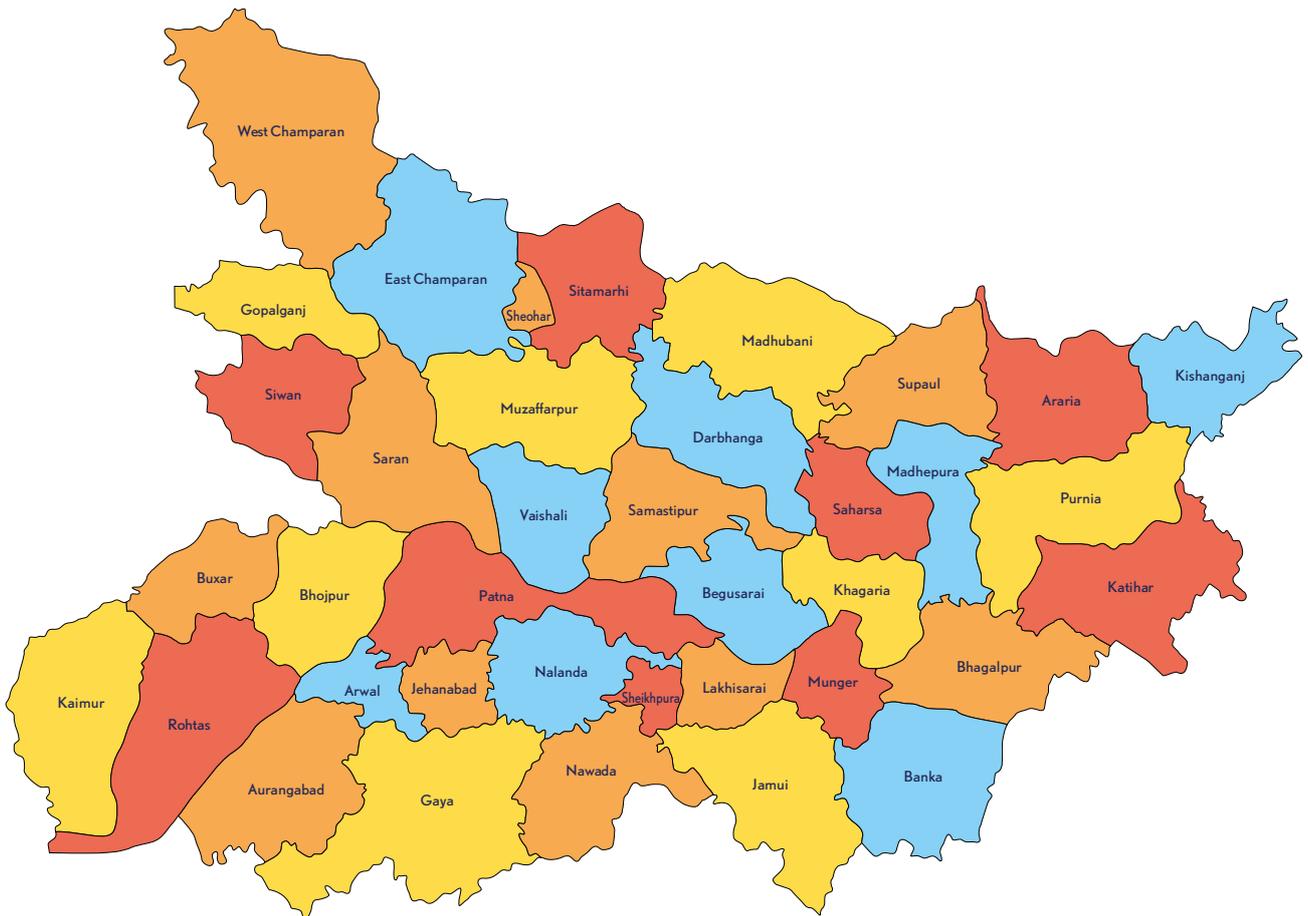




ENERGY STATUS REPORT ON BIHAR



BIHAR: KEY HIGHLIGHTS AT A GLANCE

Bihar is India's second-fastest growing economy among the poor states. Bihar has witnessed strong growth in the per capita net state domestic product (NSDP), which grew at a Compound Annual Growth Rate (CAGR) of 12.3% between 2004-05 and 2015-16 annually. This growth was mostly led by export of cereals, mineral fuels, edible vegetables and pharmaceutical products. The economy of Bihar is projected to grow at a CAGR of 13.4% during 2012-2017, i.e. in the 12th Five-Year Plan. According to the

latest state-wise export data for the last six years, exports from Bihar rose from a modest Rs. 351.34 crore in 2009-10 to Rs. 6,310.93 crore in 2014-15, pulling up Bihar onto the 17th rank in export from 24th rank in the last fiscal year.

