading of urban consumers by engagement of Meter Reading Agency in all Divisions.
- (v) Cent-percent billing by outsourcing billing activities to computer agency.
- (vi) Disconnection drive in case of non-payment every month.
- (vii) Inspection of consumer premises to detect theft of energy and taking immediate legal action against the consumers involved in theft of energy.

- (viii) Providing multiple options of payment to consumers in the form of direct deposit in Discoms own collection counter at Sub-divisions and Block levels, in the counter of Gramin Banks, Online Payment, Door to Door collection of revenue from rural consumers by RRF, Mobile Van for payment, Collection of revenue through Sahaj/ Vasudha Kendras, Installation of Any Time Payment Machine in Town, etc.
- (ix) Filing certificate cases and their disposal promptly.
- (x) Remote meter reading of all HT consumers.
- (xi) Allowing payment through RTGS to all HT consumers.
- (xii) Regular monitoring at District level by DMs.
- (xiii) Regular visiting field offices and conducting review meeting at the level of MD and CMD.
- (xiv) Review meeting being conducted every month at the level of Chief Secretary, Bihar.
- (xv) Pre-paid meter already procured and being installed in the premises of big consumers.

E. Improving Consumer Convenience

Improving consumer convenience should be the focus of any distribution utility. For improving consumer convenience “Bihar Standard of Performance guidelines” has been recently issued by the Regulator. DISCOM should submit the compliance on SOP within the time period as prescribed by the regulator. For improving further and make the process more transparent, state regulator can undertake Customer Satisfaction Survey through some independent agency. Customer segmentation in terms of differentiated service delivery can also be prescribed by state regulator in the next phase.



F. Revamping Maintenance Philosophy

Presently DISCOMS are only engaged in Break Down repair work of the various equipments. In order to increase reliability of the system DISCOM should look for implementing system driven preventive maintenance system. Power Transformers, Distribution Transformers, Circuit Breakers can be checked periodically for identification of any faults and correction thereof. Further, Discom should have defined roadmap to adapt Predictive Maintenance.

G. Performance Monitoring Mechanism

In order to implement appropriate reform measures and to meet the objective, baseline parameters need to be verified and established, and hence it is proposed that a Third Party Audit should be carried out for establishing the baseline parameters for the KPI indicated below and thereafter following performance parameters need to be monitored at the DISCOM Corporate level.

Table-7.6

Corporate Strategic Objectives	KPI	UOM
Maximize Rate of Return	PAT	RsCrs
	No of households to be electrified	Nos in Lakhs
	CAPEX	Rs. Crs
Sustain AT&C loss level & achieve further reduction	AT&C Losses	%
	Collection Efficiency	%
	Billing Efficiency	%
Monitoring Distribution Cost	Establishment Cost	Rs. Crs
	R&M Cost	Rs. Crs
	A&G Cost	Rs. Crs
	Power Purchase Cost	Rs./unit
Enhancing Customer Satisfaction	CSI Overall	Index
	Total Consumer Complaints/ '000 consumers	Nos.
	New initiatives to enhance customer convenience	Nos.
	Addition in regards to Payment Avenues	Nos.
	PA Compliance Index	Index
Operational Efficiency	No. of customers served /employee	Ratio
System Reliability	SAIDI	Hrs
	SAIFI	nos.
	DTR Failure Rate	%
	PADCI (Project Av. Duration Closure Index)	Months
	No of Accidents (Fatal/ Non Fatal)	Nos

H. Connecting the Unconnected

As per GoB in FY 2014-15, there are about 160.50 lakhs un-electrified households in the state including 157.54 lakhs in the rural areas and 3.06 lakhs in urban areas.

A. Urban Area

Keeping in view of the fast growth of households in the urban areas due to migration from rural to urban, GOB had set target to release connections to

1.58 lakhs households in FY 2015-16 & 1.47 lakhs in FY 2016-17. So that, till FY 2016-17, every household is electrified.

B. Rural Area

Out of 157.54 lakhs un-electrified rural households in the state, GoB made a plan to electrify all households located in these villages by extending supply from the grid in a phased manner as shown in Table.

Table-7.7

Un-electrified H/H as on 01.04.2015	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Left out
Rural- 15753915	3500000	3500000	3500000	3500000	14000000	1753915*
Urban- 306177	158513	147664	-	-	306177	0
Newly Constructed Household after FY 2014-15						
Rural	560333	576847	593848	611350	2342378	
Urban	102284	106676	111256	116032	436248	
Total Rural	4060333	4076847	4093848	4111350	16342378	
Total Urban	260797	254340	111256	116032	742425	

* These left out rural H/H will be the BPL families using electricity through another BPL H/H of the same premises. They will take separate connection as per the requirement.

I. Electrification of remote house hold through Decentralized Distributed Generation (DDG) under RGGVY/ MNRE schemes

Decentralized Distributed Generation (DDG) scheme under RGGVY is for those villages/ habitations where grid connectivity is either not feasible or not cost effective. The distributive generation can be from conventional or renewable sources such as Biomass, Bio fuels, Biogas, Mini Hydro and Solar etc. In Bihar, 820 villages (624 remote villages and 196 LWE villages) have been identified in the state which will be electrified through Decentralized Distributed Generation (DDG) scheme. Out of 820 villages, Detailed

Project Reports (DPR) for 225 villages have been prepared and submitted for REC approval by Bihar State Hydro Power Corporation Limited (BSHPCL) which is the nodal agency for implementation of DDG scheme in the state. Approvals of DPR for 48 villages have already been received from REC and the project is under implementation stage. The above villages will be electrified at an estimated cost of 35.21 cr. either through the Biomass based (Gasifier) Power Plant or through Solar Photovoltaic Power Plant or both with local distribution line and service connection to individual households. The details of various off grid solutions of MNRE through solar PV are at Annexure-V.



ASSESSMENT OF ADEQUACY OF DISTRIBUTION SYSTEM

Table-7.8

SI. No.	DESCRIPTION	Units	Existing as on 31 st March 2015	ONGOING SCHEMES (RAPDRP B+RGGVY+BRGF+ADB+STATE PLAN)	TOTAL
1	66/33/11kV NEW PSS	Nos.	624	564	1188
2	Total 66/33/11kV PSS Capacity	MVA	7466.15	8451	15917
3	11/0.415kV NEW Distribution Transformer Capacity	Nos.	100842	149539	250381
4	Total 11/0.415kV Distribution Transformer Capacity	MVA	7066.93	8717	15784

- Total capacity at 33/11 kV PSS level by FY 2018-19= 15917 MVA
- Total capacity at 11/0.415 kV DTR level by FY 2018-19 = 15784 MVA

From the above table it is evident that the transformation capacity at 66/11kV & 33/11kV levels is projected to grow from 7466 MVA in FY 2014-15 to 15917 MVA in FY 2018-19.

The projected peak demand of the state, including demand of large industrial consumers at 33 kV level, has been projected at 8774 MW in FY 2018-19.

The Energy billed for HT (Industrial) (33kV+11 kV bulk consumer) for FY-13 is 1405 MU.

From the above, load of 33 kV consumers in FY 2018-19 is about 120 MW and the peak demand is about 95MW by applying a demand factor of 0.95 and Diversity factor 1.2 ($120 \times 0.95 / 1.2$).

Correspondingly, the demand met at 11 kV and below comes to 8679 MW (8774MW minus 95MW) which corresponds to 9643 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity at 33/11kV level in FY 2018-19 is projected to

15917 MVA. This translates to an average loading of 61% on 33/11kV transformers under peak demand conditions.

The transformation capacity at 11/0.415 level is projected to grow from 7066.93 MVA in FY 2014-15 to 15784 MVA in FY 2018-19.

Similarly the load of 11 kV consumer in FY 2018-19 is about 120MW and the peak demand is about 95 MW by applying a demand factor of 0.95 and Diversity factor 1.2 ($120 \times 0.95 / 1.2$).

Correspondingly, the demand met at 11 kV and below comes to 8574 MW (8679 MW minus 95 MW) which corresponds to 9526 MVA considering a power factor of 0.9. Against this peak requirement, the installed capacity at 11/0.415kV level is projected at 15784 MVA in FY 2018-19. This translates to an average loading of 60% on 11/0.415 kV transformers under peak demand conditions.



Fund Requirement

The summary of total fund required for these proposed distribution works are as under-

Table-7.9

Details of Investment Planned

(Rs in Cr.)

Distribution	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
State Plan	121.47	-	-	-	121.47	No central assistance required
DDUGJY	1456.78	2913.55	1456.78	-	5827.1	These schemes have already been approved by MoP.
IPDS	606.71	1213.42	606.71	-	2426.84 (2100-DPR-I 326.84- DPR-II)	

Action point- State

1. To complete all the distribution works necessary for providing 24x7 quality supply to all the connected consumers.
2. To take necessary steps to meet the agreed trajectory for reduction of AT&C losses. The state would make a detailed Plan to electrify all rural households in next 3 months.
3. To identify such un-electrified households which can not be electrified by extending supply from the existing grid in next 3 months and to formulate a detailed plan in next 3 months to finalise the economical feasible option for connection with the grid and off grid solutions. Otherwise, it would make a detailed program for electrification of these villages / habitations through MNRE or any other schemes.
4. To introduce modern technologies to monitor reliable supply like sub-station automation, providing adequate communication infrastructure, GIS, Reliability, Centralised Network Analysis and Planning tools, SAP

driven ERP systems, DMS (Distribution Management Systems), OMS (Outage Management System), etc.

5. The state may review the plan for augmentation of distribution network keeping in view of the increased load projections with overall system peak load of 8774 MW.
6. State would take necessary steps to meet the Performance Standards specified by SERC.
7. To make arrangement of balance funds after approval of ongoing schemes of GOI like DDUGJY and IPDS.

GOI Intervention

To release the BRGF grant as the projects are under various stages of tendering / implementation



Renewable energy is increasingly becoming an important source of the energy mix –meeting the twin objectives of meeting energy security and clean energy considerations. Bihar has good potential for promotion and development of renewable and non conventional energy projects, particularly Solar and Biomass Projects. Good explorable options and potential exist for power generation from irrigation canal drops, solar, biomass cogeneration etc. State has already issued liberal policies for promotion of renewable energy generation.

Government of Bihar is keen to tap renewable power potential of the state, particularly solar and biomass power potential, to meet the growing demand of power in an environmental

friendly and sustainable manner. The area of studies are :

- Renewable energy plan
- Grid connected and off grid Roof Top Solar scheme
- Solar water pumping scheme particularly for agricultural consumers
- Action plan of the state
- Fund Requirements
- GoI/ State Government. Interventions

Grid Connected Renewable Energy:

The total grid connected Renewable Energy (RE) installed capacity as on March 2015 is 139 MW. Category wise break up of present installed capacity and potential of generating power from Renewable Energy Sources is given in Table:

Table -8.1

Source	Present Installed Capacity (MW)	Potential (MW)
Solar	-	11200*
Bagasse based cogeneration	85	300
Biomass based power generation	1	619
Wind	-	144
Total	86 MW	12263 MW

* As per National Institute of Solar Energy (NISE), estimated Solar Power potential in the state of Bihar is in the range of 11,200 MW considering 3% of waste land in the state to be used for Solar Power Generation.

Policy in place:

GoB's policy - "Bihar Policy for promotion of New and Renewable Energy Source 2011"- is already in place. The policy was modified by Government of Bihar vide modification dated 24.06.2011 for Solar, Biomass & other renewable energy projects.

Besides above, Solar Policy 2015 and Net Metering Regulation for the state also has been

drafted and circulated for comments from various stake holders.

Government of Bihar Initiatives and Plan

It is proposed to set up Solar PV / Solar Biomass Hybrid plants (grid connected) of about 151 MW capacity in the state by FY 2016 – 17. Out of 151 MW, PPA for 148 MW has already been executed.



Break up of proposed 151 MW capacity addition is as follows:

Solar PV : 100 MW (Through Bidding Process)
 Solar PV : 38 MW (on preferential tariff at BERC Rate)
 Solar PV : 10 MW (Under JNNSM Scheme with SECI)
 Solar BioMass Hybrid Project : 3 MW (PPA) is under process. This project is funded by EU

The list of plants already proposed is given in Table below:

List of RNES Plants already Proposed

Table-8.2

Name of the Project	Capacity (MW)	Solar / Wind	Proposed rate of electricity after completion of Projects (Rs/ KWh)	Owner ship Private/ state owned	Likely year of Commissioning / COD
Alfa Infrastructure Pvt. Ltd.	20	Solar	7.87	Private	
Udipta Energy	5	Solar	7.98	Private	
Azure Power	10	Solar	8.39	Private	
Welspun Project 1	15	Solar	8.56	Private	
Welspun Project 2	15	Solar	8.64	Private	
Welspun Project 3	10	Solar	8.70	Private	
Acme Cleantech Project 2	15	Solar	8.73	Private	
Acme Cleantech Project 3	10	Solar	8.73	Private	
Solar Biomass Hybrid Project	3	Solar		Project funded by EU. BSPGCL is Project Developer as per the consortium agreement to qualify for implementation of the Hybrid project through EU grant	Tariff to be determined by BERC
SECI	10	Solar	5.50	Government. of INDIA	
Sunmark Energy	10	Solar	10.90	Private	
Response Energy	10	Solar	10.90	Private	
Alex Green Pvt. Ltd.	10	Solar	10.90	Private	
Avantika Contr. Ltd.	5	Solar	10.90	Private	
Glatt Solutions Ltd.	3	Solar	10.90	Private	

In addition to the above, BSPGCL has sought approval from Government of Bihar (GoB) for installation of additional 150 MW grid

connected solar PV plants by FY 2017-18 through tariff based competitive bidding.



Year Wise proposed capacity addition plan through renewable (grid interactive) is as follows (Table):

Table-8.3

TYPE	Year wise capacity addition plan (cumulative) (MW)			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Solar PV (Competitive Bidding)	38	138	288	288
Solar PV under JNNSM Phase - II	10	10	10	10
Wind	0	0	0	0
Bagasse	88	94	94	94
Bio Mass	3	3	3	3
Biomass Solar PV Hybrid	----	3	3	3
TOTAL	139	248	398	398

Action Plan of the State for Grid Interactive NCE/RNES Plants:

The state has to ensure completion of renewable generating capacities in the State of Bihar as per the following roll out plan:

Table-8.4

TYPE	Year wise capacity addition plan (MW)			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Solar PV (Competitive Bidding)	38	100	150**	-----
Solar PV under JNNSM Phase – II	10	----	-----	-----
Bagasse	3	6	----	-----
Bio Mass	2	----	-----	-----
Biomass Solar PV Hybrid	----	3	-----	-----
TOTAL	53	109	150	-----

**** Submitted for GOB approval**

Fund Requirement

For developing 288 MW Solar projects and 97 MW bagasse / biomass based renewable energy plants in the State, no grant or financial assistance is required from Central Government. as all these projects would be developed by Private Investors / IPPs.

The 10 MW Solar plant will be developed by SECI under JNNSM Phase-II Scheme for which Viability Grant Fund (VGF) @ 2.5 Crores / MW would be required from GoI for which the tariff is fixed @ Rs. 5.50 / kWh.

Proposed 3 MW Biomass Solar Hybrid project would be funded by EU and tariff of power from this plant will be decided by BERC.



Total fund requirement (year wise) for these projects is given here under:

Table-8.5

TYPE	Year wise Fund Requirement for RNES (Rs. in Crores)			
	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Solar PV (Competitive Bidding)	304	800	1200	-----
Solar PV under JNNSM Phase - II	55	----	-----	-----
Bagasse	16.5	33	----	-----
Bio Mass	11	----	-----	-----
TOTAL	386.5	833	1200	-----

Intervention by State Government. :

- GoB may submit their proposal to MNRE for VGF funding as per norms of the scheme.
- Set up single window clearances mechanism to expedite clearances of NCE projects.
- Notify Solar Policy with incentives such as net metering, unrestricted banking of energy during ToD hours and other fiscal incentives.

Intervention by GOI :

- Viability Gap Funding (VGF) for the 10 MW Solar Project in the State. VGF of Rs. 2.5 Crs./ MW requested.
- Subsidy for development of Green Corridor from National Clean Energy Fund (NCEF).

Renewable Energy Initiatives of Government of Bihar at Consumer Level:

- Grid connected and Off Grid Roof Top Solar Scheme:**

BREDA has undertaken following initiatives:

- Off grid Rooftop Solar Power Plant at Government buildings is implemented in the State by BREDA (Bihar Renewable Energy Development Authority). 1KWp solar rooftop power plant at residences and commercial buildings (6000 nos) is also proposed to be implemented during FY 2015 -16.
- 2 x 100 kWp and 2x 50 kWp rooftop SPV power programme is proposed to be implemented during FY 2015 -16.

- Installation of 25KWp Solar Power plant at District Collectorate, Hospital & Circuit House of each of the 38 districts (total 114 locations) of Bihar. The above system is already installed in 80 locations during FY 2013-14 and balance 34 locations during FY 2014-15.

During the FY 2014-15 an approval of 1.0 MW capacity for grid connected roof top system had been received from MNRE to BREDA which is state nodal agency for the promotion & development of renewable energy in the state. This scheme is having a provision of 30% subsidy from MNRE and 70% has to be borne by the beneficiary. Out of 1.0MW, 250kW will be installed at Patna air port.

• Solar water Pumping Scheme

Solar water pumping scheme particularly for agricultural consumers: - 1560 nos of 2HP Solar water pump installed in the state during FY2014-15. Further 3300 Nos. of 2HP/3HP Solar water pump for irrigation is going to be implemented in FY 2015-16.

This is a scheme by MNRE. Presently the scheme is being implemented by BREDA since FY 2013-14. Total subsidy provided is 90% (30% from MNRE & 60% from Government. of Bihar) of the bench mark cost of the pump. Balance 10% is to be borne by the beneficiary. The details of the pumps installed during last 3 years are as follows:



Table-8.6

Year	No of Pumps
FY 2013-14	1560
FY 2014-15	
FY 2015-16	3300

It is proposed that around 600 pumps/ year would be installed in the state if the above subsidy pattern is continued.

- Solar Off-Grid Systems**

It is an ongoing scheme of MNRE in which domestic lighting system (DLS) / home lighting system (HLS- Model-II) are being provided to the beneficiaries in rural and urban areas having

one solar module of 12 W, 2 LEDs each of 9 W and one battery of 12V, 12Ah capacity. This scheme is having a provision of 30% subsidy from MNRE, 60% from GOB and 10% has to be borne by the beneficiary. So far more than 8500 nos. systems have been installed in the state during last five years.

The Government buildings, hospitals, Public Health Centers (PHCs), Block offices in rural and semi-urban areas are proposed to be provided with Solar Off-Grid Systems with battery support.

Proposal for above schemes would be prepared on annual basis and submitted to MNRE for approval. The projected figures of above scheme are mentioned in the table given below:

Table-8.7**Details of Renewable Energy initiatives by BREDA**

Sl. No.	Particulars	Unit	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
A	Grid connected Solar Rooftops		1.0 MW	5.0 MW	120 MW	125 MW	150 MW
	Investment required	Rs. Cr.	8.0	40.0	960	1000	1200
	Subsidy from MNRE	%	30%	30%	30%	30%	30%
B	Solar off-grid systems						
i)	Solar power Plant		2 nos X 100 KW, 1 no x 50 KW 33 nos x 8-25 KW (total 677 KW)	2 nos X 100 KW, 2 nos x 50 KW 6000 nos x 1 KW	2 nos X 100 KW, 2 no x 50 KW 534 nos x 10 KW	2 nos X 100 KW, 2 no x 50 KW	2 nos X 100 KW, 2 no x 50 KW
	Investment required	Rs. Cr.	15.76	131.10	95.88	5.10	5.10
	Assistance from MNRE	%	20%	20%	20%	20%	20%
	Assistance from GOB	%	80%	80%	80%	80%	80%
ii)	Solar pump systems	No.	1560 nos 2HP	1500 nos 3HP 1800 nos	600 nos 2HP	600 nos 2HP	600 nos 2HP

Sl. No.	Particulars	Unit	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
				2HP			
	Investment required	Rs. Cr.	46.8	121.50	18.0	18.0	18.0
	Assistance from MNRE (Rs. 43000/HP)	%	28.67%	28.67%	28.67%	28.67%	28.67%
	Assistance from GOB	%	60%	60%	60%	60%	60%
	Beneficiary	%	11.33%	11.33%	11.33%	11.33%	11.33%
iii)	Solar Home Lighting	No.	4900	1500	1800	1800	1800
	Investment required	Rs. Cr.	4.9	1.5	1.8	1.8	1.8
	Assistance from MNRE (Rs. 1440/No)	%	14.4%	14.4%	14.4%	14.4%	14.4%
	Assistance from GOB	%	75.6%	75.6%	75.6%	75.6%	75.6%
	Beneficiary	%	10%	10%	10%	10%	10%
iv)	Solar Lantern for BPL and SC & ST	No.	5000	5000	5000	5000	5000
	Investment required	Rs. Cr.	1.1	1.1	1.1	1.1	1.1
	Assistance from MNRE	%	0%	0%	0%	0%	0%
	Assistance from GOB	%	100	100%	100%	100%	100%
v)	Off grid solar PV system (Demonstration Project)	Nios	25 nos X 200 Wp	-	-	-	-
	Investment required	Rscr	0.1025	-	-	-	-
	Assistance from MNRE		90%	-	-	-	-
	Beneficiary		10%	-	-	-	-

Action PLAN - State –renewable energy

DPRs for above schemes would be prepared and submitted to MNRE for approval on yearly basis.

GOI INTERVENTION

(a) To facilitate expeditious approval of DPRs

for the above schemes under National Clean Energy Funds (NCEF).

(b) Capital subsidy under Rashtriya Krishi Vikash Yojana for solar Pump system.



With increasing importance being given to low carbon growth these days, the cheapest and more affordable option to overcome the energy deficit is Demand Side Management (DSM) and implementation of energy efficiency measures in various sectors such as agriculture, municipalities, buildings, domestic, industries etc. The DSM has been traditionally seen as a means of reducing peak electricity demand. In fact, by reducing the overall load on an electricity network, DSM has various beneficial effects, including mitigating electrical system emergencies, reducing the number of blackouts and increasing system reliability. Possible benefits can also include reducing dependency on expensive imports of fuel, reducing energy cost, and reducing harmful emissions to the environment. Finally, DSM has a major role to play in deferring high investments in generation, transmission and distribution networks. Thus DSM applied to electricity systems provides significant economic, reliability and environmental benefits. Opportunities for reducing energy demand are numerous in all sectors and many are low-cost, or even no cost, items that most enterprises or individuals could adopt in the short term, if good energy management is practised. It is observed that in Bihar, DSM activities are yet to start. The status of state initiatives as received are furnished hereunder:

1. MoU has been signed between B.E.E & DISCOMs under which two consultants from Energy Efficiency Services Limited (EESL) & two officials from each Discoms have formed two dedicated DSM cells & started functioning from Nov 2014.
2. Rural Electrification Corporation Power Distribution Company Ltd (REC PDCL) has been appointed by EESL for conducting load survey which is in progress.
3. Annual DSM energy savings report is to be made on completion of load survey by end of March 15
4. Potential sources of DSM in the state would be made available after completion of Load survey. DSM measures adopted by the state are:
 - a. ToD tariff for HTS categories
 - b. Power Factor incentive/surcharge for HTS.
 - c. Capacitor charges applicable to the LTS category

In view of absence of any data, an exercise has been undertaken using data from other states such Rajasthan & Andhra Pradesh. Going by the experience of these states, one finds the most common measures of DSM and the average normative savings for each measure are as furnished below:

Table-9.1

Sector	DSM Technique	Energy saving Potential as % of total consumption	Investment/MU of savings (INR Crs.)
Agriculture	Replacement with Energy efficient pump Sets	27%	1.5
Domestic	Replacement of ICLs with LED bulbs	23%	0.8
Commercial building	Retrofitting of Energy efficient equipments	15%	1.5
Public water Works (PWW)	Replacement with energy efficient Pumps	26%	0.6
Municipal Street lighting(MSL)	Replacement of existing street light with LEDs	51%	2.0

Application of the above provides substantial energy savings per year. In Street lighting, the saving potential is maximum, because in this sector DSM can be planned and implemented by

municipal authority. Public water works is a government organization and hence penetration rate is quite high. In other sectors, serious awareness campaign through stakeholders'

consultation is required to achieve and enhances the desired energy savings.