This growth in economy led to a surge in power demand where the peak power demand increased by 168% in 8 years during 2008-09 and 2015-16.

Parameter	Information
Population (Rural) (Urban)	10.38 Crores 9.21 Crores (88.7 %) 1.17 Crores (11.2 %)
Area	94.2x103 Sq. Km
Households	Total Rural households - 16926968 Total Rural households (electrified) - 1754673 Total Urban households - 2013671 Total Urban households (electrified) - 1343762
Forest cover	Forest cover in Bihar has come down sharply after bifurcation of the state in the year 2000, and stands at a poor 7.23%. Out of 38 districts, only 11 have natural forests.

Table no. 1: Key facts on Bihar | **Source:** 24x7 Power for all¹

CURRENT SITUATION

POWER GENERATION

The installed electricity generation capacity in Bihar is 3,074 MW, as on December 31, 2016². This attributes less than 1% of India's total Installed capacity of 310 GW. Out of the total 3,074 MW, 89% capacity is from coal

based thermal, 4.2% comes from hydro, and the balance 6.6% comes from renewable energy sources. In terms of ownership, Central Sector Allocation has the largest share of 86.52%, followed by the share of state sector that is 9.12%, and Private sector / Independent Power Producer contributes a mere 4% of the total energy mix in Bihar.

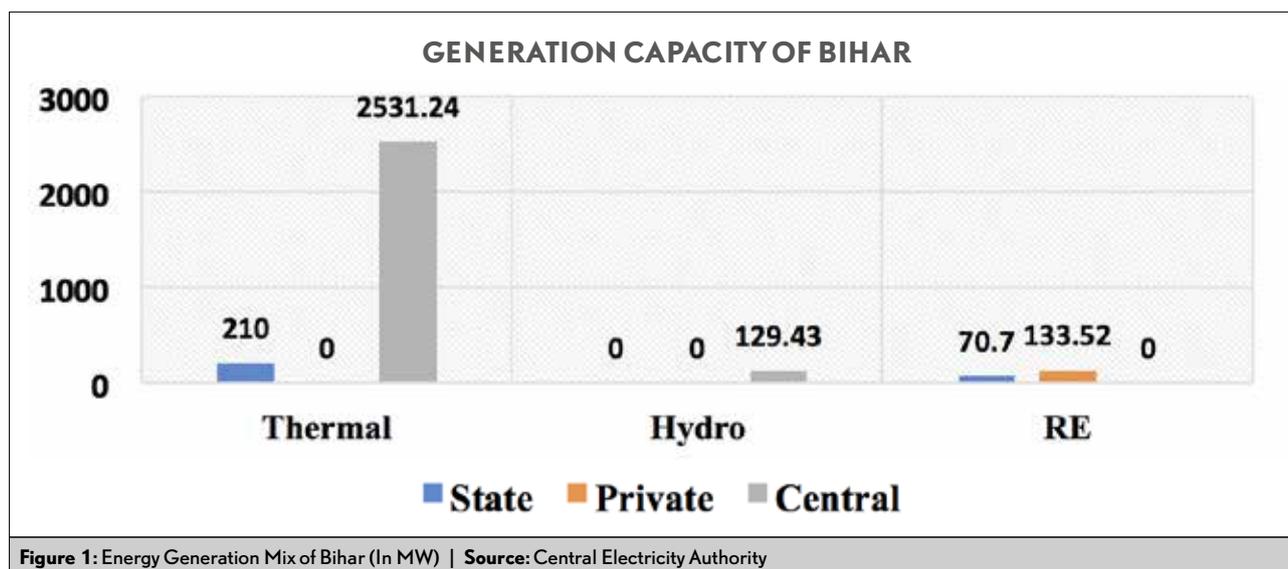


Figure 1: Energy Generation Mix of Bihar (In MW) | Source: Central Electricity Authority

These figures paint a very grim picture of growth in the energy sector in Bihar. For a population of over 110 million in the state, a measly installed capacity of 3 GW is available, that too is majorly owned by Central Government agencies. The involvement of private sector/independent power producer is almost negligible in the state, which indicates that for Bihar to move towards energy sufficiency, it is imperative to entice more state and private sector investment. These investments are also needed to acquire more sustainable sources and technologies, like solar and biomass; since the state is highly dependent on coal and other fossil fuel energy. Fortunately, in the last few years, both state and central government have been inclined to strengthen investment and policy support towards renewable energy and its deployment to meet 24*7 power for all target. They have also projected the capacity addition of 7,151 MW by FY 2018-19 making total capacity over 10 GW.

POWER DEMAND AND AVAILABILITY

In FY 2015-16, the annual energy requirement was in order of 23,960 MU against the availability of 23,658 MU, resulting in energy shortage by 1.6%. Likewise, the peak power demand in the year 2015-16 was 3,735 MW against the achieved demand of 3484 MW, indicating a

peak shortage of 6.7%. These energy and peak shortages have reduced significantly in the last eight years. The annual energy requirement of Bihar during the year 2008-09 was in the order of 10,527 MU against the availability of 8,801 MU, resulting in energy shortage by 16.4%; while the peak demand in Bihar during the year 2008-09 was 1,842 MW against met peak demand of 1,333 MW, resulting a peak shortage of 27.6%. The reduction in shortages is mainly since the increase in availability has outstripped the increase in demand

Figure 2 shows that the energy demand has almost doubled in the last 8 years and also the gap between demand and supply has shrunk evidently. However, this increase in energy demand and supply is still less than the projected growth by CEA and Ministry of Power. Energy requirement is projected to grow at a CAGR of 11.8%, against the CAGR of energy availability at 13.75%. But the annual energy requirement of state in 2014-15 was 13% less than the demand projected by the Ministry of Power i.e. 22,225 MU. The plausible reason behind this lag could be either the industrial growth that occurred at a pace much slower than the anticipated pace, or that the anticipated electrification of unelectrified households did not happen.

² Executive summary of month of December 2016 (PDF). Central Electricity Authority, Ministry of Power, Government of India http://www.cea.nic.in/reports/monthly/executivesummary/2016/exe_summary-12.pdf

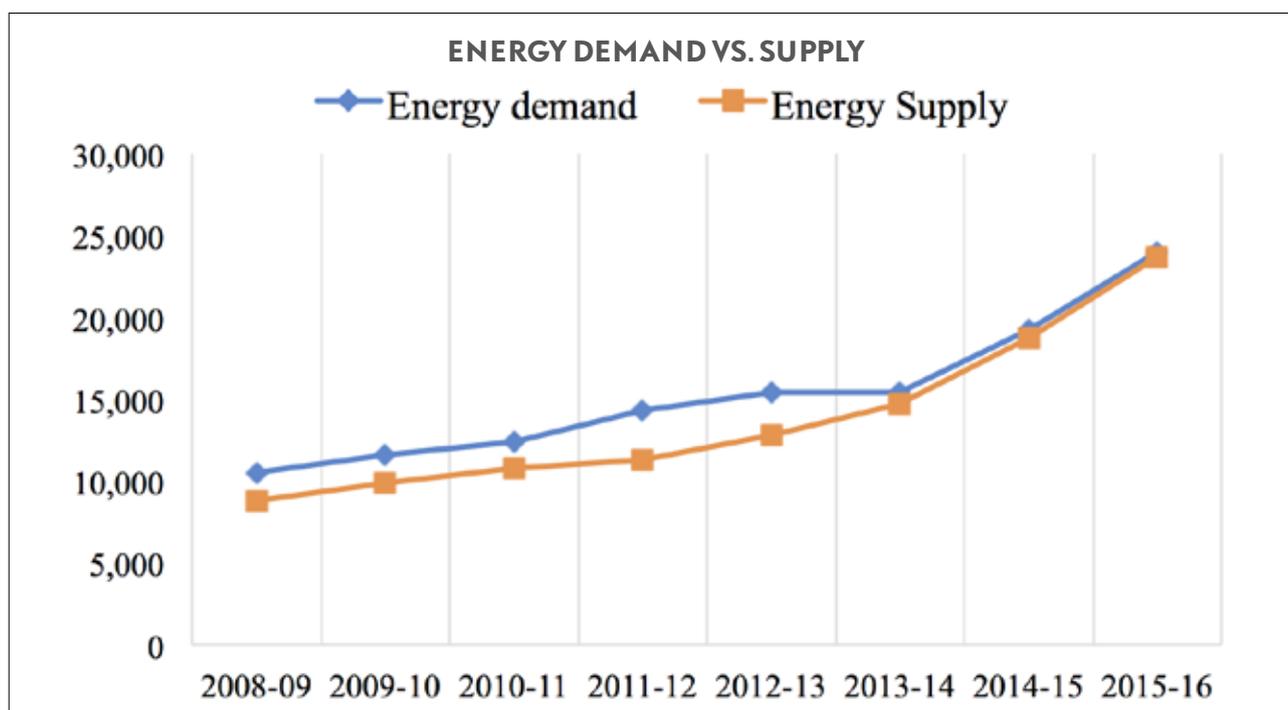


Figure. 2: Energy Demand Vs Supply (In MU) | Source: Central Electricity Authority³

The Ministry of Power released the Power for All report for Bihar, where the projected rise in energy availability by FY 2018-19 is upto 63,229 MU, while the peak energy

availability is 8093 MW. This projection is almost double than the current availabilities of FY 2015-16.