In this chapter, the demand side energy savings potential that exist in Bihar, interventions and timelines are discussed.

Table-9.2

State's Electricity Consumption Profile

Sl no	Energy consumption Profile(2013-14)							
	Domestic	Commercial	Street lighting	Irrigation	PWW	Industrial	Others	Total
No of consumers	3900733	273466	389	51989	1192	17273	23	4245065
Connected load(MW)	4153.18	649.28	7.58	160.41	20.74	743.68	170.46	5905.33
Energy consumption(MU)	3281	819	46	322	59	1835	1881	8243
Energy consumption(%)	40%	10%	1%	4%	1%	22%	23%	100%
Per unit Tariff(Rs/Kwh)	2.46 *	4.00	6.88	6.14	2.97	6.85	6.28	4.56

Source:GOB *Wt average of rural and urban

Interventions

The agricultural sector accounted for about 4% of the state's energy consumption i.e. 3.22 BU during 2013-14 which are presumably accounted for pumps installed by irrigation department of GOB for lift irrigation like purposes. Bihar farming diaspora has been using Diesel operated pumps for irrigation purposes till date and thus substantial saving on replacement programmes by energy efficient pumps does not exists here.

Domestic sector accounted for an energy consumption of 3281MU which is nearly 40% of the total consumption in 2013-14. In order to stimulate investments in energy efficient lighting projects, high quality LED lamps are proposed to be given to households at the cost of incandescent lamps (ICLs) to encourage them to invest in energy efficiency under the Domestic Efficient Lighting Program (DELP).

The Domestic Efficient Lighting Programme (DELP) seeks to promote high quality LED lighting in the domestic sector by overcoming the high first cost barrier. DELP will enable sale of LED bulbs from designated places at a cost that is much less than the market price of Rs. 350-450 as replacements of Incandescent

Lamps (ICLs). The programme will reduce installed load by 505 MW as shown in Table-9.3 and will lead to annual energy consumption reduction of the state by more than 531 million KWh. The saved energy can be sold to better paying consumers like Industry and Commercial, which will provide additional revenue stream to the Distribution Companies (DISCOMS).

ICLs are extremely energy inefficient form of lighting. In contrast, LEDs consume a fraction of energy used by ICLs to provide better light

DELP KEY FEATURES

- LED at cost of Rs. 95-105 as against a market price of Rs 350-450
- Consumer take LED bulb at Rs. 10/-, Balance paid by DISCOM from energy savings or by consumer in 8-12 months installment.
- 3 years free replacement warrantee
- No impact on tariff
- Total upfront investments by EESL
- Benefits sharing approach

output. A single LED outlasts about 30 ICLs, and hence on life cycle cost effectiveness it fares better than ICL and CFL. However, the penetration of LEDs is very low because of their high first cost. To overcome this barrier, Energy Efficiency Services Limited (EESL), has been implementing programmes in several states to provide high quality LEDs as replacements to



ICLs and CFLs at a cost of Rs. 95-105 each to residential consumers.

EESL, procures the LEDs bulbs and provides to consumers at an initial rate of Rs. 10 each

(balance by DISCOM from energy savings or by consumer in installment) as against their market price of Rs. 350-450.

Table-9.3

No. of inefficient ICLs and CFLs to be replaced	95.4 Lakh
Total reduction of connected load in the state	505 MW
Total energy consumption reduction in the state	531 million KWh
Energy bill reduction for households per annum	Rs. 300-400
Cost reduction for DISCOMS per annum of peak power	Rs. 703 Crore
Upfront investment by State/ DISCOM	Nil
Total Program Investment by EESL/ Lighting companies*	Rs. 104 Crore
Recovery of cost	1. DISCOM Repayment 2. Consumer Repayment

Note: * Taxes such as service tax, sales tax, or any other taxes as applicable will be charged on actual basis which is not included in these amounts.

EESL will make / arrange the upfront investment estimated at Rs. 104 Crore for procurement, transportation, distribution of 95.4 Lakh LED to domestic households in the state.

In FY 2013-14, the commercial sector in the state of Bihar accounted for nearly 10% of the total energy consumption, i.e., 819 MU of which the targeted baseline for energy conservation is around 15% (i.e. 123 MU) in the organized sector in buildings having connected load greater than 100 kW or with contract demand of 120 kVA or more. This can help the state alleviate 123 MU, with an estimated investment requirement of Rs. 185 Crores. In addition to these, Bihar Government has already adopted Energy Conservation Building Code (ECBC) for new commercial buildings; the effective implementation of which will also result in significant energy savings.

The municipal sector accounted for 2% of the energy consumption, with Public Water Works (PWW) comprising 1% (59 MU) and Street Lighting (SL) constituting of around 1% (46 MU). Various energy audit studies have revealed a savings potential of 38 MU (14.5 MU from PWW + 23.5 MU from SL) through replacement

of inefficient drinking and sewage water pumping systems with energy efficient ones and conventional street lights with LEDs. Thus, it can be estimated with an investment of around Rs. 56 Cr. all the drinking and sewage water pumping systems can be made energy efficient and savings of around 38 MU annually can be achieved.

As per EESL's Street Lights Nation Programme, EESL replaces the conventional street lights with LEDs at its own costs (without any need for municipalities to invest) and the consequent reduction in energy and maintenance cost of the municipality is used to repay EESL over a period of time. The contracts that EESL enters into with Municipalities are typically of 7 years duration where it not only guarantees a minimum energy saving (of-typically 50%) but also provides free replacements and maintenance of lights at no additional cost to the municipality. The service model enables the municipalities to go in for state of the art street lights with no upfront capital cost and repayments to EESL are within the present level of expenditure. Thus there is no additional revenue expenditure required to be incurred by the municipality for change over to smart and energy efficient LED street lights.



Approach / Strategy

All the above interventions involve replacement of inefficient equipment / appliances with energy efficient ones for the agriculture, domestic, commercial buildings and municipalities. **These can be undertaken by the State Government, at no upfront cost by using the Energy Service Company (ESCO) model.** The model is based on the concept of promoting Performance Contract mode where the company invests in any project by entering into a contract agreement with the facility owner which is recovered through the savings accrued due to reduced electricity bills.

Action Points

The sector-wise Central Government and State Government actions envisaged to facilitate implementation of energy efficiency measures as mentioned above are detailed below:

Central Government (LED Bulbs)

- BEE may consider formulation of specification for LED bulbs and introducing star label scheme for LED bulbs.
- Energy Efficiency Services Limited (EESL) to take up project design and project development.

State Government

- Distribution Companies / Utilities may file DSM petition with Bihar Electricity Regulatory Commission for getting sanction of the proposed DSM plan.
- Ensure formulation of a detailed time line in consultation with concerned departments like Distribution Companies for implementation of energy efficiency measures in municipalities.
- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills.

Savings accrued due to reduced electricity bills.

Central Government (Commercial Buildings)

- BEE may provide technical support for effective enforcement of ECBC and promotion of ESCO based retrofitting works in Government buildings. BEE can provide support for capacity building of state department through establishment of ECBC cells for compliance of ECBC and retrofitting in Government buildings.

Energy Efficiency Services Limited (EESL) to take up project design and project development for retrofitting in commercial buildings.

State Government

- Government of Bihar has to adopt ECBC Directives for new commercial building design and mandated energy audit of existing commercial building once in a three-year period. Effective enforcement of ECBC compliance and mandating retrofitting in energy-audited buildings may result in reduction of electrical consumption from commercial sector. Government of Bihar may consider mandatory retrofitting in Government buildings with an objective of reduction of electricity bills, which state government is paying against electricity bill of these buildings. This would also demonstrate impact of ESCO based retrofitting projects to private building owners to adopt the same.
- As per the Planning Commission's projection; residential building are becoming one of the larger consumers of electricity in the country by 2030. BEE is introducing design guidelines for energy efficient multi storey residential apartments including in the composite and hot & dry climatic zone. State Government may mandate compliance of these guidelines through institutional framework in the state.
- Ensure formulation of a detailed time line in consultation with concerned departments like Public Works Department, for



implementation of energy efficiency measures in municipalities.

- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills.
- For residential buildings, the state could adopt the star labeling scheme for multi-storey residential apartment buildings, being prepared by BEE.

Central Government (LED Street Lights)

- BEE may consider formulation of specification for LED street lights and provide some financial assistance for one pilot project under MuDSM program.
- Energy Efficiency Services Limited (EESL) to take up project design and project development.

State Government

- Ensure formulation of a detailed time line in consultation with concerned departments

like Public Health & Engineering Department and Urban Development Department for implementation of energy efficiency measures in municipalities.

- Ensure establishment of a payment security mechanism so that the company making investments under the ESCO mode recovers the same through the savings accrued due to reduced electricity bills

In addition to the above, Bihar Electricity Regulatory Commission (RERC) may be requested to issue directives for creation of DSM funds by DISCOMs / Utilities of the State so that DSM activities can get extra emphasis. Such funds can be utilized for meeting incremental cost of efficiency improvement.

It may be noted that the cost and saving of energy figs have been worked out on a notional basis in absence of GoB's data on that. Therefore, these figs have not been considered in others tables for any calculation.



Financial Position

After unbundling of the erstwhile Bihar State Electricity Board (BSEB) in November'2012,

Bihar Discoms commenced their operations with a loss of Rs. 1642.41.00 Cr. in FY 2012-13, which increased to Rs. 2124.72 Cr. in FY 2013-14.

The details of Discom wise losses are as follows:

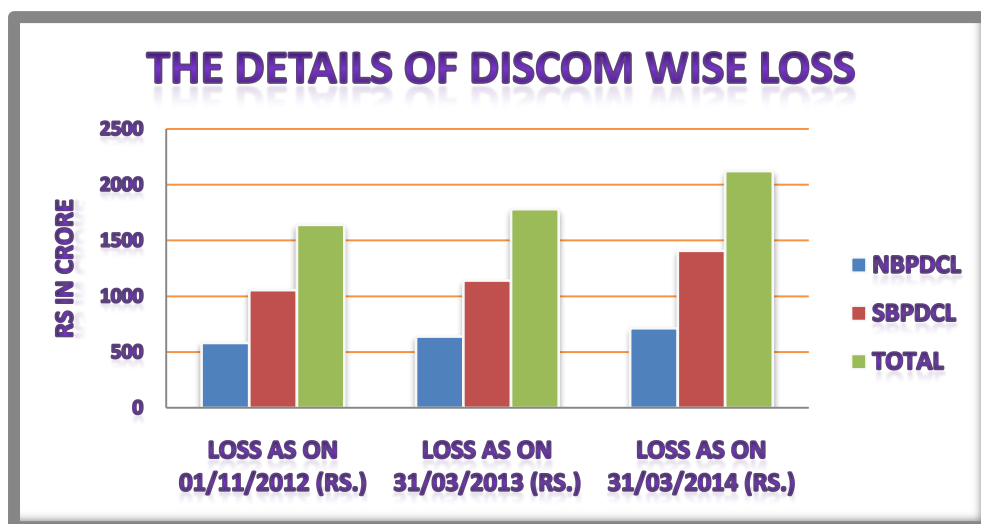


Table-10.1

(Rs. in Cr.)

Name of Discom	Loss as on 01/11/2012	Loss as on 31/03/2013	Loss as on 31/03/2014
NBPDCCL	585	640	715
SBPDCL	1058	1142	1410
Total	1643	1782	2125

The primary reason for increasing the loss level from FY 2012-13 to FY 2013-14 despite one tariff hike during this period @6.9% was that the additional revenue has been spent on higher quantum of power purchase at comparatively higher cost due to additional requirement and state generation projects did not come up to supply the additional requirement.

However during this period the following measures taken by the Discoms had helped Bihar Discoms to reduce their AT & C loss level substantially. These measures are as follows:

- 1) Collection of energy bills from consumers in time with segregated responsibilities against JEE, AEE & EEE of Supply Divisions, Sub-divisions and Sections.
- 2) Appointment of Rural Revenue Franchisee for meter reading, bill distribution and collection from rural consumers
- 3) Cent-percent billing by outsourcing billing activities to computer agency, etc. These measures are enumerated in previous chapters in greater details.

Financial Viability

Based on the road map discussed in the previous chapters, various scenarios have been prepared to visualize the profitability from operating the business as per the roadmap laid down and sensitivity thereof with changes in important input parameters like tariff and AT&C losses. However, the analysis has been restricted up to FY 2018-19 being the analysis framework for 24x7 PFA initiatives.

The following scenarios have been detailed in subsequent sections:

- At targeted growth rate as per "24x7 Power for All" Road Map (Base case).
- Same as (a) and tariff hikes for viability.
- Non-Adherence to AT & C Loss Reduction Trajectory and subsequent dependence on higher tariff hike.
- At targeted growth and loss reductions as per roadmap and all fundings including those under GOI schemes as per Debt equity ratio of 70:30.
- Keeping revenue grants growing in proportion to power purchase cost (In the ratio same as for FY 2013-14).

COMMON ASSUMPTIONS

- Average cost of power purchase considered as Rs. 4.11 per unit excluding intrastate transmission charges of 16paise/unit. The details are given as hereunder:

As per Audited Accounts 2013-14				
Sl. No.	Description	NBPDCL	SBPDCL	Total
1.	Energy purchased (MU)	5778.2	9266.4	15044.6
2.	Less Inter state transmission losses	129.1	206.6	335.8
3.	Net energy at state periphery (1-2)-A	5649.0	9059.8	14708.8
4.	Purchase cost (Cr. Rs.)	2272.0	3210.2	5482.1
5.	PGCIL Charges @43 Paise/ unit (Average Based on PGCIL Bills) on units purchased from outside state (5063.63 MU+7955.26 MU)			559.8
6.	Total purchase cost at State Periphery			6041.9
	Purch. Cost(Rs/kWh)			4.11
7.	Approved Total charges for Intrastate transmission for FY 2013-14(RE)-Cr Rs.			223.21
8.	Total cost at State Periphery-B			6265.1
9.	Total power purchase cost incl. Transmission cost Rs(kWh)-B/A			4.26

- No change in power purchase cost, as any change in the power purchase cost will be taken care by the Fuel and Power Purchase Cost Adjustment mechanism;
- Escalation towards O&M cost (excl employees cost) and administrative and General expenses has been considered @ 6% p.a. in line with average changes in WPI;

Month/ Year	WPI Indices	CPI Indices
Average 2012-13	168	215
Average 2013-14	178	236
Increase	5.95%	9.8%
Say	6.0%	10%

Source : eaindustry.gov.in

- Escalation towards Employee Cost considered @ 10% p.a. based on CPI Indices.
- Purchase Demand considered as forecasted in previous chapters
- Grant, Loan and Equity ratio has been considered as 75%:15%:10% (considering 15% additional grants as incentives for achieving the targets for GOI schemes i.e. DDUGJY/IPDS for which DPR(s) has been submitted. All other investments have been considered for funding as per Debt equity ratio 70:30.
- Interest computation has been done as per the existing loan profiles of Bihar Discoms. Interest on future long term loan has been calculated @ 12% p.a. and Short Term Loan @ 13% p.a. respectively.
- The existing average billing rate was Rs 4.56/kWh in FY 2013-14. From FY 2014-15, the average billing rate is considered based on wt. average of projected consumer profile based on the tariff order issued for the FY 2015-16.

Year	Rs/kWh
FY 2015-16	4.28
FY 2016-17	4.14
FY 2017-18	4.08
FY 2018-19	4.03

The ABR is reducing on Y-o-Y due to change in consumer mix.

The details of wt average billing rate is given in Annexure-XV.



9. Intrastate transmission charges considered as Rs. 0.16 per unit (Based on tariff order 2014-15).
10. Depreciation has been computed @ average 3.41% for existing assets and 5.28% for new incoming assets.
11. Escalation towards Meter Rent & Other Receipts has considered @ 4% p.a. as per CAGR of no. of electrified households and other income considered growing @ 10% p.a.
12. Revenue subsidies & Grants considered @ fixed as Rs 2656 Cr (Based on FY 2013-14 actual figs). However, a scenario -E has been given considering this grant growing @ 48% of Power Purchase cost (in line with previous periods) and declining in ratio of AT&C loss reduction trajectory of state. This reduction on an average works out to 4% every year.
13. Receivable against supply of power has been projected @ 2 months level.
14. Liabilities for purchase of power has been considered as 2 month of power purchase & transmission charges and have been taken as payable against purchase of power for FY thereafter.
15. Collection efficiency has been assumed as 100%.

Scenario A : Targeted Growth Rate as per 24x7 Road Map (Base case)

ASSUMPTIONS

- ✓ No tariff hike and change in power purchase cost.
- ✓ T&D losses, AT&C losses and Collection Efficiency as per targeted trajectory.



Table-10.2A

Financial Position of the Utilities (Scenario A)

(Rs. in Cr.)

BIHAR					
Description	Units	2015-16	2016-17	2017-18	2018-19
Total energy sold	MU	16134	24077	33050	43835
Energy share of DISCOM	MU	16134	24077	33050	43835
Energy Requirement at state periphery	MU	27398	38100	49215	61750
AT & C Losses	%	38.71%	34.26%	30.18%	26.23%
Collection efficiency	%	100.0%	100.0%	100.0%	100.0%
T&D Losses	%	41.1%	36.8%	32.8%	29.0%
Energy availability at state periphery	MU	27780	36684	47292	63299
Energy purchase (At state periphery)	MU	27780	38100	49215	63299
Power purchase cost(At state periphery)	Rs/Unit	4.11	4.11	4.11	4.11
Revenue Parameters					
Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Tariff increase	%	0%	0%	0%	0%
Effective Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Inter state sale of surplus energy	MU	382	0	0	1549
Expense					
Employee cost escalation	%	10%	10%	10%	10%
Repair & Maintenance escalation	%	6%	6%	6%	6%
Administrative & General escalation	%	6%	6%	6%	6%
Financial position of Utility		(In Crore Rs)			
		2015-16	2016-17	2017-18	2018-19
Net sales-Power		7058	9968	13485	18285
Other income like meter rent,theft recov etc		249	259	269	280
Subsidies		2656	2656	2656	2656
Other income		172	190	209	229
Total Income		10135	13072	16618	21450
Expenditure					
Transmission charges	@0.16/unit	438	610	787	988
Power Purchase(excl Transmission cost)		11418	15659	20227	26016
Employee cost		450	495	545	599
R & M Cost		108	115	122	129
Admn. & General expenses		69	73	77	82
Others		15	16	17	18
Total expenses		12498	16967	21775	27831
Gross Profit		-2363	-3895	-5157	-6382
Interest		491	561	1192	2028
Depreciation		308	438	534	567
Profit before tax		-3163	-4894	-6884	-8977
Tax		0	0	0	0
Net Profit after taxes		-3163	-4894	-6884	-8977

Table-10.2B

(Rs. in Cr.)

cash inflow	2015-16	2016-17	2017-18	2018-19
-Grants	1503	2961	1481	0
-Equity	255	448	224	0
-Long term loans	427	717	359	0
-Profit before Tax	-3163	-4894	-6884	-8977
-Depreciation	308	438	534	567
-Interest	491	561	1192	2028
-Bank borrowings for working capital	19	21	23	25
-Security deposit from consumers	42	47	51	57
Deposit for Electrification, Service Connection etc.	91	100	110	121
-Short term loans	0	4388	10718	19262
Total cash inflow	-26	4787	7808	13083
Cash outflow				
-capital expenditure	2185	4127	2064	0
-Loan repayments	0	94	94	200
-Repayment of Short term loans	0	0	4388	10718
-Interest payouts	491	561	622	635
-Increase in working capital	-181	497	70	138
-Interest on short term loans@13% p.a.	0	0	570	1393
-Tax	0	0	0	0
Total cash outflow	2495	5279	7808	13083
Net cash inflow	-2521	-492	0	0
Opening cash balance from previous year	3013	492	0	0
Closing cash balance	492	0	0	0

Based on the above figures, it is evident that if Bihar Discoms adhere to the target electrification and reduction of T&D losses, the financial losses would be there.

Scenario B: As per Scenario-A, and considering Tariff hikes for viability

Table-10.3A

Financial Position of the Utilities (Scenario B)

(Rs. In Cr.)

BIHAR					
Description	Units	2015-16	2016-17	2017-18	2018-19
Total energy sold	MU	16134	24077	33050	43835
Energy share of DISCOM	MU	16134	24077	33050	43835
Energy Requirement at state periphery	MU	27398	38100	49215	61750
AT & C Losses	%	38.71%	34.26%	30.18%	26.23%
Collection efficiency	%	100.0%	100.0%	100.0%	100.0%
T&D Losses	%	41.1%	36.8%	32.8%	29.0%
Energy availability at state periphery	MU	27780	36684	47292	63299
Energy purchase (At state periphery)	MU	27780	38100	49215	63299
Power purchase cost(At state periphery)	Rs/Unit	4.11	4.11	4.11	4.11
Revenue Parameters					
Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Tariff increase	%	10%	10%	10%	10%
Effective Average billing rate	Rs/Unit	4.71	5.01	5.43	5.90
Inter state sale of surplus energy	MU	382	0	0	1549
Expense					
Employee cost escalation	%	10%	10%	10%	10%
Repair & Maintenance escalation	%	6%	6%	6%	6%
Administrative & General escalation	%	6%	6%	6%	6%
Financial position of Utility		(In Crore Rs)			
		2015-16	2016-17	2017-18	2018-19
Net sales-Power		7749	12061	17948	26484
Other income like meter rent,theft recov etc		249	259	269	280
Subsidies		2656	2656	2656	2656
Other income		172	190	209	229
Total Income		10825	15165	21081	29649
Expenditure					
Transmission charges	@0.16/unit	438	610	787	988
Power Purchase(excl Transmission cost)		11418	15659	20227	26016
Employee cost		450	495	545	599
R & M Cost		108	115	122	129
Admn. & General expenses		69	73	77	82
Others		15	16	17	18
Total expenses		12498	16967	21775	27831
Gross Profit		-1673	-1802	-694	1817
Interest		491	561	876	1141
Depreciation		308	438	534	567
Profit before tax		-2472	-2801	-2104	108
Tax		0	0	0	0
Net Profit after taxes		-2472	-2801	-2104	108

Table-10.3B**(Rs. in Cr.)**

cash inflow	2015-16	2016-17	2017-18	2018-19
-Grants	1503	2961	1481	0
-Equity	255	448	224	0
-Long term loans	427	717	359	0
-Profit before Tax	-2472	-2801	-2104	108
-Depreciation	308	438	534	567
-Interest	491	561	876	1141
-Bank borrowings for working capital	19	21	23	25
-Security deposit from consumers	42	47	51	57
Deposit for Electrification, Service Connection etc.	91	100	110	121
-Short term loans	0	1953	3898	3979
Total cash inflow	665	4445	5452	5999
Cash outflow				
-capital expenditure	2185	4127	2064	0
-Loan repayments	0	94	94	200
-Repayment of Short term loans	0	0	1953	3898
-Interest payouts	491	561	622	635
-Increase in working capital	-66	731	465	760
-Interest on short term loans@13% p.a.	0	0	254	507
-Tax	0	0	0	0
Total cash outflow	2610	5512	5452	5999
Net cash inflow	-1945	-1068	0	0
Opening cash balance from previous year	3013	1068	0	0
Closing cash balance	1068	0	0	0

Tariff hikes to the tune of 10% from FY 2015-16 are required to sustain the financial implications of 24x7 PFA objectives by FY 2018-19.