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Energy Demand (In MU)	10527	11587	12384	14311	15409	15391	19294	23960
Energy Supply (In MU)	8801	9914	10772	11260	12835	14759	18759	23658
Energy Deficit (%)	16.40%	14.40%	13.00%	21.30%	16.70%	4.10%	2.80%	1.30%
Peak Power Demand (In MW)	1842	2249	2140	2031	2295	2465	2994	3735
Peak power Supply (In MW)	1333	1509	1659	1738	1784	2312	2874	3484
Peak Power Deficit (%)	27.6 %	32.90%	22.50%	14.40%	22.30%	6.20%	4.00%	6.70%

Table no. 2: Actual Power Supply Position in India from FY 2008-09 to FY 2015-16 | Source: Central Electricity Authority⁴

POWER AVAILABILITY

Jammu and Kashmir is the most energy-starved state facing power deficit by 15.3%. There are other parts of the country, such as Uttar Pradesh (12.5%), North-Eastern states (5.2%) and Karnataka (5.2%) that have higher power deficit than Bihar.

Among the eight states the across Gangetic Plain, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand and Uttar Pradesh, Bihar (1.3%) had a lower power deficit as compared to Uttar Pradesh (17%), Jharkhand (2.3%) and Uttarakhand (1.7%) for FY 2015-16⁵.

So, Bihar appears to be doing well, as regards power deficits, but that is because its power demand, capacity and

generation, as we mentioned, are very low. Bihar's power generation is primarily dependent on thermal energy (89%), while hydro and renewables account for only 4.2% and 6.6%, respectively. Also, per capita electricity consumption of Bihar is lowest contributing to low power demand.

PER CAPITA CONSUMPTION

The per capita power consumption in Bihar is 228.8 kWh, which is 76% lower than the all-India average of 901.3 kWh. Figure 3 shows the trends in the yearly increase of Per Capita Electricity Consumption for the last 10 years. States like Haryana, Punjab, Gujarat and Tamil Nadu have per capita electricity consumption over 1700 kWh, which is almost double than the national average. In comparison to these states, Bihar ranks as the lowest per

³ Load Generation Balance Report, Central Electricity Authority

⁴ Executive summary of month of December 2016 (PDF). Central Electricity Authority, Ministry of Power, Government of India. http://www.cea.nic.in/reports/monthly/executivesummary/2016/exe_summary-12.pdf

⁵ 24*7 Power for All – Bihar, December 2015, http://powermin.nic.in/sites/default/files/uploads/BIHAR_PFA_REPORT_15.12.2015_With_Signature_II.pdf

capita consumption in the country. The low per-capita power consumption evidently indicates that a large portion of the population of Bihar does not have access to modern energy, despite claiming that over 98% of the villages are electrified. The data also highlights that the cities and

villages that are electrified through central grid system are highly underserved. Therefore, the energy access outcome must be measured at the household level, in both villages and cities to capture this power disparity.