Scenario C: Non-Adherence to Performance Parameters (Loss Reduction Trajectory) and subsequent dependence on Higher Tariff Hike.

ASSUMPTIONS

- ✓ T & D losses higher by 2% than the targeted trajectory.
- ✓ Power purchase cost constant for all the years.



Table-10.4A

Financial Position of the Utility (Scenario C)

(Rs. in Cr.)

BIHAR					
Description	Units	2015-16	2016-17	2017-18	2018-19
Total energy sold	MU	16134	24077	33050	43835
Energy share of DISCOM	MU	16134	24077	33050	43835
Energy Requirement at state periphery	MU	28342	39320	50696	63506
Collection efficiency	%	100.0%	100.0%	100.0%	100.0%
T&D Losses	%	43.1%	38.8%	34.8%	31.0%
Energy availability at state periphery	MU	27780	36684	47292	63299
Energy purchase (At state periphery)	MU	28342	39320	50696	63506
Power purchase cost(At state periphery)	Rs/Unit	4.11	4.11	4.11	4.11
Revenue Parameters					
Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Tariff increase	%	0%	0%	0%	0%
Effective Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Inter state sale of surplus energy	MU	0	0	0	0
Expense					
Employee cost escalation	%	10%	10%	10%	10%
Repair & Maintenance escalation	%	6%	6%	6%	6%
Administrative & General escalation	%	6%	6%	6%	6%
Financial position of Utility		(In Crore Rs)			
		2015-16	2016-17	2017-18	2018-19
Net sales-Power		6905	9968	13485	17666
Other income like meter rent,theft recov etc		249	259	269	280
Subsidies		2656	2656	2656	2656
Other income		172	190	209	229
Total Income		9982	13072	16618	20830
Expenditure					
Transmission charges	@0.16/unit	453	629	811	1016
Power Purchase(excl Transmission cost)		11648	16161	20836	26101
Employee cost		450	495	545	599
R & M Cost		108	115	122	129
Admn. & General expenses		69	73	77	82
Others		15	16	17	18
Total expenses		12744	17488	22407	27944
Gross Profit		-2762	-4416	-5790	-7114
Interest		491	561	1304	2234
Depreciation		308	438	534	567
Profit before tax		-3561	-5416	-7628	-9915
Tax		0	0	0	0
Net Profit after taxes		-3561	-5416	-7628	-9915

Table-10.4B**(Rs. in Cr.)**

cash inflow	2015-16	2016-17	2017-18	2018-19
-Grants	1503	2961	1481	0
-Equity	255	448	224	0
-Long term loans	427	717	359	0
-Profit before Tax	-3561	-5416	-7628	-9915
-Depreciation	308	438	534	567
-Interest	491	561	1304	2234
-Bank borrowings for working capital	19	21	23	25
-Security deposit from consumers	42	47	51	57
Deposit for Electrification, Service Connection etc.	91	100	110	121
-Short term loans	0	5242	12302	21746
Total cash inflow	-425	5120	8760	14835
Cash outflow				
-capital expenditure	2185	4127	2064	0
-Loan repayments	0	94	94	200
-Repayment of Short term loans	0	0	5242	12302
-Interest payouts	491	561	622	635
-Increase in working capital	-248	498	56	99
-Interest on short term loans@13% p.a.	0	0	681	1599
-Tax	0	0	0	0
Total cash outflow	2428	5280	8760	14835
Net cash inflow	-2853	-160	0	0
Opening cash balance from previous year	3013	160	0	0
Closing cash balance	160	0	0	0

The scenario exhibits that if Discoms fail to adhere to the committed AT& C loss reduction trajectory by 2%, then tariff hikes to the tune of 12% in FY 2015-16, 13% in FY 2016-17, 14% in

FY 2017-18 and modest 4% in FY 2018-19 may be needed to have financial sustainability by FY 2018-19.

SCENARIO-D : Viability at Targeted Growth Rate as per 24x7 Road Map plus all schemes of GOI also financed in Debt equity ratio of 70:30

Table-10.5A

Financial Position of the Utility (Scenario D)

(Rs. in Cr.)

BIHAR					
Description	Units	2015-16	2016-17	2017-18	2018-19
Total energy sold	MU	16134	24077	33050	43835
Energy share of DISCOM	MU	16134	24077	33050	43835
Energy Requirement at state periphery	MU	27398	38100	49215	61750
AT & C Losses	%	38.71%	34.26%	30.18%	26.23%
Collection efficiency	%	100.0%	100.0%	100.0%	100.0%
T&D Losses	%	41.1%	36.8%	32.8%	29.0%
Energy availability at state periphery	MU	27780	36684	47292	63299
Energy purchase (At state periphery)	MU	27780	38100	49215	63299
Power purchase cost(At state periphery)	Rs/Unit	4.11	4.11	4.11	4.11
Revenue Parameters					
Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Tariff increase	%	0%	0%	0%	0%
Effective Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Inter state sale of surplus energy	MU	382	0	0	1549
Expense					
Employee cost escalation	%	10%	10%	10%	10%
Repair & Maintenance escalation	%	6%	6%	6%	6%
Administrative & General escalation	%	6%	6%	6%	6%
Financial position of Utility		(In Crore Rs)			
		2015-16	2016-17	2017-18	2018-19
Net sales-Power		7058	9968	13485	18285
Other income like meter rent,theft recov etc		249	259	269	280
Subsidies		2656	2656	2656	2656
Other income		172	190	209	229
Total Income		10135	13072	16618	21450
Expenditure					
Transmission charges	@0.16/unit	438	610	787	988
Power Purchase(excl Transmission cost)		11418	15659	20227	26016
Employee cost		450	495	545	599
R & M Cost		108	115	122	129
Admn. & General expenses		69	73	77	82
Others		15	16	17	18
Total expenses		12498	16967	21775	27831
Gross Profit		-2363	-3895	-5157	-6382
Interest		557	824	1693	2654
Depreciation		383	631	821	881
Profit before tax		-3304	-5350	-7672	-9916
Tax		0	0	0	0
Net Profit after taxes		-3304	-5350	-7672	-9916

Table-10.5B**(Rs. in Cr.)**

cash inflow	2015-16	2016-17	2017-18	2018-19
-Grants	0	0	0	0
-Equity	655	1238	619	0
-Long term loans	1529	2889	1445	0
-Profit before Tax	-3304	-5350	-7672	-9916
-Depreciation	383	631	821	881
-Interest	557	824	1693	2654
-Bank borrowings for working capital	19	21	23	25
-Security deposit from consumers	42	47	51	57
Deposit for Electrification, Service Connection etc.	91	100	110	121
-Short term loans	0	4716	11547	20809
Total cash inflow	-26	5115	8638	14630
Cash outflow				
-capital expenditure	2185	4127	2064	0
-Loan repayments	0	94	94	292
-Repayment of Short term loans	0	0	4716	11547
-Interest payouts	557	824	1080	1152
-Increase in working capital	-181	497	70	138
-Interest on short term loans@13% p.a.	0	0	613	1501
-Tax	0	0	0	0
Total cash outflow	2561	5541	8638	14630
Net cash inflow	-2587	-426	0	0
Opening cash balance from previous year	3013	426	0	0
Closing cash balance	426	0	0	0

The scenario exhibits that if Discoms do not get grant support for GOI schemes and take fundings in Debt equity ratio of 70:30, then tariff hikes to the tune of 10% in FY 2015-16, 11% in FY 2016-17, 11% in FY 2017-18 and modest 12% in FY 2018-19 may be needed to have financial sustainability.

SCENARIO-E : Viability at Targeted Growth Rate as per 24x7 Road Map with Revenue grant growing in previous years proportion to power purchase cost and adjusted for reduction pro rata to AT&C loss trajectory by FY 2018-19.

Financial Position of the Utility (Scenario -E)

Table-10.6A

(Rs. in Cr.)

BIHAR					
Description	Units	2015-16	2016-17	2017-18	2018-19
Total energy sold	MU	16134	24077	33050	43835
Energy share of DISCOM	MU	16134	24077	33050	43835
Energy Requirement at state periphery	MU	27398	38100	49215	61750
AT & C Losses	%	38.71%	34.26%	30.18%	26.23%
Collection efficiency	%	100.0%	100.0%	100.0%	100.0%
T&D Losses	%	41.1%	36.8%	32.8%	29.0%
Energy availability at state periphery	MU	27780	36684	47292	63299
Energy purchase (At state periphery)	MU	27780	38100	49215	63299
Power purchase cost(At state periphery)	Rs/Unit	4.11	4.11	4.11	4.11
Revenue Parameters					
Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Tariff increase	%	0%	0%	0%	0%
Effective Average billing rate	Rs/Unit	4.28	4.14	4.08	4.03
Inter state sale of surplus energy	MU	382	0	0	1549
Expense					
Employee cost escalation	%	10%	10%	10%	10%
Repair & Maintenance escalation	%	6%	6%	6%	6%
Administrative & General escalation	%	6%	6%	6%	6%
Financial position of Utility		(In Crore Rs)			
		2015-16	2016-17	2017-18	2018-19
Net sales-Power		7058	9968	13485	18285
Other income like meter rent,theft recov etc		249	259	269	280
Subsidies		4687	5801	6685	7557
Other income		172	190	209	229
Total Income		12166	16218	20647	26352
Expenditure					
Transmission charges	@0.16/unit	438	610	787	988
Power Purchase(excl Transmission cost)		11418	15659	20227	26016
Employee cost		450	495	545	599
R & M Cost		108	115	122	129
Admn. & General expenses		69	73	77	82
Others		15	16	17	18
Total expenses		12498	16967	21775	27831
Gross Profit		-332	-749	-1128	-1480
Interest		491	561	622	635
Depreciation		308	438	534	567
Profit before tax		-1131	-1749	-2284	-2682
Tax		0	0	0	0
Net Profit after taxes		-1131	-1749	-2284	-2682

Table-10.6B**(Rs. in Cr.)**

cash inflow	2015-16	2016-17	2017-18	2018-19
-Grants	1503	2961	1481	0
-Equity	255	448	224	0
-Long term loans	427	717	359	0
-Profit before Tax	-1131	-1749	-2284	-2682
-Depreciation	308	438	534	567
-Interest	491	561	622	635
-Bank borrowings for working capital	19	21	23	25
-Security deposit from consumers	42	47	51	57
Deposit for Electrification, Service Connection etc.	91	100	110	121
-Short term loans	0	0	0	2140
Total cash inflow	2005	3545	1120	862
Cash outflow				
-capital expenditure	2185	4127	2064	0
-Loan repayments	0	94	94	200
-Repayment of Short term loans	0	0	0	0
-Interest payouts	491	561	622	635
-Increase in working capital	-181	497	70	138
-Interest on short term loans@13% p.a.	0	0	0	0
-Tax	0	0	0	0
Total cash outflow	2495	5279	2850	972
Net cash inflow	-490	-1734	-1730	-110
Opening cash balance from previous year	4064	3574	1840	110
Closing cash balance	3574	1840	110	0

The scenario exhibits that if Discoms continue getting growing revenue grant support in the same proportion of power purchase cost as in FY 2013-14 (After adjustments in accordance with AT&C losses reduction trajectory), then modest tariff hikes to the tune of 4% in FY 2015-16, 5% in FY 2016-17, 5% in FY 2017-18 and 1% in FY 2018-19 may be needed to have financial sustainability in the year FY 2018-19.

Sensitivity Analysis & Results

The additional investment to the extent required under state plans and share thereof in new schemes would have an impact on the tariff. The same has been worked out and presented in Annexure- XVI.

ACTION POINTS -DISCOMS/ STATE GOVT

1. Regular tariff filing and rolling over of tariff orders ;
2. Regular pass through of fuel cost adjustment;
3. To take necessary measures for reduction in AT&C losses as per projections
4. Timely preparation and finalization of annual accounts
5. Timely release of subsidy to the Discoms.
6. Provide support for Equity/Loans for capital expenditure.



Communication

Successful implementation of 24X7 Power Supply Scheme requires clear communication among all the stakeholders across the value chain, including the consumers. In order to avoid potential roadblocks in implementation due to poor communication and flow of information, the following table lists the primary responsibility of each stakeholder and the corresponding method in which it will be carried out.

A centralized corporate communication team can be formed at headquarters of the DISCOM

for looking at activities of overall communication strategy.

The financial situation in Bihar makes it imperative to raise tariffs while other initiatives including 24X7 supply are implemented. Such tariff increases would inevitably impact consumers and meet with resistance. To address this, the utilities would clearly communicate their plans on implementing the reliable 24X7 supply scheme along with the other reliability and efficiency improvement measures that they are implementing. A high level of involvement of the Government of Bihar will also be required.

Table-11.1

Proposed communication responsibilities

Communication Objective	Responsibility	Frequency
“Power for all” - Roll Out Plan	Energy Secretary	Quarterly
Power Supply Position	CMD Transco	Daily
Energy Savings & Conservation	CEO, State Energy Efficiency Deptt.	Monthly
Planned Outages & Disruption	CMD, Discom	Daily
Real time feeder-wise Information	CMD, Discom	Daily
Status update on Deliverables	Secretary, Energy	Quarterly
Renewable Power	CEO, State Renewable Energy Deptt.	Quarterly
Generation- Projects, PLF & Fuel	MD, State Genco	Monthly
Transmission Projects – Physical Progress and Achievements	CMD, Transco	Monthly
Distribution – Progress ,Achievements, Losses, Consumer Initiatives etc.	CMD, Discom	Monthly

INFORMATION TECHNOLOGY INITIATIVES

The need to adopt IT in every sphere of utility operation is pervasive. Power is a complex product that must be consumed on a real time basis. The overall value involved in the process is very high. Even more importantly it touches all citizens. Yet, the information systems that drive the operations of the sector are generally very basic and information transparency and consistency is poor. While sporadic efforts have been made in the past to improve this, quantum changes are required to increase IT adoption in all spheres of power sector operation.

In Bihar, IT adoption on a massive scale will be pursued in the following areas:

- At the corporate level, the operations need to be integrated through implementation of Enterprise Resource Planning Systems (ERP). This would cover critical aspects like Finance and Accounts, Asset Management, Inventory Management, Human Resource Management, Project Management, Personal information System (PIS). ERP will help in timely capitalization of asset, deriving better business value of investment etc.

- At the commercial operations level there is a need to comprehensively implement Customer Management Systems (CMS) for undertaking customer related processes including billing and collections, customer complaint management, new connection provision etc.
 - Centralized Information & Monitoring System for operational, enforcement & litigation, vigilance activities and analysis.
 - Power management would require the institution of technically capable controlling facilities equipped with tools like SCADA and Distribution Management Systems (DMS) that allow for adequate visualization of the networks and response capabilities. Technologies for sub-station automation, GIS, SCADA, DMS, OMS, etc., shall be adopted. For the urban areas SCADA is quite useful for improving reliability and reduction of network downtime.
 - Regional Distribution Control Centers (RDCC) within the State are proposed to be established. These will initially cater to the principal load centers, but would thereafter be expanded to all load centers of the state. This will be a key initiative, not only for effectively managing 24X7 supply, but also thereafter for other functions like forecasting.
 - Renewable Energy Management centers shall be established and equipped with adequate capabilities through financing availed from KfW and ADB.
 - Power procurement optimization tools will be implemented to reduce the power procurement costs and improve supply reliability. This shall be achieved through the institution of technically robust forecasting, scheduling and dispatch (Unit Commitment) and settlement tools. The tools shall be used to ensure that the control room operators have the ability to take real time decisions to ensure cost reduction.
 - Project monitoring tools shall be incorporated in the PMU to ensure that progress on the investments in the state are monitored rigorously and bottlenecks identified.
 - Standards of service specified under Section 57 of the EA 2003 shall be monitored. The utilities shall use IT tools to gather the information with regards to service standards with minimal manual intervention to ensure transparency and credibility.
- The above need to be implemented urgently, and also need to be integrated with each other to ensure that the systems are inter-operable (i.e., they can talk to each other). For this the utilities shall evolve a detailed IT plan to implement the above in a well-coordinated manner.

Institutional Arrangement

A strong monitoring framework is essential to ensure the success of the “Power for all” scheme. The following structure is being proposed to undertake regular monitoring of the progress of all initiatives being under-taken in this scheme.

- **Government of India (GOI) Level Committee:** It is proposed that this committee will review the overall progress of the scheme on a quarterly basis and provide necessary support to ensure a coordinated response from the Central Government. - where necessary. The committee may be constituted with the following members – PFC, REC, CEA, SECI, EESL, Ministry of Power Ministry of Coal, and MNRE.
- **State Government Level Committee:** It is proposed that a State level committee headed by the Chief Secretary will be formed to review the progress of the scheme on a quarterly basis. This committee will monitor the progress of the works undertaken as part of the scheme and issue



directions to enable faster execution. This committee will be constituted with the following Principal Secretaries/ Secretaries of the Power, Finance, Urban Development, Agriculture and other relevant departments along with the CMD/Chairman/MD of BSPHCL, BSPTCL, NBPDC, SBPDCL and BREDA.

- **Department Level Committee:** It is proposed that the Department level committee headed by the Energy Secretary will be formed and shall undertake steps required to ensure the projects are progressing as per the action plan. This 9999 committee will undertake progress reviews on a monthly basis. The committee will be constituted with the following members –Secretary (Energy), CMD BSPHCL, MD of Discoms and BREDA.
- **District Level Committee** – It is proposed to constitute a district level committee headed by the District Collector to take action that is necessary to ensure the projects are completed in a timely manner and address any issues pertaining to land or other relevant approvals. The committee will be constituted with the following members – District Collector, S.E BSPTCL, S.E Discom and BREDA representatives.
- **Project Monitoring Unit (PMU)** – A project monitoring unit shall be set to up for monitoring the progress of the works being undertaken under this scheme. The PMU will operate under the Secretary, Energy and shall be operated by an external independent agency. The PMU shall be responsible for undertaking coordination, preparing the action plans and monitoring progress of all works under the “Power for all” scheme. The PMU would also help facilitate in tracking the action steps and providing feedback to the various committee that are proposed to be set up under the scheme. Government of India shall provide grants for the PMU operations.

The committees that are being proposed above are required to be set up at the earliest to kick start the whole scheme. It is important that the committees keep meeting on a regular basis as per the frequency/ timelines mentioned above – to ensure that the objectives set out under the “Power for all” scheme are achieved.

Capacity Building

With the increase of IT in the Generation, Transmission & Distribution system and to meet the expectations of 24 X 7 power supply for the consumers in the state, it is important to focus on capacity building of the employees for enhancement of technical know-how for latest technological developments and to increase the consumer satisfaction. The capacity building may also include consumer grievance system, awareness regarding importance of working with safety, outage management system, demand side management etc. It is also imperative to state that for serving the consumers in a different way change of mindset of the employees would be required. It is critical that Change Management initiatives are rolled out and institutionalized throughout the DISCOM for achieving better results. The details of the present employee in the Bihar Discoms are as under:

s

Employee base

No. of Technical Employees in GENCO + DISCOMs – 3628 & No. of Non-Technical Employees in GENCO + DISCOMs – 5510.

In view of the importance of the training on new technologies, there is a requirement for development and implementation of Human Resource training programme so as to realize the dream of 24 X 7 power supply system in the state in its true sense.

There is already a provision for Demand Side Management (DMS) trainings under various programmes of Bureau of energy Efficiency (BEE) and the same should be implemented to achieve the goal of 24 X 7 power for goal. The



training for the class C & D employees are also being provided under RAPDRP Part- C scheme.

The state has proposed several initiatives like One regional residential training institutes at Darbhanga area Board office premises for technical/non technical workmen with investment of RS 4.00 Crores. One regional residential training institute at Munger for technical/non technical workmen with investment of Rs 4.00 Crores. One residential training Institutes of Patna for Training of Technical/non-technical officers Rs5.50Crores.

Following training programmes are proposed to be implemented for Discoms:

(i) Training of Electrical Engineer

- Up to date technologies.
- Updating of technical skills.
- Training of managerial skills.
- Training of Accountancy.

- Management training.
- Office management.
- Operation & maintenance.
- Store & Purchase
- Training of newly recruited technical/non-technical officers.
- Civil.

(ii) Training of Non-technical officers –

- Accountancy.
- Office management.
- Managerial Skills.
- Store & Purchase.

(iii) Training of technical workmen–

- Updation of technical skills.
- Operation & maintenance
- Training of Non-technical workmen
- Office functionary
- Accountancy



CHAPTER – 12 : YEAR WISE ROLL OUT PLAN

YEAR WISE ROLL OUT PLAN						
Deliverables						
Power for All – Roll Out Plan	Units	FY2015-16	FY2016-17	FY2017-18	FY2018-19	Total
GENERATION						
State Sector	MW	470	283	-	120	873
Central Sector	MW	429.07	503.33	1089.70	161.2	2183.3
Private Sector/IPP/UMPP	MW	-	-	-	500	500
Joint Venture	MW	314	50	916	1373	2653
NCE/RNES	MW	53	109	150	-	312
Total		1266.07	945.33	2155.7	2154.2	6521.3
TRANSMISSION						
Inter State						
Grid Substation (New/ Augmentation)						
765/400 KV	Nos/MVA		1/1500			1/1500
400/220 KV	Nos/MVA	2/1500	4/2110			6/3610
400/132 KV	Nos/MVA		1/400			1/400
220/132 KV	Nos/MVA	1/160	1/60			2/220
Lines						
765 KV	ckt km					
400 KV	ckt km		540	204		744
Intra State						
Grid Substation (New/ Augmentation)						
400/220 KV	Nos/MVA			3/3000		3/3000
220/132 KV	Nos/MVA	7/3480	7/2240	4/1600 +500*	3200*	18/11020*
132/33 KV	Nos/MVA	39/5360	7/750	3/400+ 500*	3200*	49/10210*
Lines						
400 KV	ckt km			210		210
220 KV	ckt km	1611	860	290		2761



YEAR WISE ROLL OUT PLAN						
Deliverables						
Power for All - Roll Out Plan	Units	FY2015-16	FY2016-17	FY2017-18	FY2018-19	Total
132 KV	ckt km	2444.83	550	190		3184.83
DISTRIBUTION						
AT&C Losses	%	42.63%	38.13%	34.00%	30.00%	
33/11 kV S/s	Nos	145	189	230		564
	MVA	2780	2803	2868		8451
11/0.415 New DTR	Nos	51790	49081	48668		149539
	MVA	3457	3236	2024		8717
No. and length of 33 kV lines	No./ km	145/3350	166/4152	175/2834		486/10336
No. and length of 11 kV lines	No./ km	580/36491	914/67099	1279/22852		2773/126442
Length of LT lines	km	45979	33654	17109		96742
Electrification of UE villages	Nos.	800	800	1301		2901
Electrification of UE Habitations	Nos.	15000	15000	15936		45936
No of households to be electrified	Nos.	4321130	4331187	4205104	4227382	17084803
RENEWABLE ENERGY						
Solar Capacity Addition	MW	48	100	150*	-	148
Bagasse	MW	88	6	-	-	94
Bio Mass	MW	3	-	-	-	3
Bio Mass solar PV Hybrid	MW	-	3	-	-	3
Solar rooftop grid-connected	MW	-	-	-	1.0	1
Solar off-grid						
Solar power plant	Nos/kW	2/100, 2/50, 1/6000	2/100, 2/50, 534/10	2/100, 2/50	2/100, 2/50	-
Solar pump systems	MW/Nos	2.2/1500 & 1.5/1800	1.5/600	1.5/600	1.5/600	-
Solar Home Lighting	Nos	1500	1800	1800	1800	6900
Solar Lantern for BPL and SC&ST	Nos	5000	5000	5000	5000	20000
Off grid solar PV system	Nos/Wp	-	-	-	-	-
* Submitted for GoB approval						



CHAPTER – 13 : SECTOR WISE INVESTMENT PLAN & FUND REQUIREMENT

SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT									
(Rs in Cr.)									
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
Generation	Under Construction (2870 MW)		STATE (2x250 MW)	300	64	-	-	364	Funding by PFC + HUDCO + CBI + Canada Bank
			JOINT VENTURE (2x195 MW + 3x660 MW)	820	600	358	-	1778	Share of State: KUBNL, 2X195 MW-3515 (Equity) 35% share of 30% equity funding & NABINAGAR, 3X660 MW-22698 (Equity) 50% share of 30% equity fund
	Projects Under R&M (220 MW)		STATE (2x110 MW)	81	-	-	-	81	Under RSVY / BRGF
	Total generation (3090 MW)			1201	664	358	-	2223	
Transmission	Intra State								
		Phase-II, Extension Scheme	GSS Augmentation & lines	236.27				236.27	
	BRGF Schemes	Phase-III, Part-I Scheme	New GSS, Augmentation & lines	685.01				685.01	

SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT									
									(Rs in Cr.)
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
		Phase-III, Part-II, Kishanganj Project	New GSS & lines	178.05				178.05	
		N-1 Compliance Scheme	GSS Augmentation & lines	146.92				146.92	
	State Plan	Replacement of old outlived 20 nos. of 20 MVA Power Transformer by 50 MVA Power Transformer with associated	GSS Augmentation	55	55			110	
	State Plan	Bihta 220/132/33 KV GSS, 2x160 + 2x 50 MVA with associated lines.	New GSS & lines	40	59.65			99.65	
		Construction of 14 nos. of 132/33 KV Grid Sub-Station along with associated transmission lines in 14 Revenue Sub-Division Scheme	New GSS & lines	194.57	361.33			555.9	

SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT

(Rs in Cr.)									
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
		Construction of 17 nos. of 132/33 KV Grid Sub-Station along with associated transmission lines in 17 Revenue Sub-Division Scheme	New GSS & lines	234.05	434.67			668.72	
	ADB Schemes	Construction of 3 nos. of Grid Sub-Stations along with associated transmission lines	New GSS & lines	82.6				82.6	
	JV Schemes to be implemented by BGCL (JV of BSPHCL & PGCIL)	Phase-IV, Part-I Scheme	New GSS & lines	1250	90			1340	
		Phase-IV, Part-II Scheme	New GSS & Transmission lines	425	1593.75	166.25		2185	
	State Plan New proposals	New Kagharia GSS 220/132/33 KV(2X160+2X50 MVA) with associated lines.	New GSS & lines	10.6	74.2	21.2		106	

SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT									
(Rs in Cr.)									
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
		Generation Linked Scheme:- Proposed - Power evacuation system from Lakhisarai, Pirpainti and TPS by One GSS - Kajara Pool & associated lines from all Three TPS.	New GSS & lines					0	Linked with power plant implementation (Estimated cost 1600 Cr.)
		Transmission capacity enhancement by 500 MVA to cater 2017-18 peak demand.				320	480	800	Preliminary assessed transmission capacity.
		Transmission capacity enhancement by 3200 MVA to cater 2018-19 peak demand.				2048	3072	5120	Preliminary assessed transmission capacity.
		Intra state Total		3538.07	2668.6	2555.45	3552	12314.12	
	INTER STATE	On-going ISTS projects	New GSS & Transmission lines	-	-	-	-	0	

SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT									
(Rs in Cr.)									
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
			Augmentation on existing sub-stations	-	-	-	-	0	
		On-going Tariff Based Competitive Bidding (TBCB) Schemes		-	650	-	-	650	
		Planned Inter-State Transmission system		-	-	-	-	0	
		Inter state Total		0	650	0	0	650	
Total Transmission				3538.07	3318.6	2555.45	3552	12964.12	
Distribution	State Plan								
				121	-	-	-	121	No central assistance required
Proposed Schemes	IPDS								
				607	1213	607	-	2427	New schemes by GOI which are being finalized by MOP as per norms of the schemes/policies
	DDUGJY								
				1457	2914	1457	-	5828	New schemes by GOI which are being finalized by



SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT									
(Rs in Cr.)									
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
									MOP as per norms of the schemes/policies
GoI Schemes already Sanctioned and under implementation									
GoI Schemes already Sanctioned and under implementation(in Crores)	RGVY 11 th plan phase-II			2489	-	-	-	2489	Sanctioned
	RGVY 12 th plan			2581	2581	-	-	5162	Sanctioned Rs 5892.28 Crores and Rs 1088.27 Crores disbursed
	ADB			47				47	
	RAPDRP-Part-B			917		-	-	917	Sanctioned
	Special Plan(BRGF) Phase I, Phase II & Phase II Part C			1901	2101	75	-	4077	Sanctioned Rs 4980.56 Crores and Rs 1422.41 Crores disbursed
	RAPDRP-A(IT)			178				178	Sanctioned
	RAPDRP-A (SCADA)			13.5	1.5	1.5	0.5	17	Sanctioned Rs 18.5 Crores and Rs 1.5 Crores disbursed
	Total sanctioned GOI schemes			8126.5	4683.5	76.5	0.5	12887	

SECTOR WISE INVESTMENT PLAN AND FUND REQUIREMENT									
(Rs in Cr.)									
			Sector	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Total	Remarks
Total Distribution				10311.5	8810.5	2140.5	0.5	21263	
Renewable Energy	Solar PV (Competitive Bidding)			304	800	1200	-	2304	
	Solar PV under JNNSM Phase - II			55	-	-	-	55	
	Bagasse			484	33	-	-	517	
	Bio Mass			17	-	-	-	17	
Total Renewable				860	833	1200	-	2893	
GRAND TOTAL				15910.57	13626.1	6253.95	3552.5	39343.12	



GoB Data

Category-wise Growth in consumers

		Year-wise figures from FY 2009-10 to FY 2014-15					
		FY 2009-10	FY 2010-11	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15
(i)	Domestic	2116648	2517875	2996481	3773077	4698332	5334722
(ii)	Commercial	190089	195145	216530	279879	301634	Others= 379088
(iii)	Industrial (LT)	18917	17144	16181	18816	19280	
(iv)	Industrial (HT)	929	915	1179	1317	1551	
(v)	Public Lighting	379	306	355	399	419	
(vi)	Traction	15	15	17	17	19	
(vii)	Agriculture	59121	54704	57615	57838	53332	50235
(viii)	Public Water Works & Sewage Pumping	768	923	970	1098	1236	Incl. in others
	Total	2386866	2787027	3289328	4132441	5075803	5764045

GoB Data

Census 2011 Data of Households in Bihar

Description	Rural		Urban		Total	
	No.	(%)	No.	(%)	No.	(%)
No. of Households in Bihar	1,69,26,968	89.4	20,13,671	10.6	1,89,40,639	100
No. of Electrified Households	17,54,673	56.6	13,43,762	43.4	30,98,435	16.4
Balance Un-electrified Households	1,51,72,295	95.8	6,69,909	4.2	1,58,42,204	83.6

(Source: Census of India-2011)

Detailed Calculation of energy Demand in the State of Bihar up to FY 2018-19

Sl. No.	Particulars→ ↓		Years			
			FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
A	DEMAND PROJECTIONS FOR ELECTRIFIED HOUSEHOLDS					
1	Consumption of Rural Electrified Households					
2	Consumption (units per day per household)	Units	1.6	1.9	2.2	2.5
3	Annual Energy Requirement for existing electrified Rural Household	MUs	1,903	2,260	2,617	2,973
4	Consumption of Urban Electrified Households					
5	Consumption (units per day per household)	Units	5.0	6.0	6.5	7.0
6	Annual Energy Requirement for existing urban electrified Household	MUs	3,789	4,547	4,926	5,305
7	Total Annual Energy Requirement for existing electrified households(A3+A6)	MUs	5,692	6,807	7,542	8,278
B	ADDITIONAL ENERGY REQUIREMENTS FOR ELECTRIFIED DOMESTIC CONSUMERS					
1	Additional Energy Required for Electrified Households (Annual projection (-) current Energy available MUs)	MUs	759	1,874	2,609	3,345
C	ELECTRIFICATION OF UN-ELECTRIFIED HOUSEHOLDS (per year)					
	URBAN					
1	Un-electrified Household as on 31.03.2015	Nos.	52%	48%		
2	Electrification of Un-electrified Household	Nos.	158,513	147,664	-	-
3	Cumulative Annual Energy Requirement for Electrification of Un-electrified Household	MUs	289	671	726	782
	RURAL					
4	Un-electrified Households	Nos.				
5	Targeted Electrification of Un-electrified		25%	25%	25%	25%
6	Electrification of Un-electrified Household	Nos.	3,500,000	3,500,000	3,500,000	3,500,000
7	Cumulative Annual Energy Requirement for Electrification of Un-electrified Household	MUs	2,044	4,855	8,432	12,775
8	Total households electrified out of Un-electrified	Nos.	3,658,513	3,647,664	3,500,000	3,500,000
9	Annual Energy Requirement for Electrification of Un-electrified Household	MUs	2,333	5,525	9,158	13,557
D	ELECTRIFICATION OF NEWLY CONSTRUCTED HOUSEHOLDS (per year)					
	URBAN					
1	Total Household - Urban (nos.) 2015					

Sl. No.	Particulars→ ↓		Years			
			FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
	Yearly Increase in Urban H/H	Nos	102,284	106,676	111,256	116,032
2	Yearly cumulative Increase in Urban H/H as per GoB	Nos.	102,284	208,960	320,216	436,248
3	Cumulative Annual Energy Requirement (MUs) for newly constructed Household - Urban	MUs	187	458	760	1,115
	RURAL					
4	Total Household Rural 2015					
	Yearly Increase in Rural H/H as per GOR	Nos.	560,333	576,847	593,848	611,350
5	Yearly cummulative Increase in Rural H/H as per GOB		560,333	1,137,180	1,731,028	2,342,378
6	Annual Energy Requirement for newly constructed Household	MUs	327	789	1,390	2,137
7	Total newly constructed households	Nos.	662,618	683,523	705,104	727,382
8	Cumulative Annual Energy Requirement for newly constructed Household	MUs	514	1,246	2,150	3,252
E	ANNUAL ENERGY REQUIREMENTS					
1	Total Additional Annual Energy Requirement - Domestic Consumer	MUs	3,606	8,645	13,917	20,154
2	Current Energy Available - Total	MUs	10,322	10,322	10,322	10,322
3	Current Energy Available - Domestic	MUs	4,933	4,933	4,933	4,933
4	Total Domestic Annual Energy Requirement (Current + Projection)	MUs	8,539	13,578	18,850	25,087
5	Current Energy Available - Other than Domestic	MUs	5,389	5,389	5,389	5,389
6	Total Annual Energy Requirement - Other than Domestic Consumers (with 20% growth P.A.)	MUs	6,467	7,760	9,312	11,175
	Additional Energy Required for other than domestic Categories of Consumers (year wise)	MUs	1,078	1,293	1,552	1,862
7	Additional Energy Required for other than domestic (Cumulative)		1,078	2,371	3,923	5,786
	Additional pump sets required by new agricultural consumers each of 5HP assumed	Nos.	210,000	300,000	400,000	500,000
	Additional pump sets required by new agricultural consumers(cumulative)	Nos.	210,000	510,000	910,000	1,410,000
	Additional Agricultural energy demand (8hrs/day,180days/yr)	MUs	1,128	2,739	4,888	7,573
8	Total Energy Requirements (all)	MUs	16,134	24,077	33,050	43,835

Break up & details of capacities existing and likely to be added year wise

Particulars	Location	FY 2014 -15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Remarks
A. State Sector Projects							
Barauni Stage-I (2 X 110 MW)	Bihar	-----	220	220	220	220	Units are under R&M. Expected COD of Unit – I is October 2015 and Unit – II is March 2016.
Barauni Stage-II (2 X 250 MW)	Bihar	-----	250	500	500	500	Expected COD of Unit – I is August 2015 & Unit – II April 2016.
Small Hydro (BSHPCL)	Bihar	55	55	88	88	88	15 nos (total capacity33 MW) small hydro projects is expected to commission by April 2016
Dagmara HEP						120	Expected COD of is April 2018
Total State Sector	Bihar	55	525	808	808	928	
B. CENTRAL SECTOR ALLOCATION							
Talchar – I (2 x 500 MW)	Odisha	416.5	416.5	416.5	416.5	416.5	
Farakka – I & II (1600 MW)	W.B	508.8	508.8	508.8	508.8	508.8	
Farakka – III (500 MW)	W.B	107.6	107.6	107.6	107.6	107.6	
Kahalgaoon – I (840 MW)	Bihar	354.9	354.9	354.9	354.9	354.9	
Kahalgaoon – II (1500 MW)	Bihar	74.7	74.7	74.7	74.7	74.7	
Dadri – I	U.P	180	180	-----	-----	-----	PPA to be expired after 31.08.15
Dadri – II	U.P	266.3	-----	-----	-----	-----	PPA expired on 31 st March 2015

Particulars	Location	FY 2014 -15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Remarks
Teesta V HEP	Sikkim	108.43	108.43	108.43	108.43	108.43	
Rangit – HEP	Sikkim	21	21	21	21	21	
Chukka HEP	Bhutan	80	80	80	80	80	
Tala HEP	Bhutan	260.1	260.1	260.1	260.1	260.1	
Arun –III	Nepal				125	125	<i>Requested for allotment of 250 MW power from this project(50% consider)</i>
Punatsangchhu & Mangdechhu, HEP,	Bhutan				750	750	<i>Requested for allotment of 1500 MW power from this project (50% consider)</i>
Barh Stage-I (3 X 660 MW)	Bihar	-----	342	1025	1025	1025	<i>Expected CoD of Unit - I in July 2015. Remaining Unit - II & III in 1st quarter of 2016-17.</i>
Barh Stage-II (2 X 660 MW)	Bihar	505.3	859	859	859	859	<i>Unit-I is running and expected CoD of Unit-II-May 2015.</i>
Talchar STPS (2 X 660 MW)	Odisha	-----	-----	-----	-----	-----	<i>PPA Executed. Allocation to be made by MoP, GoI. Expected COD during late 13th plan</i>
Katwa STPS (2 X 800 MW)	W.B	-----	-----	-----	-----	-----	<i>PPA Executed. Allocation to be made by MoP, GoI. Expected COD during late 13th plan</i>
North Karanpura, Jharkhand (3 X 660MW)	Jharkhand				214.7	214.7	
Gajmara STPS (4 X 800 MW)	Odisha	-----	-----	-----	----	-----	<i>PPA Executed. Allocation to be made by MoP, GoI. Expected COD during late 13th plan</i>



Particulars	Location	FY 2014 -15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Remarks
Darlipalli STPS (4 X 800 MW)	Odisha	-----	-----	-----	-----	161.2	PPA Executed. Allocation to be made by MoP, GoI. Expected COD during FY 2018-19
Total Central Sector		2883.7	3312.7	3816.03	4905.73	5066.93	
C. IPPs Project (Through Competitive Bidding Process Under Case- I)							
GMR Kamalanga Energy Ltd.	Odisha	260	260	260	260	260	
Adani Enterprises Limited	Gujarat	200	200	200	200	200	Contribution of 200 MW only up to FY 2015-16 has been considered, PPA for which is going to be expired after that. Extension of PPA is under progress
Essar Power limited, Jharkhand	Jharkhand						PPA executed for supply of 450 MW (from 9th July 2014) and additional 300 MW (from 17th Oct 2015). However due to cancellation of coal block these PPAs are expected to be terminated. As such no contribution from this plant is considered
Power purchase through long term contract under Case-1	----					500	Bidding for procurement of power expected to be started in phases shortly
Total IPPs		460	460	460	460	960	



Particulars	Location	FY 2014 -15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Remarks
D. Joint Venture (JV) Projects							
MTPS Stage-I (2 X 110 MW)	Bihar	220	220	220	220	220	Unit – I is under operation. After R&M CoD of Unit – II was declared on 15.11.14 and is under operation.
MTPS Stage-II (2 X 195 MW) KBUNL	Bihar	-----	264	264	264	264	Allocation for Bihar State is 264 MW (67.7%). PPA has been executed, Expected COD of Unit – III is August 2015 & that of Unit – IV is January 2016.
Nabinagar Railway (4 X 250MW)	Bihar	-	50	100	100	100	Allocation for Bihar State is 100 MW (10%). PPA has been executed,
Nabinagar Stage-I (3 X 660 MW)	Bihar	-----	-----	-----	916	1373	Final allocation by MoP for Bihar State is 1373 MW (69.36%). PPA has been executed for 25 years. Expected COD of Unit – I is March 2017 & that of Unit – II is September 2017 & Unit-III is March 2018.
Nabinagar JV (3 X 660 MW) Stage-II	Bihar	-----	-----	-----	-----	916	PPA Executed. Allocation considered similar to Nabinagar Stage-I. Allocation is yet to be decided by MoP, GoI. Expected. CoD- Two unit expected in FY 2018-19.
Total JV Projects		220	534	584	1500	2873	
E. Renewable Energy Sources (Bagasse, Biomass & Solar PV & Solar – Biomass Hybrid Project							
Solar PV	Bihar	-----	38	138	288	288	Availability includes 150 MW from FY 2017-18 onwards subject to approval of 150 MW Solar PV Project by the GoB.
Solar PV under JNNSM	Bihar	-----	10	10	10	10	Contracted with SECI, GoI under JNNSM



Particulars	Location	FY 2014 -15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	Remarks
Phase-II							<i>Phase – II.</i>
Bagasse based Cogeneration Project	Bihar	85	88	94	94	94	<i>Riga sugar mill's project of 3 MW is to be commissioned in the year FY 2015 – 16.</i>
Biomass based Generation project	Bihar	1	3	3	3	3	
Biomass - Solar PV Hybrid Project	Bihar	----	-----	3	3	3	
Total RNES		86	139	248	398	398	
F. Ultra Mega Power Project							
Jharkhand UMPP (6 x 660 MW)	Jharkhand	-----	-----	-----	-----	-----	
Total UMPP		-----	-----	-----	-----	-----	<i>Allocation is final. Expected COD during late 13th plan</i>
Grand Total Availability at 100 %		3704.7	4970.7	5916.03	8071.73	10225.93	

NOTES:

GoB/MoP has also planned following Common Project in the State :

- a) Buxar Bijlee (1320 MW)** – The project is in preliminary stage. MoU signed on 17.01.13 with SJVNL having 100% ownership. Land acquisition is under progress. Not likely to achieve commercial operation by FY2018 – 19. As such, the capacity not considered in above table.
- b) Lakhisarai Bijlee (1320 MW)** - The project is in preliminary stage. MoU signed on 22.02.14 with NTPC having equity share NTPC – 74% and BSPGCL – 26%. JVC yet to be formed as approval by MOP for 85% power to Bihar is still pending. In this connection, Chief Secretary, GoB has already made a request to MoP,



GoI vide letter dated 03.09.2014. Land acquisition is in progress. Not likely to achieve commercial operation by FY 2018 – 19. As such, the capacity not considered in above table.