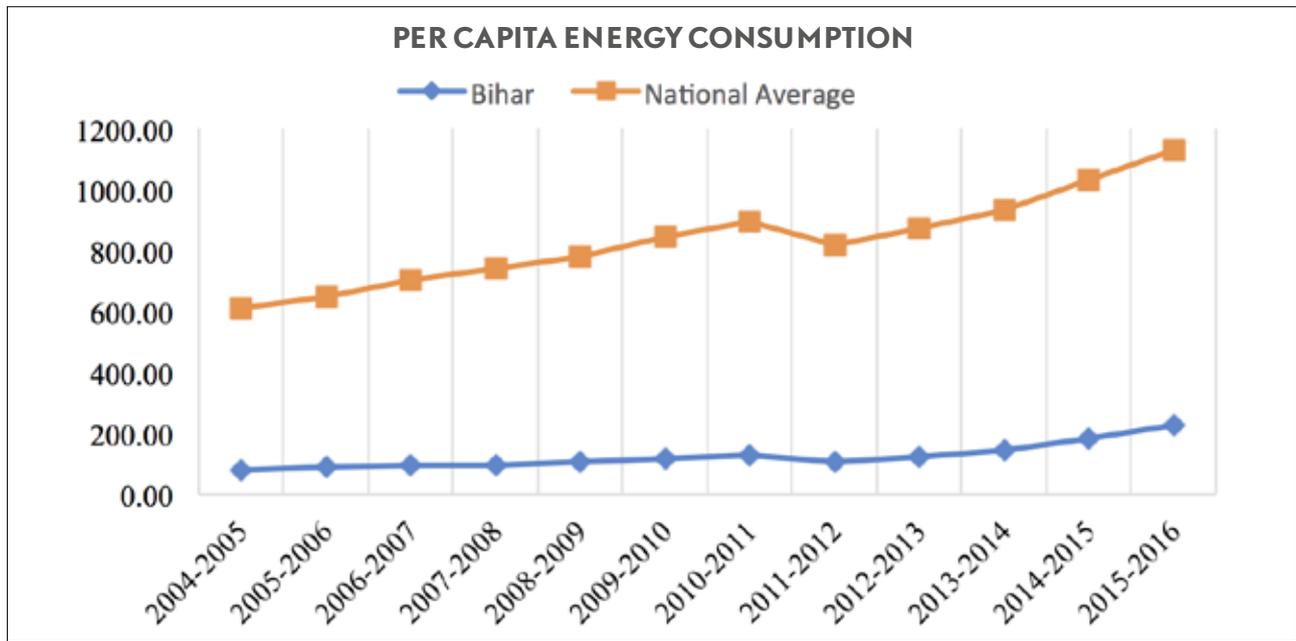


Figure 3: Per Capita Energy Consumption of Bihar vs. National Average (In kWh) | Source: Indiatat.com

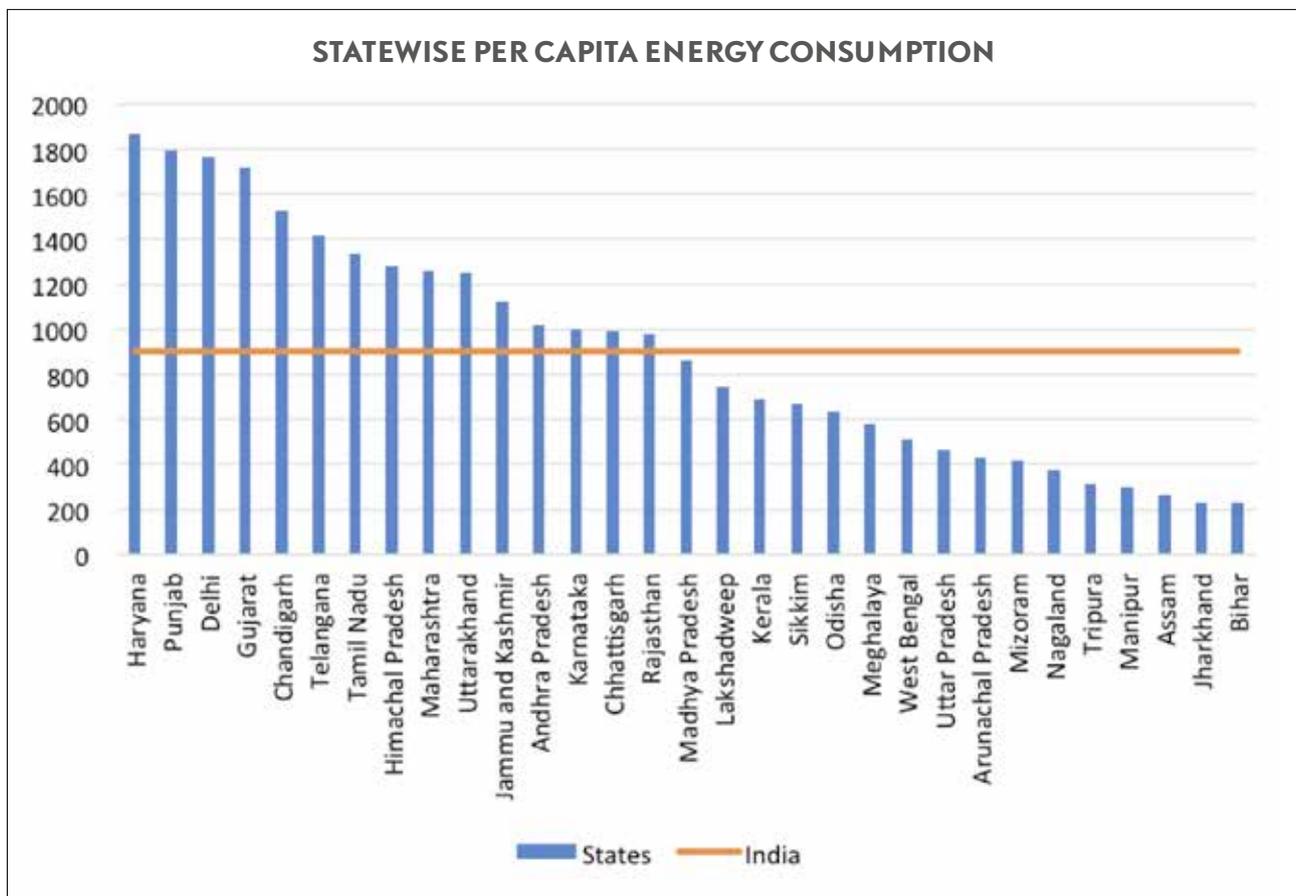


Figure 4: Per Capita Energy Consumption (State wise) (In kWh) | Source: Indiatat.com