- c) Pirpainti Bijlee (1320 MW)** - *The project is in preliminary stage. MoU signed on 22.02.14 with NHPC having equity share NHPC – 74% and BSPGCL – 26%. JVC yet to be formed as approval by MOP for 85% power to Bihar is still pending. In this connection, Chief Secretary, GoB has already made a request to MoP, GoI vide letter dated 03.09.2014. Land acquisition is in progress. Not likely to achieve commercial operation by FY 2018 – 19. As such, the capacity not considered in above table.*
- d) UMPP (4000 MW)** :*The project is planned at village Kawara, Banka District of Bihar for which approval of GoB accorded on 22.04.2013. Land of about 2500 acres has been identified. Approval of Water resource department, GoB for 120 Cusecs water from river Ganga has also been accorded on 22.01.2013. Ministry of coal vide DO letter dated 08.04.2015 has recommended Pirpainti/Baharat coal Block to the UMPP in Bihar. PFC has been appointed as consultant. Once the coal block is attached and site specific studies are carried out & clearances are obtained, developer will be selected through Case-II bidding. Not likely to achieve commercial operation by FY 2018 – 19. As such, the capacity not considered in above table.*



MNRE Schemes/options for electrification of remote households**OPTION- I :**

- System proposed:**

100 Wp Solar system will be provided to each household

❖ This system would include:

- 5 Nos. of D.C. operated LED lights (2 Luminaires of 5 watts each and 3 Luminaires of 8 watts each) for 4 hours operation each day.
- One D. C. Fan of 12 watts for 10 hours operation each day.
- One D.C. B&W TV 12 watts for 4 hours operation each day can be attached or any other appliance can be powered
- One Mobile Charger

- Load Estimation:**

Sl. No.	Load Description	Nos.	Unit Load (W) [DC]	Total Load (W)	Hours of use per day	Energy Consumption (Wh)/day
1	D.C. operated LED Lights	5	8WX3 5WX2	34	4 hours	136
2	D.C. Fan	1	12Wx1	12	10 hours	120
3.	D.C. B&W TV	1	12	12	4 hours	48
4.	Mobile Charger	1	5	5	3 hours	15
					<i>Total</i>	<i>319</i>
					<i>Say</i>	<i>0.3units/day</i>

- System requirement to meet consumer demand for above consumption profiles i.e. 0.3 units per day is estimated with autonomy for two(2) non sunshine day is as under:

Sl. No.	System	Consumption Profile (with Two day Autonomy)
1	Solar PV Module	100 Wp
2	Battery Storage (Tubular type)	12V, 75 AH

- Estimated Project Cost: Broad estimated cost for system for typical household is: **Rs. 25,000/-**

OPTION II:

• SYSTEM PROPOSED:

- a. 200 Wp Solar system will be provided to each household
- b. This system would include:
 - 5 Nos. of D.C. operated LED lights (2 Luminaires of 5 watts each and 3 Luminaires of 8 watts each) for 6 hours operation each day.
 - One D. C. Fan of 24watts (or 2 fans of 12 watts each) for 12 hours operation each day.
 - One D.C. colour TV 30 watts for 4 hours operation each day can be attached or any other appliance can be powered.
 - One Mobile Charger

• Load Estimation:

Sl. No.	Load Description	Nos.	Unit Load (W) [DC]	Total Load (W)	Hours of use per day	Energy Consumption (Wh)/day
1	D.C. operated LED Lights	5	8WX3 5WX2	34	6 hours	204
2	D.C. Fan*	1	24W X1 or 12Wx2	24	12 hours	288
3.	D.C. Color TV	1	30	30	4 hours	120
4.	Mobile Charger	1	5	5	3 hours	15
					Total	627
					Say	0.6 units/day

- System requirement to meet consumer demand for above consumption profiles i.e. 0.6 units per day is estimated with autonomy for two (2) non sunshine day is as under:

Sl. No.	System	Consumption Profile (with Two day Autonomy)
1	Solar PV Module	200 Wp
2	Battery Storage (Tubular type)	12V, 150 AH

- Estimated Project Cost: Broad estimated cost for system for typical household is: **Rs. 50,000/-**



OPTION III

- ❖ TARGET GROUP : Village with a cluster of 15 “House Holds”, which cannot be connected to the Grid
- ❖ Proposed Solution : Through Solar PV Mini Grid And Central Control Room

- **Load Estimation:**

Sl. No.	Load Description	Nos.	Unit Load (W) [AC]	Total Load (W)	Hours of use per day	Energy Consumption (Wh /day)
1	Power for A.C. LED Lights	5	8WX3 5WX2	34	6 hours	204
2	Power for A.C. Fan and or Power for A.C. Loads like Color TV, Set top box / PC and Mobile Charger etc.	1	50W	50	6 hours	300
Total						504
say						0.5 unit/day

- i. Proposed Load for each house hold: each house hold = 500 Whrs.
- ii. Total Load for 15 households = 7500 Whrs.
- iii. **Solar System Specs. for the above Load:**
- iv. Solar PV Panel = 2.5 KWp
- v. Battery = 48V, 600AH
- vi. Off Grid PCU (Inverter and Charge controller) =48 V , 2.5 KW
- vii. **A central control room for batteries and PCU**
- viii. Other balance of System Components
- ix. **Budgeted cost of the System is Rs. 7.5 Lakhs**



OPTION IV:

- TARGET GROUP : Villages with 50 “House Holds”, which cannot be connected to the Grid
- Proposed Solution : Through Solar PV Mini Grid And Central Control Room
- Load Estimation:

Sl. No.	Load Description	Nos.	Unit Load (W) [AC]	Total Load (W)	Hours of use per day	Energy Consumption (Wh /day)
1	Power for A.C. LED Lights	5	8WX3 5WX2	34	6hours	204
2	Power for A.C. Fan and or Power for A.C. Loads like Color TV, Set top box / PC and Mobile Charger etc.	1	50W	50	10hours	500
Total						704
say						0.7 unit/day

- Proposed Load for each house hold: each house hold =700 Whrs.
- Total Load for 50 households = 35000 Whrs.
- Solar System Specs. for the above Load:
- Solar PV Panel =12.5 KWp
- Battery = 240V, 600AH
- Off Grid PCU (Inverter and Charge controller) =240 V , 12.5 KW
- A central control room for batteries and PCU
- Other balance of System Components
- Budgeted cost of the System is Rs. 30 Lakh

PROPOSED SCHEME:

- MNRE may provide subsidy at the rate of 40%.through NCEF
- A network of local technicians will have to be created for service and repair.
- Some local agencies / NGO's will have to be involved to ensure upkeep and proper use through awareness and training of users.

The beneficiary may be asked to keep some fixed amount as “Reserves” like for battery replacement in future.



Existing Inter & Intra State Transmission system**(A) Existing Intra-State Transmission System**

- A.1 - 132 KV Existing System
 A.2 - 220 KV Existing System
 A.3 - GSS Capacity

(B) Existing Inter-State Transmission System

- B.1 - ISTS GSS Capacity
 B.2 - ISTS Line Reactors
 B.3 - ISTS Transmission Line

A.1 - BSPTCL 132 KV TRANSMISSION LINES					
Sl No	Name of Line	Circuit	Length (in Km)	Total Length (in C-Km)	Conductor type and characteristics
1	132 KV Bodhgaya - Chandauti (Line-I)	Double	16	32	Panther
2	132 KV Bodhgaya - Chandauti (Line-II)	Double	14	28	Panther
3	132 KV Chandauti - Sipara	Single	90	90	Panther
4	132 KV Chandauti - Belaganj	Single	20	20	Panther
5	132 KV Belaganj - Jehanabad	Single	30	30	Panther
6	132 KV Jehanabad - Masaudhi	Single	30	30	Panther
7	132 KV Masaudhi - Sipara	Single	24	24	Panther
8	132 KV Jehanabad - Ataula	Single	28	28	Panther
9	132 KV Chandauti/Jehanabad LIL0-Tehta	Double	6	12	Panther
10	132 KV Chandauti - Sonenagar (L-30)	Single	76	76	Panther
11	132 KV Chandauti - Rafiganj (L-31)	Single	41	41	Panther
12	132 KV Rafiganj - Sonenagar (L-31)	Single	35	35	Panther
13	132 KV Sonenagar - Rihand	Single	188	188	Panther
14	132 KV Sonenagar -Japla - Garhwa - Rihand	Single	188	188	Panther
15	132 KV Chandauti - Tekari DCSS	Single	28.9	28.9	Panther
16	132 KV Tekari-Goh (DCSS)	Single	22	22	Panther
17	132 KV Bodhgaya - Wazirganj	Single	30	30	Panther
18	132 KV Wazirganj - Nawada	Single	26	26	Panther
19	132 KV Bodhgaya - Sherghati	Single	27	27	Panther
20	132 KV Bodhgaya - Imamganj	Single	56.51	56.51	Panther
21	132 KV Dehri - Banjari	Single	38	38	Panther
22	132 KV Sasaram- Banjari DCSS	Single	47.002	47.002	Panther
23	132 KV Banjari-KCL	Single	1	1	Panther
24	132 KV Dehri - Sasaram Ckt.-I	Single	20	20	Panther
25	132 KV Sasaram - Kudra TSS Ckt.-I	Single	13	13	Panther

A.1 - BSPTCL 132 KV TRANSMISSION LINES					
Sl No	Name of Line	Circuit	Length (in Km)	Total Length (in C-Km)	Conductor type and characteristics
26	132 KV Kudra TSS - Karamnasa Ckt.-I	Single	10	10	Panther
27	132 KV Dehri - Pusouli Ckt.-II	Single	26	26	Panther
28	132 KV Dehri/Pusouli LILO Point-Kudra	Single	2	4	Panther
29	132 KV Kudra- Kochas DCSS	Single	27.5	27.5	Panther
30	132 KV Pusouli - Mohania Ckt.-II	Single	10	10	Panther
31	132 KV Mohania - Karamnasa Ckt.-II	Single	11	11	Panther
32	132 KV Karamnasa - Sahupuri	Single	131	131	Panther
33	132 KV Karamnasa - Chandauli - Sahupuri	Single	131	131	Panther
34	132 KV Dehri - Bikramganj Ckt.-II	Single	45	45	Panther
35	132 KV Bikramganj - Dumroan Ckt.-II	Single	35	35	Panther
36	LILO of 132 KV Dehri- Dumraon ckt.I (new) at Bikramganj	Double	1.5	3	Panther
37	LILO of 132 KV Dehri- Dumraon ckt.II (old) at Kochas	Double	31.6	63.2	Panther
38	132 KV Dehri - Dumroan Ckt.-I	Single	80	80	Panther
39	132 KV Dumroan - Buxar (DCSS)	Single	16.1	16.1	Panther
40	132 KV Dehri - Sonenagar	Double	14.45	28.9	Panther
41	132 KV Ara (PG) - Ara	Single	7	7	Panther
42	132 KV Ara (PG) - Dumroan	Single	60	60	Panther
43	132 KV Ara (PG) - Jagdishpur (DCSS)	Single	26.3	26.3	Panther
44	132 KV Fatuha - Sipara	Single	26	26	Panther
45	132 KV Sipara - Mithapur	Single	16	16	Panther
46	132 KV Mithapur-Jakkanpur	Single	1	1	Panther
47	132 KV Sipara-Jakkanpur	Double			Panther
48	132 KV Fatuha - Gaighat	Single	23	23	Panther
49	132 KV Fatuha - Katra	Single	17	17	Panther
50	132 KV Katra - Gaighat	Single	15	15	Panther
51	132 KV Khagaul - Bihta	Double	14.5	29	Panther
52	132 KV Khagaul - Digha (8 Km Overhead & 8 Km under ground cable)	Double	16	32	Panther
53	132 KV Biharsarif (SG) - Baripahari	Double	5	10	Panther
54	132 KV Biharsarif (SG) - Barh Ckt.-I	Single	25	25	Panther
55	132 KV Barh - Hathidah Ckt.-I	Single	20	20	Panther
56	132 KV Biharsarif (SG) - Hathidah Ckt.-II	Single	32.5	32.5	Panther
57	132 KV Biharsarif (SG) - Ekangarsarai DCSS	Single	30	30	Panther
58	132 KV Ekangarsarai - Hulasganj DCSS	Single	14.5	14.5	Panther
59	132 KV Baripahari - Harnaut	Single	26	26	Panther
60	132 KV Harnaut - Fatuha	Single	45	45	Panther
61	132 KV Biharsarif (SG) - Barhi (DVC) (L-28)	Single	142	142	Panther
62	132 KV Nalanda - (L-28) LILO Point	Double	2	4	Panther



A.1 - BSPTCL 132 KV TRANSMISSION LINES					
Sl No	Name of Line	Circuit	Length (in Km)	Total Length (in C-Km)	Conductor type and characteristics
63	132 KV (L-28) Line-Rajgir grid (t-connection)	Single	6	6	Panther
64	132 KV Barhi (DVC) - Rajgir (L-29)	Single	16	16	Panther
65	132 KV Rajgir - Biharsarif (L-29)	Single	126	126	Panther
66	132 KV Biharsarif (SG) - Nawada DCSS	Single	41	41	Panther
67	132 KV Hathidah - Lakhisarai	Single	28	28	Panther
68	132 KV Hathidah - Shekhpura	Single	28	28	Panther
69	132 KV Lakhisarai - Jamui	Single	35	35	Panther
70	133 KV Lakhisarai (PG) - Lakhisarai (BSPTCL) (under construction 14.5 Km constructed)	Double	15	30	Panther
71	132 KV Biharsarif (SG) - Shekhpura	Single	39.49	39.49	Panther
72	132 KV Shekhpura - Jamui (DCSS)	Single	49	49	Panther
73	132 KV Lakhisarai - Jamalpur	Single	45	45	Panther
74	132 KV Sultanganj - Jamalpur	Single	38	38	Panther
75	132 KV Ara - Ara TSS	Single	4.01	4.01	Panther
76	132 KV Dumroan - Dumroan TSS	Single	2	2	Panther
77	132 KV Bodhgaya - Paharpur TSS	Double	35	70	Panther
78	132 KV Rafiganj - Rafiganj TSS	Single	4.6	4.6	Panther
79	132 KV Barh/Hathidah line - Mokama TSS	Single	6	6	Panther
80	132 KV Lakhisaai - Lakhisarai TSS	Single	6	6	Panther
81	132 KV Jamui - Jhajha TSS	Double	31	62	Panther
82	132 KV Khagaul - Khagaul TSS	Single	1	1	Panther
83	132 KV Fatuha - Khusrupur TSS	Single	7.2	7.2	Panther
84	132 KV Sabour - Sultanganj Ckt I	Single	30	30	Panther
85	132 KV Sabour - Sultanganj Ckt II	Single	31	31	Panther
86	132 KV Sultanganj - Deoghar	Single	105	105	Panther
87	132 KV KhSTPS - Sabour	Single	25	25	Panther
88	132 KV KhSTPS - Kahalgaon	Single	6	6	Panther
89	132 KV Sabour - Kahalgaon	Single	19	19	Panther
90	132 KV Kahalgaon- Sultanganj	Double	33.314	66.628	Panther
91	132 KV Sultanganj- Lakhisarai	Double	40	80	Panther
92	132 KV Kahalgaon - Lalmatia	Single	60	60	Panther
93	132 KV Banka (PG) - Sabour (DCSS)	Double	21.58	43.16	Panther
94	132 KV Banka (PG) - Banka (DCSS)	Double	10	20	Panther
95	LILO on 132 KV Sabour- Banka trans. Line at Banka (PG) (02 nos. of circuits)	Double	14	28	Panther
96	132 KV Purnia (PG) - Purnia	Triple	1.33	3.99	Panther
97	132 KV Purnia - Naugachia (L-16)	Single	70	70	Panther
98	132 KV Naugachia - BTPS (L-16)	Single	136	136	Panther
99	132 KV Purnia - Khagaria (L-23)	Single	150	150	Panther



A.1 - BSPTCL 132 KV TRANSMISSION LINES					
Sl No	Name of Line	Circuit	Length (in Km)	Total Length (in C-Km)	Conductor type and characteristics
100	132 KV Khagaria - BTPS (L-23)	Single	60	60	Panther
101	132 KV Purnia - Katihar	Single	29	29	Panther
102	132 KV Purnia - Saharsa	Single	101.2	101.2	Panther
103	132 KV Purnia - Farbisganj	Single	85	85	Panther
104	132 KV Purnia (PG) - Kishanganj	Single	70	70	Panther
105	132 KV Dalkola (WB) - Kishanganj	Single	26	26	Panther
106	132 KV Kishanganj - Farbisganj	Double	88.6	177.2	Panther
107	132 KV Farbisganj - Kataya Ckt.-I (New)	Double	39.7	79.4	Panther
108	132 KV Farbisganj - Kataya Ckt.-II (Old)	Single	50.9	50.9	Panther
109	132 KV Madhepura - Saharsa (half D/C)	Single	50	50	Panther
110	132 KV Madhepura - Supoul	Double	30	60	Panther
111	132 KV Madhepura - Sonebarsa	Single	50	50	Panther
112	132 KV Saharsa - Uda Kishanganj	Single	50.35	50.35	Panther
113	132 KV Supoul - Kataya	Double	59.6	119.2	Panther
114	132 KV BTPS - Begusarai (L-9 & L-10)	Double	10	20	Panther
115	132 KV Begusarai - Samastipur (L-9)	Single	57	57	Panther
116	132 KV Begusarai - Dalsingsarai (L-10)	Single	34	34	Panther
117	133 KV Begusarai - Kusheshwarsthan	Single	65	65	Panther
118	132 KV Dalsingsarai - Samastipur (L-10)	Single	23	23	Panther
119	132 KV KBUNL - Samastipur	Double	85.2	170.4	Panther
120	132 KV KBUNL - Muzaffarpur Ckt-I	Single	15.5	15.5	Panther
121	132 KV KBUNL - Muzaffarpur Ckt-II	Single	16.7	16.7	Panther
122	132 KV KBUNL - SKMCH	Single	14.116	14.116	Panther
123	132 KV Samastipur - Darbhanga	Single	40	40	Panther
124	132 KV Samastipur - Hazipur (220 KV)	Double	60	120	Panther
125	132 KV Hazipur (220KV)-Hazipur (132KV)	Double	2	4	Panther
126	132 KV Samastipur/Hazipur LILo Point-Jandaha	Double	16	32	Panther
127	132 KV Hazipur - Sheetalpur	Double	30	60	Panther
128	132 KV Chapra - Sheetalpur	Double	40	80	Panther
129	132 KV Muzaffarpur - Vaishali	Double	30.1	60.2	Panther
130	132 KV Vaishali - Sheetalpur	Double	30.21	60.42	Panther
131	132 KV Chapra - Siwan	Single	70	70	Panther
132	132 KV Chapra/Siwan-Ekma	Single	0.6	0.6	Panther
133	132 KV Gopalganj - Siwan	Single	40	40	Panther
134	132 KV Gopalganj-MusraKh-Siwan	Single	74.866	74.866	Panther
135	132 KV Gopalganj - Bettia	Double	60.75	121.5	Panther
136	132 KV Gopalganj/BettiaCkt-I-Sidhwalia SM	Single	12	12	Panther

A.1 - BSPTCL 132 KV TRANSMISSION LINES					
Sl No	Name of Line	Circuit	Length (in Km)	Total Length (in C-Km)	Conductor type and characteristics
137	132 KV MTPS - Motihari	Single	70	70	Panther
138	132 KV Bettia - Motihari	Single	45	45	Panther
139	132 KV Bettia - Ramnagar	Single	41.5	41.5	Panther
140	132 KV Bettia - Raxaul	Double	37.1	74.2	Panther
141	132 KV Ramnagar - BHPC, Balmikinagar	Single	77.77	77.77	Panther
142	132 KV Motihari - Dhaka	Double	24	48	Panther
143	132 KV Dhaka - Sitamarhi	Double	52	104	Panther
144	132 KV Sitamarhi-Runisaidpur	Single	21	21	Panther
145	132 KV Runisaidpur-SKMCH	Single	35	35	Panther
146	132 KV SKMCH-Muzaffarpur	Single	15	15	Panther
147	132 KV Darbhanga(220 KV) - Darbhanga(132 KV)	Single	1	1	Panther
148	132 KV Darbhanga/Pandaul LILO point - Gangwara	Double	8	16	Panther
149	132 KV Darbhanga - Phoolparas	Single	71.8	71.8	Panther
150	132 KV Darbhanga - Pandaul	Single	28	28	Panther
151	132 KV Pandaul - Madhubani	Single	16	16	Panther
152	132 KV Madhubani - Jainagar	Single	40	40	Panther
153	132 KV Jainagar - Phoolparas	Single	55	55	Panther
154	132 KV Phoolparas-Supoul	Double	31.92	63.84	Panther
155	132 KV Chapra - Chapra TSS	Single	1	1	Panther
156	132 KV Hazipur - Hazipur TSS	Single	2	2	Panther
157	132 KV Sheikhpura- Lakhisarai DCSS line	Single	29.5	29.5	Panther
158	132 KV Pusouli- Kudra D/C line	Double	13.6	27.2	Panther
159	132 KV Pusouli- Kochas DCSS line	Single	28	28	Panther
160	132 KV Pusouli-Mohania DCSS line	Single	14.5	14.5	Panther
161	132 KV Bettiah- Dhanha D/C line (under const.)	Double	35	70	Panther
Total Length of 132 KV transmission Line				7067.352	

A.2 - BSPTCL 220 KV TRANSMISSION LINES

Bihar State Power Transmission Company Ltd,						
220 KV Transmission Line Length						
SI No	Name of Line	Circuit	Ckt Km Length	Total Length (in Km)	Conduct or type and characteristics	No of Sub-Conductor (NSC)
1	220 KV Biharsarif (PG) - Biharsarif	Triple	1.67	5.01	Zebra	Single
2	220 KV Biharsarif - Bodhgaya	Double	80	160	Zebra	Single
3	220 KV Biharsarif - Fathua	Double	40	80	Zebra	Single
4	220 KV Biharsarif - Begusarai	Double	75	150	Zebra	Single
5	220 KV Begusarai - MTPS	Double	152	304	Zebra	Single
6	220 KV Gaya (PG) - Bodhgaya	Double	17	34	Zebra	Single
7	220 KV Gaya (PG) - Dehri	Double	95	190	Zebra	Single
8	220 KV Pusouli - Dehri	Single	65	65	Zebra	Single
9	220 KV Pusouli - Sahupuri (UP)	Single	71	71	Zebra	Single
10	220 KV Patna (PG) - Sipara	Double	0.45	0.9	Zebra	Single
11	220 KV Patna (PG) - Fatuha	Single	26	26	Zebra	Single
12	220 KV Sipara - Fatuha	Single	26	26	Zebra	Single
13	220 KV Patna (PG) - Khagaul	Single	40	40	Zebra	Single
14	220 KV Sipara - Khagaul	Single	39	39	Zebra	Single
15	220 KV KBUNL - Gopalganj (under const. by Powertech)	Single	101.35	101.35	Zebra	Single
16	220 KV KBUNL - Darbhanga (completed but not commissioned)	Single	68.53	68.53	Zebra	Single
17	220 KV Purnea (PG) - Madhepura	Double	100.09	200.18	Zebra	Single
18	220 KV Muzaffarpur (PG) - Hazipur	Double	51	102	Zebra	Single
19	220 KV LILO line of Pusouli (new) GSS D/C (Line I)	Double	4.552	9.104	Zebra	Single
20	220 KV LILO line of Pusouli (new) GSS D/C (Line II) (under construction)	Double	5.5	11	Zebra	Single
21	220 KV Pusouli- Dehri D/C trans. line (under construction)	Double	52	104	Zebra	Single
Total Length of 220 KV tr Line				1787.074		
400 KV Transmission Line Length						
SI No	Name of Line	Circuit	Ckt Km Length	Total Length (in Km)	Conduct or type and characteristics	No of Sub-Conductor (NSC)
1	400 KM Biharsarif-TTPS	Single	75	75	Moose	Single

A.3 - Existing GSS Capacity

OPERATIONAL GRIDS IN BSPTCL DISTRICTWISE									
Sl. No.	DISTRICT	Sl. No.	Name of grids	Power Transformer Capacity (in MVA)					
				220/132		132/33		132/25	
				Capacity	Total capacity	Capacity	Total capacity	Capacity	Total capacity
1	Araria	1	Forbishganj	-----		2X20	40	-----	
2	Arwal	2	Ataula	-----		2x20	40	-----	
3	Aurangabad	3	Sonenagar	-----		1X50+ 1X20	70	1x20+ 1x21.6	41.6
		4	Rafiganj	-----		1X50+1x20	70	-----	
		5	Aurangabad	-----		2x20	40	-----	
		6	Goh	-----		2x20	40	-----	
4	Begusarai	7	Begusarai	2x100	200	2x50	100	-----	
5	Bhojpur	8	Ara	-----		2X50+1x20	120	-----	
		9	Jagdishpur	-----		2x20	40	-----	
6	Buxar	10	Buxar	-----		2x20	40	-----	
		11	Dumraon	-----		2x20	40	-----	
7	Bhagalpur	12	Sabour	-----		2x50	100	-----	
		13	Sultanganj	-----		2x20	40	-----	
		14	Kahalgaon	-----		1X50+2x20	90	-----	
		15	Naugachhia	-----		2x20	40	-----	
8	Banka	16	Banka	-----		2x20	40	-----	
9	Darbhanga	17	Darbhanga	2X100	200				
		18	Darbhanga	-----		1x50 + 1x20	70	-----	
		19	Kusheshwar Sthan	-----		2x20	40	-----	
		20	Gang-wara	-----		2x50	100	-----	
10	East Champaran	21	Motihari	-----		1X50+1x20	70	-----	
		22	Dhaka	-----		1x20+1X10	30	-----	
		23	Raxaul	-----		2x20	40	-----	
11	Gaya	24	Bodh Gaya	4x150	600	2x50	100	-----	
		25	Chandauti	-----		2x50	100	2x13.35	26.7
		26	Belaganj	-----		2X20	40	-----	
		27	Tekari	-----		2x20	40	-----	
		28	Wazirganj	-----		2x20	40	-----	
		29	Imamganj	-----		2x20	40	-----	
		30	Sherghati	-----		2x20	40	-----	
12	Gopalganj	31	Gopalganj	2x100	200	2X50	100	-----	
13	Jamui	32	Jamui	-----		2x20	40	-----	
14	Jehanabad	33	Jehanabad	-----		2x20	40	-----	
		34	Hulasganj	-----		2x20	40	-----	
		35	Tehta	-----		2x20	40	-----	
15	Katihar	36	Katihar	-----		3X20	60	-----	
16	Khagaria	37	Khagaria	-----		2X20	40	-----	
17	Kishanganj	38	Kishanganj	-----		1X50+1X20	70	-----	
18	Kaimur/Bhabhua	39	Mohania	-----		1X50+1X20	70	-----	
		40	Karmnasa	-----		1x50+ 2x20	90	1x20+ 1x21.6	41.6
		41	Kochas	-----		2X20	40	-----	
		42	Kudra	-----		2x20	40	-----	