T & D LOSSES

The distribution network of Bihar consists of 1,10,758 circuit km low tension lines, 2,200 nos of 11 kV feeders with 49,650 circuit km network, and 495 nos of 33 kV lines with 7,930.28 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 7,066.93 MVA respectively. The 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 trippings in the system. Bihar is also challenged by high transmission and distribution (T&D) losses, reported to be 42% in 2013-14 against the Indian average of 27%. In 2013-14, financial losses measured in terms of cost coverage are as high as 52% for the north Bihar distribution network, and 50% for the south Bihar distribution network. 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 revised tariff hike at 6.9% was that the additional revenue was neutralized by higher quantum of power purchase at comparatively higher cost due to additional requirement, and the state generation projects were not able to meet the additional demand.

The average AT&C loss of Bihar was 46.63% during 2014-15. However, Bihar has projected to reduce the AT&C losses at 21% level by 2021-22.

GOVERNMENT BODIES IN BIHAR POWER SECTOR

The Government of Bihar has restructured the erstwhile Bihar State Electricity Board into one apex holding company, Bihar State Power Holding Company Ltd. (BSPHCL) and its four subsidiaries. These subsidiaries are two distribution companies (DISCOMs), a transmission company and a generation company. The two DISCOMs are: North Bihar Power Distribution Company Ltd. (NBPDC) and South Bihar Power Distribution Company Ltd. (SBPDCL). The transmission company is Bihar State Power Transmission Company Ltd. (BSPTCL) and the generation company is Bihar State Power Generation

Distribution Agencies	Area	Consumer base
North Bihar Power Distribution Company Ltd	21 districts of North Bihar	Over 23 Lakhs Consumer
South Bihar Power Distribution Company Ltd	17 districts of South Bihar	Over 18 Lakhs Consumer
Bihar State Power Transmission Company Limited	Transmission network of 6182 Kms. of 132 K.V. Lines & 1663 Kms. of 220 K.V. lines & 75 Kms of 400 K.V. Line as well as 97 Nos. of operational EHV sub- stations with 7360 MVA Transformation Capacity	

STATUS OF ELECTRIFICATION

As per the census 2011, the total inhabited villages in the state of Bihar are 39,073. According to a report published by the Ministry of Power, there are 585 villages which are yet to be electrified as on January 2017, as per which, 98.6% of Bihar is electrified⁶. However, the household electrification numbers display a different scenario altogether. The 'Status of Rural Electrification in Bihar' report shows that only 54.50 lakh (44.5%) rural households are electrified, out of a total 121.96 lakh rural households. This variation in electrification status poses serious questions over the effectiveness of Deen Dayal Upadhaya Gram Jyoti Yojana (DDUGJY) Scheme.

There also has been a discrepancy in the number of rural households as quoted in the DDUGJY Status report. According to the Census Report 2011, there are about 169 lakh rural households with a CAGR of 2.95 %, accounting for about 190 lakh households in 2015-16. In contrast to

this, DDUGJY report shows details of only 121 lakh rural households. Thus, there is no accountability of almost 70 lakh households. This also reduces the percentage of rural household electrification to 28%. As per the Census report 2011, 6.69 lakh (33%) urban households are still unelectrified out of the total 20 lakh urban households. This number is projected to reduce to 3 lakh by 2015-16. However, considering urban centers as development focal point, 3 lakh unelectrified households is also highly questionable.

The state is planning to electrify around 140 lakh rural households by 2018-19 under the DDUGJY scheme of Gol 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 electrification is also being planned during the same period.

⁶ Status of Rural Electrification in Bihar
http://www.ddugjy.gov.in/mis/portal/state_wise_summary1.jsp?stateCode=10

RENEWABLE ENERGY: A STEP TOWARDS GREEN ENERGY

Renewable energy is increasingly becoming an important source of the energy mix. It suffices the dual objectives of meeting energy security and clean energy considerations. Bihar has a good potential for promotion and development of renewable and non-conventional energy projects, particularly solar and biomass projects. There exists good explorable options and potential for power generation from irrigation canal drops, solar, biomass cogeneration etc. The state has already issued liberal policies for promotion of renewable energy generation.

The 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 rooftop solar scheme
- ♦ Solar water pumping scheme particularly for agricultural consumers
- ♦ Action plan of the state
- ♦ Fund requirements
- ♦ GoI/ State Government interventions

The total grid connected Renewable Energy (RE) installed capacity as on December 2016 is 204 MW. There is a proposal 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 the 151 MW, 148 MW has already been executed.