OPERATIONAL GRIDS IN BSPTCL DISTRICTWISE									
Sl. No.	DISTRICT	Sl. No.	Name of grids	Power Transformer Capacity (in MVA)					
				220/132		132/33		132/25	
				Capacity	Total capacity	Capacity	Total capacity	Capacity	Total capacity
19	Lakhisarai	43	Lakhisarai	-----		3X20	60	-----	
20	Madhepura	44	Uda-kishanganj	-----		2X20	40	-----	
		45	Madhepura	2X100	200	2x20	40	-----	
21	Muzaffarpur	46	Muzaffarpur	-----		2X50	100	-----	
		47	SKMCH	-----		2X50	100	-----	
22	Munger	48	Jamalpur	-----		2X50	100	-----	
23	Madhubani	49	Madhubani	-----		2x20	40	-----	
		50	Pandaul	-----		2X20	40	-----	
		51	Jainagar	-----		2X20	40	-----	
		52	Phulparas	-----		2X20	40	-----	
24	Nawadah	53	Nawadah	-----		2X50+1X20	120	-----	
25	Nalanda	54	Biharsharif	3x150	450	1X20	20	-----	
		55	Baripahari	-----		2X50	100	-----	
		56	Rajgir	-----		2X20	40	-----	
		57	Ekangarsarai	-----		2X20	40	-----	
		58	Harnaut	-----		2x20	40	-----	
		59	Nalanda	-----		2x20	40	-----	
26	Patna	60	Fatuah	4x100	400	3X50	150	-----	
		61	Khagaul	3x100	300	4X50	200	-----	
		62	Jakkanpur	-----		4X50+ 1X20	220	-----	
		63	Masaurhi	-----		2X20	40	-----	
		64	Bihta	-----		3X50	150	-----	
		65	Gayghat	-----		2X50	100	-----	
		66	Mithapur	-----		2X50	100	-----	
		67	Katra	-----		2X50	100	-----	
		68	Hathidah	-----		3X20	60	-----	
		69	Barh	-----		1X50+1X20	70	-----	
		70	Digha	-----		2x50	100	-----	
		71	Sipara	2x150	300	2x50	100		
		72	Karbigahia	-----		4x50	200	-----	
27	Purnea	73	Purnea	-----		2X50+ 1X20	120	-----	
28	Rohtas/Sasaram	74	Dehri-On-Sone	4x100	400	2X50	100	-----	
		75	Sasaram	-----		2X20	40	-----	
		76	Bikramganj	-----		2X20	40	-----	
		77	Banjari	-----		2X20	40	-----	
		78	Pusouli (New)	2x150	300			-----	
29	Sitamarhi	79	Sitamarhi	-----		2X50+1X20	120	-----	
		80	Runni Saidpur	-----		2x20	40	-----	
30	Saran	81	Chapra	-----		2X50+1X20	120	-----	

OPERATIONAL GRIDS IN BSPTCL DISTRICTWISE									
Sl. No.	DISTRICT	Sl. No.	Name of grids	Power Transformer Capacity (in MVA)					
				220/132		132/33		132/25	
				Capacity	Total capacity	Capacity	Total capacity	Capacity	Total capacity
		82	Sheetalpur	-----		2X20	40	-----	
		83	Musrakh	-----		2x20	40	-----	
		84	Ekma	-----		1X20	20	-----	
31	Siwan	85	Siwan	-----		1X50+1X20	70	-----	
32	Samastipur	86	Samastipur	-----		1X50+ 2X20	90	-----	
		87	Dalsingsarai	-----		2X20	40	-----	
		88	Jandaha	-----		2x20	40	-----	
33	Supaul	89	Supaul	-----		2X20	40	-----	
		90	Kataiya	-----		3X20	60	-----	
34	Saharsha	91	Saharsha	-----		1X50+1x20	70	-----	
		92	Sone barsa	-----		2x20	40	-----	
35	Shekhpura	93	Shekhpura	-----		2X20	40	-----	
37	Vaishali	94	Hajipur (132)	-----		1X50+1X20	70	-----	
		95	Vaishali	-----		2x20	40	-----	
		96	Hajipur (220)	2x100	200			-----	
38	West Champaran	97	Bettiah	-----		1X50+2X20	90	-----	
		98	Ramnagar	-----		2x20	40	-----	
		99	Dhanha	-----		2x50	100	-----	
				Total	3750	Total	6510	Total	109.9

B.1 - Existing ISTS GSS Capacity

Existing ISTS System (PGCIL)				
DETAILS OF TRANSFORMERS IN BIHAR AS ON 14.02.2015				
SL. NO.	NAME OF SUBSTATION	VOLTAGE (KV)	NO. OF TRANSFORMER	TOTAL MVA
1	PURNEA	220/132	3*100 MVA	300
			1*160 MVA	160
2	BIHARSHARIF	400/220	3*315 MVA	945
3	SASARM AC	400/220	2*315 MVA	630
		132/33	2*10 MVA	20
4	PUSAULI HVDC	400 KV BACK TO BACK CONV. XMER	2*3*234 MVA	1404
5	765 KV SASARM AC	765/400	3*500 MVA	1500
6	ARA	220/132	2*100 MVA	200
7	MUZAFFERPUR	400/220	2*315 MVA	630
8	NEW PURNEA	400/220	2*315 MVA	630
9	PATNA	400/220	2*315 MVA	630
10	GAYA	765/400/220	1*315 MVA	315
			1*500 MVA	500
			9*500 MVA	4500
11	BANKA	400/132	2*200 MVA	400
12	LAKHISARAI	400/132	2*200 MVA	400
	TOTAL TRANSFORMATION CAP. IN BIHAR (MVA)			13164
	TRANSFORMERS TO BE ADDED IN BIHAR			
1	GAYA	765/400 KV	3*500	1500
2	KISHANGANJ	400/220 KV	2*500	1000
3	MUZAFFARPUR	400/220 KV	1*500	500
4	NEW PURNEA	400/220 KV	2*500	1000
5	PATNA	400/220 KV	2*500	1000
6	PUSAULI	400/220 KV	2*500	1000
	Effective transformation cap. To be added in future			4110

B.2 - Existing ISTS Line Reactors

List of Line Reactors in Bihar							
S.No.	Name Of Transmission Lines	Length	END	Volatge Level	Capacity in MVAR	MVAR	Remarks
1	BIHARSHARIF-LAKHISARAI-I	89	BIHARSHARIF	400 kV	1X50	50	NON SWITCHABLE
2	BIHARSHARIF-LAKHISARAI-II	89	BIHARSHARIF	400 kV	1X50	50	NON SWITCHABLE
3	BIHARSHARIF-SASARAM-III	198.85	BIHARSHARIF	400 kV	1X50	50	SWITCHABLE
4	BIHARSHARIF-SASARAM-IV	198.85	BIHARSHARIF	400 kV	1X50	50	SWITCHABLE
5	BIHARSHARIF-PURNEA-I	232	BIHARSHARIF	400 kV	1X80	80	SWITCHABLE
6	BIHARSHARIF-PURNEA-II	232	BIHARSHARIF	400 kV	1X80	80	SWITCHABLE
7	PATNA-KISHANGANJ-I	352	PATNA	400 kV	1X63	63	NON SWITCHABLE AS B/R
8	PATNA-KISHANGANJ-II	352	PATNA	400 kV	1X63	63	NON SWITCHABLE AS B/R
9	MUZAFFERPUR-GORAKHPUR-I	260	MUZAFFERPUR	400 kV	1X63	63	SWITCHABLE
10	MUZAFFERPUR-GORAKHPUR-I	260	MUZAFFERPUR	400 kV	1X63	63	SWITCHABLE
11	MUZAFFERPUR-PURNEA-I	240	MUZAFFERPUR	400 kV	1X63	63	SWITCHABLE
12	MUZAFFERPUR-PURNEA-II	240	MUZAFFERPUR	400 kV	1X63	63	SWITCHABLE
13	PURNEA-MUZAFFERPUR-I	240	PURNEA	400 kV	1X63	63	SWITCHABLE
14	PURNEA-MUZAFFERPUR-II	240	PURNEA	400 kV	1X63	63	SWITCHABLE
15	PURNEA-SILIGURI-I	168	PURNEA	400 kV	1X63	63	NON SWITCHABLE
16	PURNEA-SILIGURI-III	160	PURNEA	400 kV	1X63	63	NON SWITCHABLE
17	BANKA-BIHARSHARIF-I	185	BANKA	400 kV	1X50	50	SWITCHABLE
18	BANKA-BIHARSHARIF-II	185	BANKA	400 kV	1X50	50	SWITCHABLE
19	LAKHISARAI-KAHALGAON-I	145	LAKHISARAI	400 kV	1X50	50	NON SWITCHABLE
20	LAKHISARAI-KAHALGAON-II	145	LAKHISARAI	400 kV	1X50	50	NON SWITCHABLE
21	PUSUALI-BIHARSHARIF-I	210	PUSAULI	400 kV	1X63	63	SWITCHABLE
22	PUSUALI-BIHARSHARIF-II	210	PUSAULI	400 kV	1X63	63	SWITCHABLE
23	PUSUALI-ALLAHABAD	212	PUSAULI	400 kV	1X63	63	SWITCHABLE
24	PUSUALI-SARNATH	76	PUSAULI	400 kV	1X63	63	SWITCHABLE
25	PUSAULI-BIHARSHARIF-III	199	PUSAULI	400 kV	1X50	50	SWITCHABLE
26	PUSAULI-BIHARSHARIF-IV	199	PUSAULI	400 kV	1X50	50	SWITCHABLE
27	765 KV PUSAULI-FATEHPUR	356	PUSAULI	765 kV	3X110	330	SWITCHABLE
28	765 KV GAYA-PUSAULI-FATEHPUR	145+337	PUSAULI	765 kV	3X110	330	SWITCHABLE MID POINT REACTOR
29	GAYA-MAITHON-I	277	GAYA	400 kV	1X50	50	SWITCHABLE
30	GAYA-MAITHON-I	277	GAYA	400 kV	1X50	50	SWITCHABLE
31	765 KV GAYA-BALIA	228	GAYA	765 kV	3X80	240	SWITCHABLE
32	765 KV GAYA-PUSAULI-FATEHPUR	145+337	GAYA	765 kV	3X80	240	SWITCHABLE
Sub-Total						2782	
Reactor To be commissioned in Future							
33	Kishanganj -Teesta-III (CKT-I)		Kishanganj	400 kV	1X63	63	
34	Kishanganj -Teesta-III (CKT-II)		Kishanganj	400 kV	1X63	63	
35	Kishanganj -Patna-I	352	Kishanganj	400 kV	1X80	80	
36	Kishanganj -Patna-II	352	Kishanganj	400 kV	1X80	80	
37	765 kV Gaya-Varanasi		Gaya	765 kV	3X80	240	
38	Gaya -Nabinagar		Gaya	400 kV	1X80	80	
Sub-Total						606	
TOTAL						3388	
List of Bus Reactors in Bihar							
S.No.	Name Of Substations	Voltage Level	Capacity in MVAR	MVAR			
1	BIHARSHARIF	400 KV	1X50	50			
			1X80	80			
2	PATNA	400 KV	1X80	80			
			2X125	250			
3	MUZAFFERPUR	400 KV	1X63*	63			
4	PURNEA	400 KV	2X125	250			
5	BANKA		1X80	80			
6	LAKHISARAI		1X80	80			
7	PUSAULI	400 KV	2X125	250			
		765 KV	3X110	330			
8	GAYA	400 KV	2X125	250			
		765 KV	6X80	480			
Sub-Total				2243			
9	Kishanganj	400 kV	2X125	250			
10	Biharsharif	400 KV	2X125	250			
11	Muzaffarpur	400 kv	2X125	250			
Sub-Total				750			
TOTAL				2993			
PRESENT MVAR CAP IN BIHAR				5025			
MVAR CAP TO BE ADDED IN FUTURE IN BIHAR				1293			
GRAND TOTAL MVAR CAP. IN BIHAR				6318			

B.3 - Existing ISTS Transmission Lines

ISTS Transmission Line of BIHAR					
Sl No.	Name of Sub-station/TL office	Name of the Transmission line	Total Line length	Jurisdiction KM	Jurisdiction Ckt KM
1	Khalgaon TL office	400 kV D/C(Twin Moose) Farakka - Kahalgaon - I & II	94.74	94.74	189.482
2		400 kV D/C(Twin Moose) Farakka - Kahalgaon - III & IV	95.60	95.60	191
3		400 kV D/C(Twin Moose)Kahalgaon - Lakhisarai - I & II	144.97	89.635	179.27
4		400 kV D/C(Twin Moose) Kahalgaon - Banka-I & II	47.74	47.74	95.48
5		400 kV D/C(Twin Moose)Kahalgaon - Maithon - I & II	171.85	104.05	208.1
6		400 kV D/C(Quad Moose)Kahalgaon - Barh -I & II	216.79	128.035	256.07
7		400 kV D/C(Twin Moose)Banka-Biharsharif-I & II	184.54	82.61	165.22
		Total		642.31	1284.622
8	Biharsariff S/S	400 kV D/C(Twin Moose)Biharsharif - Sasaram - I & II	192.06	99.186	198.372
9		400 kV D/C(Quad Moose)Biharsharif-Sasaram - III & IV	198.85	104.52	209.04
10		400 kV D/C(Twin Moose)Biharsharif-Muzaffarpur-I & II	129.98	57.34	114.68
11		400 kV D/C(Quad Moose)Biharsharif- Balia-I & II	241.79	85.90	171.8
12		220 kV D/C(Single Zebra)Hathida River crossing ckt-I & II	2.60	2.60	5.2
13		400 kV D/C(Twin Moose)Kahalgaon - Lakhisarai - I & II	144.97	55.439	110.878
14		400 kV D/C(Twin Moose) Banka- Biharsariff - I & II	184.54	101.93	203.86
15		400 kV D/C(Twin Moose)Lakhisarai - Biharsariff I & II	87.83	87.830	175.66
16		400 KV D/C (Quad Moose) Koderma-Biharsariff	110.69	110.690	221.38
		Total		705.44	1410.87
17	Patna S/S	400 kV D/C(Quad Moose)Barh-Patna- I & II	92.83	92.832	185.664
18		400 kV D/C(Quad Moose)Barh-Patna-III & IV	68.93	68.929	137.858
19		400 kV D/C(Quad Moose)Patna - Balia-I & II	195.32	43.139	86.278
20		400 kV D/C(Quad Moose)Patna -Balia-III & IV	184.67	47.823	95.646
21		400 kV D/C(Quad Moose)Kahalgaon - Barh -I & II	216.79	88.753	177.506
		Total		341.48	682.952
21	Pusaali S/S	400 kV D/C(Twin Moose)Sasaram - Sarnath(76.209) - Sarnath-Allahabad(143.978) - I & Sasram - Allahabad(215.427) - II	215.43	215.43	430.854
22		400 kV D/C(Twin Lapwing)Nabinagar - Sasaram - I	81.22	81.22	162.434
23		400 kV D/C(Twin Moose)Biharsharif - Sasaram - I & II	192.06	92.87	185.748
24		400 kV D/C(Quad Moose)Biharsharif-Sasaram - III & IV	198.85	94.33	188.66
25		765 kV S/C (Quad Bersimise) Gaya-Fatehpur	147.81	61.26	61.26
26		220 kV D/C(Single Zebra) Sasaram-Ara I & II	112.14	57.14	114.28
27		220 kV D/C(Single Zebra)Dehri-Sasaram & Sasram-Sahupuri(LILO portion)	4.59	4.59	9.176
28		132 kV S/C(Single Panther)Dehri - Sasaram S/C	62.69	62.69	62.69
29		132 kV S/C(Single Panther)Sasaram - Karamnasa S/C	29.00	29.00	29.00
		Total		698.53	1244.101
36	Gaya S/S	400 kV D/C(Quad Moose)Maithan - Gaya - I & II	276.95	143.16	286.32
37		400 kV D/C(Quad Moose)Koderma - Gaya - I & II	126.50	126.50	253
38		765 kV S/C (Quad Bersimise)Gaya - Balia S/C	237.70	80.19	80.19
39		765 kV S/C (Quad Bersimise) Gaya-Fatehpur	147.81	86.55	86.55
40		220 kV D/C(Single Zebra) Gaya-Dehri (LILO portion) - I & II	11.00	11.00	21.99
41		220 kV D/C(Single Zebra) Gaya-BodhGaya (LILO portion) - I & II	12.70	12.70	25.4
42		400 kV D/C(Twin Moose)Bokaro - Koderma - Ckt I & II	100.00	100.00	200
		Total		560.10	953.45
51	Purnea S/S	220 kV D/C(Single Zebra) Dalkhola - Purnea - I & II	41.00	41.00	82
52		220 kV D/C(Single Zebra) Purnea - New Purnea-I	1.00	1.00	2
		Total		42.00	
53	Ara S/S	220 kV D/C(Single Zebra) Sasaram-Ara I & II	112.14	55.00	110
54		220 kV D/C(Single Zebra)Ara-Khagaul I & II	48.44	48.44	96.88
55		400 kV D/C(Quad Moose)Biharsharif- Balia-I & II	241.79	155.89	311.78
56		765 kV S/C (Quad Bersimise)Gaya - Balia S/C	237.70	157.51	315.02
57		400 kV D/C(Quad Moose)Patna - Balia-I & II	195.32	152.57	305.14
58		400 kV D/C(Quad Moose)Patna -Balia-III & IV	185.00	137.18	274.36
59		132 kV D/C Dumraon-Ara & Ara- Ara (LILO Portion)	1.70	1.70	3.4
		Total		708.29	1500.58
60	Muzaffarpur S/S	400 kV D/C(Twin Moose)Biharsharif-Muzaffarpur-I & II	129.98	72.64	145.286
		Total		72.64	145.286
61	Maithon TL Office	400 kV D/C(Twin Moose)Kahalgaon - Maithon - I & II	171.85	67.80	135.6
62		400 kV D/C(Quad Moose)Maithan - Gaya - I & II	276.95	133.79	267.58
		Total		201.59	403.18
63	New Purnea S/S	400 kV D/C New Siliguri - New Purnea	167.00	167.00	334
64		400 kV D/C Malda - New Purnea	178.00	168.00	336
65	Category km.	Sub Total		3972.37	8295.04
		765 kV	400 kV	220 kV	
		543.02	7286	466.00	

Intra State Transmission Projects under execution for 12th plan period

Intra state Transmission Projects under execution for 12th plan period.					
Sanctioned Project for 12th Plan					
SI No	Description	Schemes	Amount (Rs.)	Remarks	Page no.
1	GSS Work	Phase-II, Extension SCHEME	472.53 Cr	Sanctioned under special plan/ BRGF. Work under progress	2
	Line Work	Phase-II, Extension SCHEME			3-4
2	Line Work	Phase-III, Part-I SCHEME	1370.02 Cr		5-6
	GSS Work(Augamintation)	Phase-III, Part-I SCHEME			7
	GSS Work(New)	Phase-III, Part-I SCHEME			8
3	New GSS Kishanganj (Project)Line	Phase-III, Part-II SCHEME,	356.1Cr		9
	New GSS Kishanganj (Project),GSS	Phase-III, Part-II SCHEME,			10
4	N-I Scheme(Line Work)	N-I Scheme	293.84 Cr		11
	N-I Scheme(GSS Work)	N-I Scheme			12
5	Externally Aided Project(Line)	ADB	196.86 Cr.	Sanctioned under ADB. Work on verge of completion.	13
	Externally Aided Project(GSS)	ADB			14
6	Line Work	Phase-IV(Part-I)	1800 Cr	Beeing implemented by BGCL(JV of BSPHCL & PGCIL) from domestic loan. Work started. Completion period-19 months from LOA dt Nov ' 2014.	15
	GSS Work	Phase-IV(Part-I)			16
7	Line Work	Phase-IV(Part-II)	2125 Cr	To be implemented by BGCL(JV of BSPHCL & PGCIL) from domestic loan. DPR under appraisal. First hearing done on 30.03.15 at Regulator level.	17
	GSS Work	Phase-IV(Part-II)			18
8	Replacement of old outlived 20 nos. MVA Power Transformer by 50 MVA Power Transformer in the following 14 nos. 132/33 KV GSS	State Plan	60.00 Cr	Sanctioned under State Plan. Tender invited.	31
9	Construction of 14 Nos. og Grid Sub-Station along with associated 132KV Transmission Lines in 14 Revenue Sub-divisions Scheme	State Plan	555.90 Cr	Sanctioned under State Plan. Order for GSS placed.	32
10	Construction of 17 Nos. og Grid Sub-Station along with associated 132KV Transmission Lines in 14 Revenue Sub-divisions Scheme(Rs.555.90 Cr)	State Plan	668.72 Cr		33-34

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
Phase-II, Extension SCHEME (472.53 Cr)			
1	Capacity Augmentation	Capacity (MVA)	Status
a	220/132 KV Level	TOTAL =1040 MVA	Under implementation. Likely to be completed by June-15
i	Bodhgaya-160 MVA,		
ii	Sipara-160 MVA,		
iii	Darbhanga-2X160 MVA,		
iv	Fatuha-100 MVA,		
v	Madhepura-(2X100) MVA,		
vi	Begusarai-(2X100) MVA &		
vii	Gopalganj-100 MV		
viii	(Total-1040 MVA)		
b	132/33 KV Level		
i	Khagaul, Bihta, Sitamarhi, AraNawada, Sabour -50 MVA andNaugachia, Jainagar, Phulparas, Supaul Dhaka & Belaganj-20 MVA	TOTAL = 420 MVA	Under implementation. Likely to be completed by June-15
	(Total-420 MVA)		

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
Phase-II, Extension SCHEME (472.53 Cr)			
Sl. No.	Description	Length (RKM) /	Status
1	New Transmission Lines		Mostly completed. Balance work to be done by June-15
a	220 KV Lines		
i	220 KV Patna (PG)-Gourichak DCSS tr line	1	
	TOTAL =	1 KM	
b	132 KV Lines		
i	132 KV Banka (PG)-Sultanganj (D/C) tr line	46.5	
ii	132 KV Lakhisarai (PG)-Lakhisarai (D/C) tr line	15.535	
iii	132 KV Lakhisarai (PG)-Jamui (D/C) tr line	25.6	
	TOTAL =	87.635 KM	
2	2nd Circuit Stringing		
a	220 KV Lines		
i	Nil.		
b	132 KV Lines		
i	Nil.		
3	Reconductoring		
a	220 KV Lines		
i	220 KV Bihar Sharif-Fatuha (D/C) Tr line	44	



SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
Phase-II, Extension SCHEME (472.53 Cr)			
Sl. No.	Description	Length (RKM) /	Status
ii	220 KV Bihar Sharif-Bodhgaya (D/C) Tr line	80	
	TOTAL =	124 KM	
(b)	132 KV Lines		
(i)	132 KV D/C Trans. line. MTPS-Muzaffarpur	32	Mostly completed. Balance work to be done by June-15
(ii)	132 KV S/C MTPS-Motihari T/Line	70	
(iii)	132 KV S/C Trans. line. Darbhanga-Pandaul	20	
(iv)	132 KV S/C T/Line Darbhanga-Samastipur	40	
(v)	132 KV S/C Trans. line. Chapra-Siwan T/L	70	
(vi)	132 KV S/C Bettiah-Ramnagar T/Line	42	
(vii)	132 KV Tr line. BTPS-Naugachia (S/C)	130	
(viii)	132 KV S/C Trans. line. Purnea-Khagaria (S/C)	150	
(ix)	132 KV Tr line. Bihar Sharif-Hathidah (D/C)	65	
(x)	132 KV Hathidah-Lakhisarai (S/C) T/Line	28	
(xi)	132 KV Tr line. Baripahari-Fatuha (S/C)	42	
(xii)	132 KV Purnea (PG)-Dalkola	50	
(xiii)	132 KV KVKahalgau-Sabour (S/C) tr line	23.3	
(xiv)	132 KV KhSTPS (NTPC)-Kahalgau (S/C) tr line	6	
(xv)	132 KV Fatuha-Jakkanpur (S/C) tr line	34	
	TOTAL =	802.3 KM	

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
Phase-III, Part-I SCHEME (1370.02 Cr)			
Sl. No.	Description	Length (RKM) / Capacity (MVA)	Status
(1)	New Transmission Lines		
(a)	220 KV Lines		Under implementation. To be completed by 2015-16
(i)	220 KV Darbhanga (400/220 KV)-Samastipur (new) DCSS tr line.	50	
(ii)	220 KV Darbhanga (400/220 KV)-Darbhanga (BSPTCL) (D/C) tr line.	10	
(iii)	LILO of 220 KV Begusarai-Kanti (D/C) tr line at Samastipur	30	
(iv)	220 KV (D/C) Gaya(PG)-Sonengar (new) tr line	100	
(v)	220 KV Darbhanga (400/220 KV) -Supaul/Lokhi (D/C) tr line	120	
(vi)	LILO of 220 KV Darbhanga (BSPTCL)-Kanti (D/C) tr line at Motipur GSS.	2x35 70	
(vii)	220 KV Darbhanga (400/20 KV)-Bhikhanpura (D/C) tr line.	100	
(viii)	LILO of 220 KV Darbhanga(BSPTCL)-Kanti 220KV (D/C) line at Musahari	2x21 42	
(ix)	220 KV BTPS (Ext)-Hazipur (D/C) tr line	100	
	TOTAL =	622 KM	
(b)	132 KV Lines		Under implementation. To be completed by 2015-16
(i)	132 KV Samastipur (220/132 KV) (New)-Samastipur (132/33 KV) (D/C) tr line	30	
(ii)	132 KV Supaul/Lokhi -Supaul (132/33 KV) (D/C) tr line	10	
(iii)	132 KV Motipur-Muzaffarpur (D/C) tr line	2x35 70	
(iv)	132 KV Musahari-Sitamarhi (D/C) tr line.	62	
(v)	132 KV Musahari-SKMCH (D/C)	18	
(vi)	132 KV Motihari (400/132 KV) -Motihari (BSPTCL) (D/C) line	36.9	
(vii)	132 KV Motihari (400/132 KV) -Bettiah (BSPTCL) (D/C) line	36.23	
(viii)	132 KV Motihari (400/132 KV) -Raxaul (BSPTCL) (D/C) line	55.65	
(ix)	LILO of 132 KV Madhepura-Sonebarsa (S/C) at Saharsa	40	
(x)	LILO of one ckt. of 132 KV Darbhanga-Phulparas at Pandaul.	20	
(xi)	LILO of one ckt. of 132 KV Darbhanga-Phulparas at Madhubani.	50	
(xii)	LILO of one ckt. of 132 KV Dhaka-Sitamarhi at Sheohar	1.5	
(xiii)	132 KV Darbhanga-Gangawara (D/C) tr line	12	
	TOTAL =	442.28 KM	
(2)	2nd Circuit Stringing		

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)				
Phase-III, Part-I SCHEME (1370.02 Cr)				
Sl. No.	Description	Length (RKM) / Capacity (MVA)	Status	
(a)	220 KV Lines			
	Nil.			
(b)	132 KV Lines			
(i)	(i) 132 KV Kishanganj-Forbesganj DCSS tr line.	(Total - 156.369 Km)	Under implementation. To be completed by 2015-16	
	(ii) 132 KV Forbesganj- Kataiya DCSS tr line			
	(iii) 132 KV Madhepura-Saharsa DCSS tr line			
(ii)	(i) 132 KVMotihari- Dhaka-Sitamarhi DCSS tr line	(Total length- 215.978 Km)		
	(ii) 132 KV Bettiah-Raxaul DCSS tr line			
	(iii) 132 KV Muzaffarpur-Vaishali DCSS tr line			
	(iv) 132 KV Darbhanga-Phulparas DCSS tr line			
	TOTAL =	372.347 KM		
(3)	Reconductoring			
(a)	220 KV Lines			
(i)	Nil.			
(b)	132 KV Lines			
(i)	132 KV Purnea(PG)-Purnea (BSPTCL) (T/C) by HTLS conductor	1.5		
	TOTAL =	1.5 KM		
(4)	Capacity Augmentation	Capacity (MVA)	Status	
(a)	220/132 KV Level		Under implementation. To be completed by 2015-16	
(i)	Nil.			
(b)	132/33 KV Level			
(i)	Bodhgaya & Rafiganj -50 MVA	100 MVA		
(ii)	Forbesgan, Katihar, Kishanganj, Saharsa&Khagaria -50 MVA	250 MVA		
(iii)	Sultanganj-(2X50) MVA, Kahalgaon-(1X50) MVA & Banka-(1X50) MVA	200 MVA		
(iv)	Pandaul-(1X50) MVA, Hajipur-(2X50) MVA, Gopalganj-(1X50) MVA, Siwan-(1X50 MVA) &Motihari-(2X50) MVA	350 MVA		
(v)	Sonenagar, Aurangabad, Dehri&Buxar-(1X50) MVA	200 MVA		
(vi)	Pusouli-(3X50) MVA &Karamnasa-(1X50)	350 MVA		
(vii)	Addition of 50 MVA, 132/33 KV power transformer at Jakkanpur, Baripahari, Chandauti, Jehanabad, Sitamarhi, Begusarai, Dumroan, Raxaul&Purnea	450 MVA		
	TOTAL =	1900 MVA		
(5)	New GSS	Capacity (MVA)	Status	
(a)	220/132/33 KV Level		Under implementation To be completed by 2015-16	
(i)	(2X160+3X50) MVA, 220/132/33 KV GSS Bikhnpura.	(Total Capacity 220/132 KV level = 320x5) = 1600 MVA & 132/33 KV level		
(ii)	(2X160+3X50) MVA, 220/132/33 KV GSS ,SKMCH			

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
Phase-III, Part-I SCHEME (1370.02 Cr)			
Sl. No.	Description	Length (RKM) / Capacity (MVA)	Status
(iii)	(2X160+2X50) MVA, 220/132/33 KV GSS Samastipur.	=600 MVA)	
(iv)	(2X160+2X50) MVA, 220/132/33 KV GSS Supoul/Laukhi.		
(v)	(2X160+2X50) MVA, 220/132/33 KV GSS Sonenagar		
(b)	132/33 KV Level		
(i)	(2X50) MVA, 132/33 KV GSS Sheohar	Total Capacity 132/33 KV level =100 MVA	

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
Phase-III, Part-II SCHEME, Kishanganj (Project) (356.1Cr)			
Sl. No.	Description	Length (RKM) / Capacity (MVA)	Status
(1)	New Transmission Lines		Under implementation. To be completed by 2015-16
(a)	220 KV Lines		
(i)	2x220 KV D/C Transmission line with AL-59 conductor between Kishanganj (PG) and Kishanganj (New)	2x4 8	
(ii)	220 KV D/C line with AL-59 conductor between Kishanganj (New)-Madhepura.	125	
(iii)	220 KV (D/C) line between Madhepura and Lokhi with AL-59 conductor	75	
	TOTAL =	208 KM	
(b)	132 KV Lines		
(i)	132 KV D/C line between Kishanganj (New) and Kishanganj (Existing).	11	
(ii)	132 KV D/C Kusheshwarsthan - Sonebarsa Transmission line	85	
	TOTAL =	96 KM	
(2)	New GSS	Capacity(MVA)	Status
(a)	220/132/33 KV Level		Under implementation. To be completed by 2015-16
(i)	(2X160+2X50) MVA, 220/132/33 KV GSS Kishanganj.	(Total Capacity 220/132 KV level = 320 MVA & 132/33 KV level = 100 MVA)	

SANCTIONED PROJECT FOR 12TH PLAN UNDER SPECIAL PLAN (BRGF)			
N-I Compliance Scheme, (291.84 Cr)			
Sl. No.	Description	Length (RKM) / Capacity (MVA)	Status
(1)	New Transmission Lines		Under implementation . To be completed by 2015-16
(a)	220 KV Lines		
(i)	Nil.		
(b)	132 KV Lines		
(i)	132 KV D/C Udakishanganj – Sonebarsa Transmission line.	55	
(ii)	132 KV D/C Kusheshwarsthan – Sonebarsa Transmission line	75	
(iii)	132 KV D/C Dalsingsarai – Kusheshwarsthan Transmission line	60	
(iv)	132 KV D/C Ramnagar – Dhanaha Transmission line	55	
(v)	132 KV D/C Sonenagar (New) – Aurangabad Transmission line	22	
(vi)	132 KV D/C Ara – Jagdishpur Transmission line	25	
(vii)	132 KV (D/C) Jagdishpur-Dumroan (new).	30	
(viii)	132 KV (D/C) Karpi-Goh transmission line	42	
	TOTAL =	364 KM	
(2)	2nd Circuit Stringing		
(a)	220 KV Lines		
(i)	Nil.		
(b)	132 KV Lines		
(i)	2nd circuit stringing of 132 KV Sherghati-Imamganj DCSS Transmission line.	30	
(ii)	2nd circuit stringing of 132 KV Ara (PG)-Jagdishpur transmission line.	29	
	TOTAL =	59 KM	
(3)	Reconductoring		
(a)	220 KV Lines		
(i)	Nil.		
(b)	132 KV Lines		
(i)	Nil.		

Sanctioned Project for 12th Plan under Special Plan (BRGF)			
N-I Compliance Scheme, (291.84 Cr)			
(4)	Capacity Augmentation	Capacity	Status
(a)	220/132 KV Level		Under implementation. To be completed by 2015-16
(i)	Hazipur&Khagaul-(1X100) MVA). (Total Capacity-200 MVA)	TOTAL =200 MVA	
(b)	132/33 KV Level		Under implementation. To be completed by 2015-16
(i)	Katra, Gaighat, Muzaffarpur, Digha, Dumraon&Darbhanga-(1X50) MVA). (Total Capacity-300 MVA)	TOTAL =300 MVA	

Externally Aided Project(EAP)					
Bihar State Power System Improvement Project Through ADB Loan No.2681- IND					
Ongoing Works:- Four Contracts Awarded for Transmission works amounting to Rs. 196.86 Cr.					
Package-I		132 Kv Transmission Lines	CKm	Status	Amount
	1	LILO of 132KV Pandaul Line at Gangwara	8	Completed	58.23 Cr
	2	LILO of 132KV Sasaram-Kudra Line at Pusauli	13.504	On verge of completion	
	3	132 Kv Pusauli- Mohania DCSS Line	15.05		
	4	132 Kv Pusauli- Kochas DCSS Line	72.2		
	5	132 Kv Lakhisarai- Sheikhpura DCSS Line	26.00		
	6	132 Kv Bettiah- Dhanha DCSS Line	35.00		
		33KV Lines	40		
		220 KV Transmission Lines	CKm		
Package-J	1	220 Kv DCDS Dehri Pusauli Line	52.478		41.52 Cr
	2	LILO of both Ckt of Sasaram (PGCIL)- Ara(PGCIL) 220 Kv D/c line to Pusauli(New)	5.00	Completed for one Ckt.	
		Total			99.75 Cr

Externally Aided Project(EAP)				
Bihar State Power System Improvement Project Through ADB Loan No.2681- IND				
Ongoing Works:- Four Contracts Awarded for Transmission works amounting to Rs. 196.86 Cr.				
Contracts	Sl No.	Description	Awarded Cost	Status
Package-G	1	Construction of 132/33 KV Sub Station at Dhanha(2X50 MVA)	49.14 Cr	
	2	Construction of 132/33 KV Sub Station at Gangwara(2X50 MVA)		Completed
	3	Construction of 6 nos. 132 KV line bay. (Bettiah-I, Pusauli-II, Kochas-I, Lakhisarai-I, Seikhpura-I Nos.)		Completed
	4	04 nos. of 33 KV Bays at remote end power sub-station connecting at Gangwara & Dhanaha GSS		
Package-H	1	Construction of 220/132 KV Sub Station at Pusauli(2X150MVA)	47.97 Cr.	On verge of completion
	2	Construction of 02 nos. 220 KV bay extension at existing Dehri Sub Station		In progress
	Total		97.11 Cr.	

List of work to be executed under Phase-IV, Part-I assigned to BGCL.			
Substation			
Sl. No.	Details of work	Tentative Cost (Cr.)	Status
1	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS Sub-station at Chapra	85.24	Work Started
2	Construction of 2x160 MVA + 3x50 MVA, 220/132/33 kV new GIS Sub-station at Gaya (Manpur)	77.64	
3	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS Sub-station at Nawada	60	
4	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS Sub-station at Sheikhpura	60	
5	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS Sub-station at Hathidah	60	
6	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS Sub-station at Jamalpur	60	
7	Construction of 2x160 MVA + 2x50 MVA, 220/132/33 kV new GIS Sub-station at Sabour	80.24	

List of work to be executed under Phase-IV, Part-I assigned to BGCL.			
Lines			
Sl. No.	Details of work	Tentative Cost as per DPR(Cr.)	Status
1	Chapra 220/132 kV new S/S – Chapra 132/33 kV S/S, 132 kV D/C transmission line (Zebra conductor)- 20 CKM	8.07	Work Started
2	Hazipur 220/132 kV new S/S – Chapra 220/132 kV S/S, 220 kV D/C transmission line- 130 CKM	44.19	
3	Chapra 220/132 kV S/S – Siwan, 132 kV D/C transmission line- 160 CKM	35.67	
4	LILO of one circuit of 132 kV D/C Khagaul-Digha line at Bihta.- 30 CKM	7.48	
5	Patna (POWERGRID)-Khagaul, 220 kV D/C transmission line.- 20 CKM	7.09	
6	LILO of 220 kV D/C Biharsharif – Bodhgaya line at Gaya (new) (Manpur) S/S- 60 CKM	18.40	
7	LILO of 132 kV D/C Bodhgaya-Chandauti (ckt 3 & 4) at Gaya new (Manpur) S/S- 60 CKM	12.65	
8	LILO of 132 kV S/C Bodhgaya-Wazirganj line at Gaya new (Manpur) S/S.- 30 CKM	7.85	
9	132 kV S/C (on D/C Tower) Gaya new (Manpur)-Hulasganj line.- 40 CKM	18.67	
10	220 kV D/C (High Capacity) Gaya (POWERGRID)-Gaya new (Manpur) line- 40 CKM	13.09	
11	220 kV D/C (High Capacity) Nawada new-Gaya new (Manpur) line- 130 CKM	78.93	
12	132 kV D/C Sheikhpura(New) – Sheikhpura (Old) transmission line (High Capacity)- 20 CKM	7.18	
13	220 kV D/C Sheikhpura (New) – Nawada (New) transmission line (High Capacity)- 120CKM	70.73	
14	220 kV D/C (High Capacity) Jamalpur new-Sheikhpura (New) transmission line- 160 CKM	91.02	
15	132 kV S/C (on D/C tower) Sheikhpura new – Biharsharif transmission line- 50 CKM	19.35	
16	132 kV D/C Nawada (New) – Nawada 132/33 kV (High Capacity) S/S- 20CKM	7.18	
17	LILO of 220 kV Begusarai-Biharsharif line at 220 kV Hathidah- 60 CKM	18.38	
18	132 KV D/C Hathidah (New) –Hathidah (Old) transmission line (Zebra Conductor)- 20 CKM	7.18	
19	LILO of 132 kV D/C (High Capacity) Sultanganj-Lakhisarai transmission line at Jamalpur.- 30 CKM	6.61	
20	132 kV D/C Jamalpur (New) – Jamalpur (Old) transmission line (Zebra Conductor).- 30 CKM	10.1	
21	132 kV D/C Sabour (New) – Sabour (Old) transmission line (Zebra Conductor).- 20 CKM	7.4	
22	LILO of 132 kV D/C Kahalgaon-Sultanganj line at Sabour.- 20 CKM	5.01	
23	220 kV D/C (High Capacity) Sabour (New) – Jamalpur (New) transmission line.- 140 CKM	83.63	
	Total:- 1410 CKM	583.34 Cr.	
i	220 KV line-860 CKM		
ii	132 KV line- 550 CKM		

List of works to be executed under Phase-IV, Part-II assigned to BGCL			
SUB-STATION			
Sl. No.	Details of works	Tentative cost as per DPR(Cr.)	Status
1	2x500 MVA, 400/220 kV GIS substation at Bihta	116	DPR under appraisal hearing beeing done at the level of State Regulatory
2	2x500 MVA + 2x160 MVA, 400/220/132 kV GIS substation at Gaighat	116	
3	2x500 MVA, 400/220 kV GIS substation at Fatuha	116	
4	3x160 MVA+4x50 MVA, 220/132/33 kV MVA GIS Substation at Jakkanpur	61	
5	3x160 MVA, + 2x50 MVA 220/132/33 kV GIS Substation at Mithapur	61	
6	2x160 MVA, + 2x50 MVA 220/132/33 kV MVA GIS Substation at Dumraon	60	

List of works to be executed under Phase-IV, Part-II assigned to BGCL			
Lines			
Sl. No.	Details of works	Tentative cost (Cr.)	Status
1	LILO of one ckt of Purnea – Naugachia/Khagaria 132 kV D/C line at Katihar.- 60 CKM	14.5	To be implemented by BGCL(JV of BSPHCL & PGCIL) from domestic loan. DPR under appraisal. First hearing done on 30.03.15 at Regulator level.
2	LILO of Biharsharif-Muzaffarpur 400 kV D/C line at Gaighat 400/220/132 kV Substation- 60 CKM	46.67	
3	Fatuha (New) – Gaighat(New) 400 kV D/C Transmission line. - 60 CKM	46.65	
4	Bihta 400/220 kV – Patna (POWERGRID) 400 kV D/C Transmission line.- 70 CKM	56.15	
5	Patna (POWERGRID) – Fatuha (new) 400 kV D/C Transmission line.- 20 CKM	32.68	
6	Jakkanpur/BSEB Colony 220/132/33 kV new S/S – Khagaul 220 kV D/C line.- 30 CKM	12.43	
7	Gaighat 400/220/132 kV New Substation – Jakkanpur/BSEB Colony 220/132/33 kV new Substation, 220 kV D/C line.- 40 CKM	13.69	
8	Patna (POWERGRID)-Mithapur/Karbigahia 220/132 kV new substation, 220 kV D/C line.- 30 CKM	10.73	
9	Fatuha 400/220 kV new Substation – Gaighat 400/220/132 kV new substation, 220 kV D/C line.- 40 CKM	13.69	
10	LILO of Ara (POWERGRID) – Pusauli (POWERGRID) 220 kV D/C line at Dumraon (new) Substation.- 60 CKM	19.39	
11	Dumraon 220/132 kV (new) substation – Dumraon 132/33 kV (Old) Substation, 132 kV D/C line (Zebra Conductor).- 20 CKM	7.47	
12	LILO of Fatuha (BSEB) – Gaighat (BSEB), 132 kV D/C line (one ckt via Katra) at Gaighat new GIS Substation.- 60 CKM	14.91	
13	LILO of both circuit at 220 kV D/C Fatuha-Khagaul line at Fatuha (new) GIS Substation.- 20 CKM	9.11	
14	LILO of Ara-Khagaul 220 kV D/C line at Bihta.- 20 CKM	9.26	
15	LILO of one circuit of Jakkanpur-Sipara 132 kV D/C line at new GIS Substation Jakkanpur/BSEB Colony.- 30 CKM	7.88	
16	Gaighat 400/220/132 kV new Substation – Mithapur/Karbigahia 220/132 kV (new) substation, 220 kV D/C line.- 30 CKM	10.73	
17	Bihta 400/220 kV new (GIS) substation-Bihta (new, BSPTCL) 220 kV D/C line.- 20 CKM	8.14	
18	LILO (tapping arrangement) of 132 kV Jakkanpur (BSPTCL) – Mithapur (BSPTCL) S/C line at Mithapur (new) GIS Substation (6 KM XLPE cable + 10 KM overhead).-20 CKM	6.19	
	Total:- 690 CKM	340.20 Cr.	
	400 KV line:- 210 CKM		
	220 KV line:- 290 CKM		
	132 KV line:- 190 CKM		

Sanction Project Under State Plan			
Replacement of old outlived 20 nos. MVA Power Transformer by 50 MVA Power Transformer in the following 14 nos. 132/33 KV GSS(Rs. 60.00 Cr)			
Sl. No.	Name of GSS	Nos of Power Transformer to be replaced	Status
1	132/33 KV GSS, Jamalpur	2	Tender in process
2	132/33 KV GSS, Kahalgaon	1	
3	132/33 KV GSS, Khagaria	1	
4	132/33 KV GSS, Saharsa	2	
5	132/33 KV GSS, Sheetalpur	1	
6	132/33 KV GSS, Chapra	2	
7	132/33 KV GSS, Siwan	2	
8	132/33 KV GSS, Motihari	2	
9	132/33 KV GSS, Dhaka	1	
10	132/33 KV GSS, Samastipur	1	
11	132/33 KV GSS, Darbhanga	1	
12	132/33 KV GSS, Paudaul	2	
13	132/33 KV GSS, Rajgir	1	
14	132/33 KV GSS, Hathidah	1	
	Total	20	
<i>Note:- The places of augmentation may change because some replacement has already been done during pendency of this scheme.</i>			
1	Construction of 220/132/33 KV Bihta GSS(.99.00 Cr. with associated lines)		Work in progress
2	Sipra- Bihta 220 KV D/C Line		
3	Bihta 220/132 KV- Bihta 132/33 KV 132 KV line		