Energy Component in State Budget-2017-18

Hon'ble Chief Minister, Bihar, Nitish Kumar has assured electricity connection to every household by 2018, which gives the energy sector as the second most priority in the state. On 26 February, 2017, the Bihar government presented a budget of Rs 10,905.03 crore for 2017-18. Budget allocated to energy sector in 2016-17 was 15,657.04 crore. 46% of the Department's allocation (Rs 5,095 crore) is estimated to be on revenue expenditure, which includes subsidy on electricity. Rs 5,810 crore has been allocated for investment in state power corporations, and loans for power projects. This is 30% less than 2016-17.

Fund Allocation to Energy Agencies

The allocation of funds for BSPHCL and its subsidiary companies, Bihar Renewable Energy Development Agency (BREDA) and Bihar State Hydroelectric Power Corporation (BSHPC) was Rs. 3110.92 crore in 2013-14, which increased to Rs. 4189.92 crore in 2014-15. The outlay for 2016-17 is Rs. 8591.60 crore.

MAJOR POLICIES AND REGULATIONS

Bihar RE Policy 2011

The Government of Bihar formulated a policy as “**Policy Guideline for Private Sector Participation for Developing Non-Conventional Energy Sources**” in 2003, which ended in 2008. Keeping in mind that Bihar has considerable potential for New and Renewable Energy sources, which is yet to be harnessed, the Government of Bihar resolved to issue a revised policy for promotion of power generation from various sources of New and Renewable Energy in 2011.

“**Bihar Policy for promotion of New and Renewable Energy Sources 2011**” was notified in June 2011, with a scope of policy development for all forms of New and Renewable Energy sources including biomass and biogas based projects, cogeneration projects, mini/micro/small hydro projects (up to 25MW), wind power projects, solar projects, municipal solid waste based projects, and any other renewable resources based projects. The prime objectives of the policy is to recognize the true potential of renewable energy in meeting the energy demand, providing access to energy, and creating many local jobs in the state.

Bihar RE Policy, 2016

Since the operative period of Bihar Renewable Energy Policy- 2011 is terminating soon, BREDA undertook the task of formulating a new policy for the next five years. Draft Bihar RE policy - 2017 was developed by BREDA with active support from CEED. This draft is now under the final stage of approval by the Government of Bihar, and shall possibly be notified by April, 2017.

The draft policy has cumulative target of 2969 MW of solar energy, 244 MW biomass and bagasse cogeneration, and 220 MW small hydro power by 2022 in the state; with an objective to meet the growing demand for power in an environmentally sustainable manner. The policy aims to provide support for decentralized renewable energy for agriculture, industry, commercial and household sector, particularly in rural areas, thereby improving the quality of power. The draft policy also intends to support research and development in the area of renewable energy to meet the state’s growing energy demand as well as promote local manufacturing to contribute to the economic growth of

the state. The policy also includes components to promote skill-development and capacity building in establishing, operating and managing RE projects to generate indirect employment opportunities for local population.

Net Metering Regulation for Grid Interactive Solar Rooftop Systems⁷.

The regulation will allow electricity consumers of the state to generate solar energy on their roofs, to consume the generated energy for their internal use, and to feed the remaining surplus solar energy into the distribution system. The main features of the regulation are mentioned in the points below:

1. The systems to be installed under the regulation shall be a minimum of 1 KWp capacity and maximum of 1 MWp capacity. However, a yearly target capacity of 10 MW has been fixed in the area of the distribution licensee.
2. The Discom shall offer the provision of Net Metering to the consumer who intends to install rooftop systems on first come first serve basis.
3. A maximum cumulative capacity at a particular distribution transformer shall not exceed 15% of the peak capacity of the distribution transformer.
4. The capacity of an individual rooftop PV system will be equal to the sanctioned load of the consumer.
5. The energy accounting and settlement will be done based on the reading of the bidirectional meters.
6. Any energy credits of a consumer from previous months shall be carried to the next billing period and will be set to zero after the settlement period.
7. The electricity generated from solar rooftop systems shall not be more than 90% of the total energy consumption of any consumer in a settlement period. No payment shall be made by the distribution licensee beyond this limit.
8. The quantum of energy consumed from the rooftop system will be considered towards the Renewable Purchase Obligation (RPO) of the distribution licensee, if the consumer is not an obligated entity.
9. Such rooftop systems shall be exempted from payment of wheeling, banking and cross subsidy surcharge if under Open Access mode.
10. The eligibility for availing benefits of REC mechanism shall be as per CERC REC Regulations, 2010.