Sl. No.	Name of GSS/ Capacity	District	Capacity(MVA)	Associated Transmission Line	Status
Construction of 14 Nos. of Grid Sub-Station along with associated 132KV Transmission Lines in 14 in Revenue Sub-divisions Scheme(Rs.555.90 Cr)					
1	Pakridayal (2x20 MVA)	East Champaran	2X20	132KV Motihari (400/132 KV)- Pakridayal DCSS line.	Work awarded
2	Chakia (2x20 MVA)	East Champaran	2X20	132KV Motipur (220/132 KV)- Chakia DCSS line.	
3	Jhanjharpur (2x10 MVA)	Madhubani	2X10	LILO of 132 KV Jainagar-Phulparas DCSS line	
4	Benipur (2x10 MVA)	Darbhanga	2X10	132 KV Kusheshwarsthan- Benipur DCSS line	
5	Belsand (2x10 MVA)	Sitamarhi	2X10	LILO of one circuit of 132KV Dhaka- Sitamarhi DCSS line	
6	Shahpur Patori (2x20 MVA)	Samastipur	2X20	132KV Samastipur (New) (220/132 KV)- Shahpurpatori DCSS line.	
7	Bakhri (2x20 MVA)	Begusarai	2X20	132 KV Begusarai (220/132 KV)- Bakhri DCSS line.	
8	Manjhaul (2x10 MVA)	Begusarai	2X10	132 KV - Bakhri- Manjhaul DCSS line.	
9	Balia (2x10 MVA)	Begusarai	2X10	132 KV Manjhaul - Balia DCSS line.	
10	Nirmali (2x20 MVA)	Supoul	2X20	LILO of one circuit of 132KV Phulparas- Supoul line	
11	Triveniganj (2x10 MVA)	Supoul	2X10	132 KV Supoul (New)- Triveniganj DCSS line.	
12	Banmankhi (2x20 MVA)	Purnea	2X20	132 KV Udakishanganj- Banmankhi DCSS line.	
13	Manihari (2x20 MVA)	Katihar	2X20	132KV Barsoi- Manihari DCSS line	
14	Piro (2x20 MVA)	Bhojpur	2X20	132KV Bikramganj- Piro DCSS line	
Construction of 17 Nos. of Grid Sub-Station along with associated 132KV Transmission Lines in 17 in Revenue Sub-divisions Scheme(Rs.668.72 Cr)					
1	Hathua (2x20 MVA)	Gopalganj	2X20	LILO on 132 KV Gopalganj- Siwan (S/C) direct transmission line on Rosera	Work awarded
2	Maharajganj (2x20 MVA)	Siwan	2X20	132 KV Musrakh- Maharajganj DSSS line	
3	Narkatiyaganj (2x20 MVA)	West Champaran	2X20	LILO on 132 KV Bettia- Ramnagar (S/C) line to Narkatiaganj for	

Sl. No.	Name of GSS/ Capacity	District	Capacity(MVA)	Associated Transmission Line	Status
				Narkatiaganj	
4	Areraj (2x20 MVA)	East Champaran	2X20	LILO on 132KV Gopalganj- Bettia S/C for line at Bettia	
5	Rosera (2x20 MVA)	Samastipur	2X20	LILO on 132 KV Begusarai- Kusasawarsthan DCSS transmission line on Rosera.	
6	Pupri (2x20 MVA)	Sitamarhi	2X20	132KV Benipatti- Pupri DCSS line	
7	Benipath (2x20 MVA)	Madhubani	2X20	LILO on 132 KV Madhubani- JainagarS line at Benipatti	
8	Mahnar (2x20 MVA)	Vaishali	2X20	132KV Jandaha- Mahnar DCSS line	
9	Araria (2x50 MVA)	Araria	2X50	LILO of 132 KV Purnea- Forbisganj (S/C) line	
10	Barsoi (2x20 MVA)	Katihar	2X20	132 KV Kishanganj (New)- Barsoi DCSS line	
11	Dhamdaha (2x20 MVA)	Purnea	2X20	LILO on 132 KV Purnea-Saharasa line to Chikni- Dhamadaha GSS	
12	Baisi (2x20 MVA)	Purnea	2X20	LILO on 132 KV Kishanganj- Dalkola (S/C) line at Baisi	
13	Gogri (2x20 MVA)	Khagaria	2X20	LILO on BTPS- Khagaria Transmission line at Gogri	
14	Teghra (2x20 MVA)	Begusarai	2X20	132KV Begusarai- Teghra DCSS line	
15	Simri Bakhtiyarpur (2x20 MVA)	Saharsa	2X20	132 KV Sonebarsa- Teghra DCSS line	
16	Tarapur (2x20 MVA)	Munger	2X20	132 KV Jamalpur (New)- Tarapur DCSS line	
17	Bhabhua (2x50 MVA)	Kaimur	2X50	132 KV Pusouli (New)- Bhabhua DCSS line	

Annexure-VIII

Year wise funding for approved /sanctioned Transmission plan for implementation under 12th plan & New Proposals

Sl. No.	Name of the Scheme	Project Cost in Cr.(Rs)	Sanctioned under plan	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
				Rs in Cr.	Rs in Cr.	Rs in Cr.	Rs in Cr.
1							
(i)	Phase-II, Extension Scheme	472.53	Sanctioned under Special Plan/ BRGF for implementation by BSPTCL.	236.27			
(ii)	Phase-III, Part-I Scheme	1370.02		685.01			
(iii)	Phase-III, Part-II, Kishanganj Project	356.1		178.05			
(iv)	N-1 Compliance Scheme	293.84		146.92			
2							
(i)	Replacement of old outlived 20 nos. of 20 MVA Power Transformer by 50 MVA Power Transformer with associated strengthening work.	110	Sanctioned under State Plan for implementation by BSPTCL.	55.00	55.00		
(ii)	Bihta 220/132/33 KV GSS, 2x160 + 2x 50 MVA with associated lines.	99.65		40.00	59.65		
(iii)	Construction of 14 nos. of 132/33 KV Grid Sub-Station along with associated transmission lines in 14 Revenue Sub-Division Scheme	555.9		194.57	361.33		
(iv)	Construction of 17 nos. of 132/33 KV Grid Sub-Station along with associated transmission lines in 17 Revenue Sub-Division Scheme	668.72		234.05	434.67		



Sl. No.	Name of the Scheme	Project Cost in Cr.(Rs)	Sanctioned under plan	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
				Rs in Cr.	Rs in Cr.	Rs in Cr.	Rs in Cr.
3							
(i)	Construction of 3 nos. of Grid Sub-Stations along with associated transmission lines (220KV - 57 KM & 132KV - 124 KM)	196.86	Sanctioned under ADB for implementation by BSPTCL.	82.6			
4							
(i)	Phase-IV, Part-I Scheme	1700	To be implemented by BGCL (JV of BSPHCL & PGCIL) from Loan.	1250.00	90.00		
(ii)	Phase-IV, Part-II Scheme	2165		425.00	1593.75	166.25	
	Total	8008.62		3527.47	2594.4	166.25	

New proposal under State plan							
Sl. No.	Name of the Scheme	Project Cost					
1	New Kagharia GSS 220/132/33 KV(2X160+2X50 MVA) with associated lines.	106 Cr.	State Plan	10.6	74.2	21.2	
2	Generation Linked Scheme:- Proposed - Power evacuation system from Lakhisarai, Pirpainti and Buxar TPS by One GSS - Kajara Pool & associated lines from all Three TPS.	1600Cr.	Linked with power plant implementation.				
3	Transmission capacity enhancement by 500 MVA	800 Cr.	State Plan			320	480
4	Transmission capacity enhancement by 3200 MVA	5120 Cr.				2048	3072
			Total	3538.07	2668.6	2555.45	3552



Annexure-IX

RAPDRP-B

Sl. No.	Particulars	SCOPE /SANCTION SBPDCL	Scope/ Sanction NBPDCCL	Estimated Cost/ LOA Cost	Achievement till Mar '15 SBPDCL	Achievement till Feb'15 NBPDCCL
1	33/11 KV New PSS			1279.5 CRORES		
	a) In Nos.	6	1		1	0
	b) Capacity additional (in MVA)	110	10		20	0
2	Augmentation of PSS					
	a) In Nos.	69	13		38	13
	b) Capacity additional (in MVA)	335.5	65		183.7	65
3	R&M of PSS (in Nos.)	30	27		2	0
4	New 33 KV Lines (CKM)	173.39	1.9		23.09	0
5	R&M 33 KV Lines (CKM)	140.71	71.94		10.765	0
6	New 11 KV Lines (CKM)	435.84	255.97		48.905	49.2
7	R&M 11 KV Lines (CKM)	500.19	432.1		40.34	107
	New DT (Nos.	1624	696		104	253
8	New DT MVA)	367.05	155		20.665	80
	DT Augmentation (Nos. & MVA)	2859	992		1200	586
9	DT Augmentation. & MVA)	318.81	106		134.86	66
10	New LT Line (in CKM)					
	AB Cable	648.23	241.6		78.31	112.5
	Conductor	139.65	288.2		16.42	38
11	R&M of LT Line (in CKM)					
	AB Cable	2141.094	1546.8		78.31	439
	Conductor	73	602.7		19.4	220
12	Consumer Metering (Nos.)					
	a) Single Phase	245315	45090		79044	5772
	b) 3 Phase	13856	6231		1461	297
13	System Metering					
a	Feeder	60	63			0
b	DT	383	696			253



Annexure-X

RGVY 11th PLAN PHASE-II & 12th PLAN

S.I NO	Particulars	Scope 11 th Plan phase-II SbpdcI	Scope 12 th plan sbpdcl	LOA COST 11 th PLAN & 12 th PLAN	Scope 11 th Plan phase-II NbpdcI	Scope 12 th plan NbpdcI	Achievement 31 st march 15 sbpdcl		Achievement 31 st march 15 NbpdcI	
							11 th Phase-II	12 th Plan	11 th Phase-II	12 th Plan
1	33/11 KV New PSS			RGVY 11 TH PLAN PHASE-2 LOA COST 3539.01 CRORES& 12 TH PLAN 5366.9 CRORES						
	a) in Nos.	23	8		27	38	0	0	0	0
	b) Capacity additional (in MVA)	220	105		301.3	405	0	0	0	0
2	Augmentation of PSS									
	a) in Nos.	88			24	170	38	0	17	0
	b) Capacity additional (in MVA)	625			128.85	1240.85	300	0	63.6	0
4	New 33 KV Lines (CKM)	503			436.36	697.85	16	0	0	0
5	R&M 33 KV Lines (CKM)	336			103.75		28	0	0	0
6	New 11 KV Lines (CKM)	23104	8165.27		7544.32	19889.45	874.43	16.5	705.94	0
7	R&M 11 KV Lines (CKM)	1495			771		25		3.38	0
8	New DT (Nos. & MVA)									
	New DT (Nos. & MVA)	28106/1770	16727/1086.58		13223/834.53	38524/2526.6	2443/153.9	40/2.5	1917/120.77	0
	DT Augmentation (Nos. & MVA)									
9	DT Augmentation (Nos. & MVA)									
10	New LT Line (in CKM)									
	AB Cable	8179	13380.6		4091.74	15410.33	1728.83	0	1555.92	0
	Conductor	12268			5086.155	15410.33	1279.07		799.01	0
11	R&M of LT Line (in CKM)									
	AB Cable									
	Conductor	2099			56		16	0	0	0
12	Consumer Metering (Nos.)									
	a) Single Phase	1827008	1319303		1177878		112723	0	86219	0

ADB

Particulars	Estimated Cost/ LOA Cost	Nbpdcl(PACKAGE B&C)		Sbpdcl(PACKAGE A&D)	
		Scope/Sanction	Achievement till March'15	Scope/Sanction	Achievement till March'15
33/11 KV New PSS					
a) in Nos.		3	2		
b) Capacity additional (in MVA)		60	40		
Augmentation of PSS					
a) in Nos.		5	5	1	
b) Capacity additional (in MVA)		66.85	66.85	10	
R&M of PSS (in Nos.)		5	5	7	7
New 33 KV Lines (CKM)		66.5	13	31.5	2.5
R&M 33 KV Lines (CKM)		22.6	2	41	3
New 11 KV Lines (CKM)		44	30	40	23
R&M 11 KV Lines (CKM)		241	123	237	174
New DT (Nos. & MVA)		311/50.6	267	283	273
DT Augmentation (Nos. & MVA)					
R&M of DT		200	136		
New LT Line (in CKM)		70	61	95	69
AB Cable					
Conductor					
R&M of LT Line (in CKM)		258	97	220	124
AB Cable					
Conductor					
Consumer Metering (Nos.)					
a) Single Phase		31971	26902	48861	40631
b) 3 Phase		3318	1970	235	109
c) LT CT					
System Metering					
Feeder					
DT		511	0		

Special Plan (BRGF)

Particulars	Estimated Cost/ LOA Cost	NBPDC		SBPDCL	
		Scope/Sanction	Achievement till Feb'15	Scope/Sanction	Achievement till Feb'15
33/11 KV New PSS	4980.56				
a) in Nos.		38	1	30	
b) Capacity additional (in MVA)		620	20	510	
Augmentation of PSS					
a) in Nos.		95	63	92	81
b) Capacity additional (in MVA)		411.25	315	387.15	353.3
R&M of PSS (in Nos.)		178		203	0
New 33 KV Lines (CKM)		1821	47.90	1219.65	10.5
R&M 33 KV Lines (CKM)		306.17	Nil	111.5	0
New 11 KV Lines (CKM)		10520	502.9	9430	115
R&M 11 KV Lines (CKM)		1793	Nil	987	0
New DT (Nos. & MVA)		5500	4	6182	0
New DT (Nos. & MVA)		851.6 MVA		762.4	0
DT Augmentation (Nos. & MVA)		3928		2987	0
DT Augmentation (Nos. & MVA)		392.8	Nil	213.15	0
New LT Line (in CKM)					
AB Cable		1540 Ckm	Nil	2831.79	
Conductor		6060 Ckm	71.8	19176.4	351.1
R&M of LT Line (in CKM)					
AB Cable		5605	Nil	2550	
Conductor		3569.15	Nil	9117.56	
Consumer Metering (Nos.)					
a) Single Phase		731372	73137	325000	325000
b) 3 Phase		Nil	Nil	15000	
c) LT CT				3000	2800
System Metering					
Feeder		596	60	830	0
DT		13465	1400	5000	2500

Annexure-XIII

DDUGJY- Project wise details of projects approved under XII Plan

Status as on 30.06.2015

Sl. No.	Name of Project	State Power Utility	PIA	Scope				Achievement			
				UE Villages	IE Villages	Habitations	BPL Hhs	UE Villages	IE Villages	Habitations	BPL Hhs
1.	Begusarai	NBPDCL	NBPDCL		694	3166	283548		23		350
2.	Darbhanga	NBPDCL	NBPDCL	47	1024	3374	270054	14	22		
3.	Gopalganj	NBPDCL	NBPDCL	381	1118	5086	213988	32	40		2965
4.	Kaithar	NBPDCL	NBPDCL	1050	257	2224	62068	26	13		329
5.	Khagaria	NBPDCL	NBPDCL	29	199	1174	169399	4	12		148
6.	Madhepura	NBPDCL	NBPDCL	8	372	2371	140289	6	4		185
7.	Madhubani	NBPDCL	NBPDCL	30	1003	3666	446048	30	8		1536
8.	Muzzafarpur	NBPDCL	NBPDCL		1717	2914	276644		21		25
9.	Paschim Champaran	NBPDCL	NBPDCL	229	1245	4679	291612	8	5		241
10.	Purba Champaran	NBPDCL	NBPDCL	29	1224	4983	393647	2			
11.	Saharsa	NBPDCL	NBPDCL		351	2601	128030		55		1580
12.	Samastipur	NBPDCL	NBPDCL	46	1063	4266	405583	11	3		133
13.	Saran	NBPDCL	NBPDCL	560	1205	4579	357092	4			
14.	Sheohar	NBPDCL	NBPDCL	6	185	633	60535	2	2		
15.	Sitamarhi	NBPDCL	NBPDCL	30	769	2589	302141	11	7		1172
16.	Supaul	NBPDCL	NBPDCL	15	460	3677	221013	2			134
17.	Vaishali	NBPDCL	NBPDCL	22	1400	3160	59953	11	18		1405
	Total NBPDCL			2482	14286	55142	4081644	163	233		10203
1.	Arwal	SBPDCL	SBPDCL		299	576	76657				
2.	Aurangabad	SBPDCL	SBPDCL	84	1658	3309	173371	5			



Sl. No.	Name of Project	State Power Utility	PIA	Scope				Achievement			
				UE Villages	IE Villages	Habitations	BPL Hhs	UE Villages	IE Villages	Habitations	BPL Hhs
3.	Bhagalpur	SBPDCL	SBPDCL	118	826	3308	280070	9			
4.	Buxar	SBPDCL	SBPDCL	84	751	2896	146006	15			100
5.	Jamui	SBPDCL	SBPDCL	54	1192	3335	158939	37	30		2126
6.	Jehanabad	SBPDCL	SBPDCL	11	530	1494	77170				
7.	Kaimur	SBPDCL	SBPDCL	42	1186	3212	186972	16			883
8.	Lekhisarai	SBPDCL	SBPDCL	24	338	1687	64597				
9.	Munger	SBPDCL	SBPDCL	28	506	1645	124251	10	3		50
10.	Sheikhpura	SBPDCL	SBPDCL		261	325	31270				
	Total SBPDCL			445	7547	21787	1319303	92	33		3159
27.	Total Bihar			2927	21833	76929	5400947	255	266		13362



ANNEXURE-XIV

DISTRICTWISE PROJECTION OF DEMAND			
S.No.	Name of District	Existing Load (2012-13) * (In MW)	Projected Load Demand (2018-19) (In MW)
1	Araria	32	92
2	Begusarai	111	318
3	Darbhanga	114	327
4	East Champaran	86	247
5	Gopalganj	77	221
6	Katihar	40	115
7	Khagaria	30	86
8	Kishanganj	31	89
9	Madhepura	24	69
10	Madhubani	88	252
11	Muzzafarpur	138	396
12	Purnia	63	181
13	Saharsa	38	109
14	Samastipur	89	255
15	Saran	84	241
16	Sheohar	8	23
17	Sitamarhi	52	149
18	Siwan	72	206
19	Supaul	36	103
20	Vaishali	83	238
21	West Champaran	74	212
	TOTAL NBPDC	1370	3929
22	Kaimur	80	229
23	Bhagalpur	112	321
24	Gaya	213	611
25	Rohtas	167	479
26	Munger	59	169
27	Patna	660	1892
28	Nalanda	147	421
29	Buxar	65	186
30	Aurangabad	77	221
31	Nawada	57	163
32	Banka	32	92
33	Jehanabad	37	106
34	Arwal	17	49
35	Bhojpur	81	232
36	Shekhpura	29	83
37	Jamui	57	163
38	Lakhisarai	46	132
	Total SBPDCL	1936	5549
	TOTAL BIHAR	3306	9478
	*GOB Data		

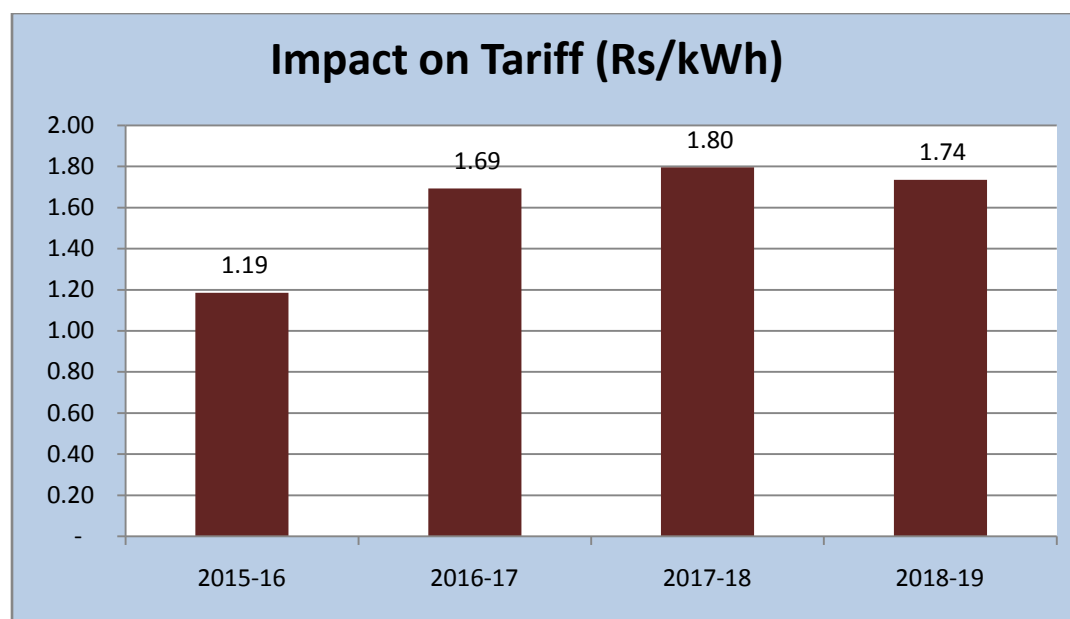
Average Billing Rate

VARIABLE ABR(Rs/kWh) based on above										
		2015-16		2016-17		2017-18		2018-19		
Sl.no	Description	Rs/kWh*	Energy(MU)	Amount (Cr Rs)	Energy(MU)	Amount (Cr)	Energy(MU)	Amount (Cr)	Energy(MU)	Amount (Cr)
1	Domestic	3.48	8539	2972	13578	4725	18850	6560	25087	8730
2	Other than domestic excl Irrigation	5.41	6467	3499	7760	4198	9312	5038	11175	6046
3	Agricultural (Irrigation)	3.83	1128	432	2739	1049	4888	1872	7573	2900
	Total		16134	6903	24077	9972	33050	13470	43835	17676
	ABR(Rs/kWh)			4.28		4.14		4.08		4.03

Sensitivity Analysis & Results

Sensitivity analysis has been carried out with respect to following parameters and impact thereof on the Tariff has been summarized in the tables below:

Implication on Tariff of 24x7 PFA



Sl. No.	Implication on Tariff	Unit	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
1	Additional Energy to be billed in the state	MUs	5,812	13,755	22,728	33,513
2	AT&C Losses (%)	%	42.63%	38.13%	34.00%	30.00%
3	Procurement of Additional Energy for supply	MUs	10,131	22,233	34,436	47,876
4	Cost of Power Purchase @ Rs. 4.26/kWh (including Intra state Transmission charges)	Rs. Crores	4,316	9,471	14,670	20,395
5	Annual T&D Infrastructure Cost (Rs. Crores)	Rs. Crores	85	299	537	720
6	Total cost of additional energy	Rs. Crores	4,401	9,770	15,207	21,115
7	Average Billing rate	Rs./kWh	4.28	4.14	4.08	4.03
8	Revenue realised by selling additional energy to the consumers	Rs. Crores	2,488	5,695	9,273	13,506
9	Additional Cost	Rs. Crores	1,913	4,075	5,934	7,609
10	Total Energy Sale (Existing + Additional Energy)	MUs	16,134	24,077	33,050	43,835
11	Impact on Tariff	Rs./kWh	1.19	1.69	1.80	1.74