⁷ <http://berc.co.in/rules-regulations/regulations/individual-regulation/218-berc-rooftop-solar-grid-interactive-systems-based-on-net-metering-regulations-2015>

FUTURE PLANS AND INITIATIVES BY BREDA

1. Off-grid Rooftop Solar Power Plant on government buildings will be implemented in the State by BREDA (Bihar Renewable Energy Development Authority). 1 KWp solar rooftop power plant on residences and commercial buildings (6000 nos) is also proposed to be implemented during 2015 -16.
2. 2 x 100 kWp and 2 x 50 kWp rooftop SPV power programme is proposed to be implemented during 2015-16.
3. Installation of 25 KWp solar power plant at District Collectorate, hospital and Circuit House for each of the 38 districts (total 114 locations) of Bihar. The above system has already been installed in 80 locations during FY 2013-14, and the balance 34 locations during 2014-15.
4. During the the year 2014-15, MNRE approved of the grid connected rooftop system of 1.0 MW capacity for BREDA, the state nodal agency for the promotion & development of renewable energy in the state. The scheme entails a provision of 30% subsidy from MNRE, while the remaining 70% shall be borne by the beneficiary. Out of the 1.0 MW, 250 kW will be installed at the Patna Airport.
5. Solar Water Pumping scheme particularly for agricultural consumers: - Scheme was launched and implemented by BREDA since 2013-14. Total subsidy provided is 90% (30% from MNRE and 60% from Government of Bihar) of the bench mark cost of the pump. Around 1000 nos of 2 HP solar water pump has been installed in the state until FY 2014-15.

New solar water pumping scheme has been launched in 2015 with the target of 3300 pumps. Total subsidy provided is 75% (30% from MNRE and 45% from Government of Bihar) of the bench mark cost of the pump. Budget allocated to this scheme was 147 crore.
6. Solar Off-Grid Systems: It is an ongoing scheme by MNRE under which the domestic lighting systems (DLS) / home lighting systems (HLS- Model-II) are provided to the beneficiaries in rural and urban areas that have one solar module of 12 W. 2 LEDs each of 9 W and one battery of 12V, 12Ah capacity is allotted to each household. This scheme has a provision of 30% subsidy from MNRE, 60% from GOB and the remaining 10% has to be borne by the beneficiary. So far, more than 8500 systems have been installed in the state during the last five years.
7. 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 will be prepared on an annual basis and submitted to MNRE for approval.

CENTRAL GOVERNMENT SUPPORT

- ♦ Bihar has signed the MOU of UDAY Scheme for financial restructuring of the discoms with the Ministry of Power. Under the scheme, the Bihar Government shall take over 75% (or Rs 2,332 crore) of the state discom's debt of Rs. 3,110 crore, as of September 2015. The outstanding sum of Rs. 778 crore will be re-priced or issued as state guaranteed discom bonds at coupon lity and reliable power supply to the consumers.
- ♦ The '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, industries, commercial businesses, public needs, any other electricity consuming entity, and also provide adequate power to agriculture farm holdings by FY 2018- 19. An overall net benefit of approximately Rs. 9000 crore would be accrued to the state by opting to participate in UDAY, that includes savings in interest cost, reduction in AT&C and transmission losses, interventions in energy efficiency, coal reforms, et al, during the turnaround period⁸.
- ♦ The Ministry of Power, Government of India, has launched the Restructured Accelerated

Power Development and Reforms Programme (R-APDRP) in July 2008. The programme focuses on establishment of baseline data, fixation of accountability, reduction of AT&C losses of upto 15% level, through strengthening and up-gradation of sub transmission and distribution network and adoption of information technology. 67 towns are covered under Part-A of R-APDRP and 26% funds have been released; whereas 60 towns are covered under Part-B of R-APDRP and 15% funds have been released uptill now. The work progress is evidently slow. The state government must accelerate the work progress of R-APDRP for the sake of the financial health of power sector. This scheme has been subsumed in Integrated Power Development Scheme (IPDS) in November, 2014. The state government should utilize the funds available under IPDS for improvement of power sector⁹.

Meanwhile, 130 towns are covered under the Integrated Power Development Scheme (IPDS) in Bihar. However, the Government of India has approved Rs. 2111.00 crore for 130 towns. Out of which Rs. 1270.82 crore is approved as grant for these towns, while only Rs 127.02 crore has been released uptill now.

⁸ 24*7 Power for All – Bihar, December 2015, http://powermin.nic.in/sites/default/files/uploads/BIHAR_PFA_REPORT_15.12.2015_With_Signature_II.pdf

⁹http://www.pfcindia.com/Content/R_APDRP.aspx



ABOUT CEED

Centre for Environment and Energy Development (CEED), an environment and energy expert group involved in creating sustainable solution to maintain a healthy, rich and diverse environment. CEED primarily works towards clean energy, clean air, clean water and zero waste solutions by creating an enabling environment and policy framework to scale up investments in low carbon development, climate mitigation and adaptation. CEED engages with government, industries, leaders, think-tanks, stakeholders and public to create environmentally responsible and socially just solutions.

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