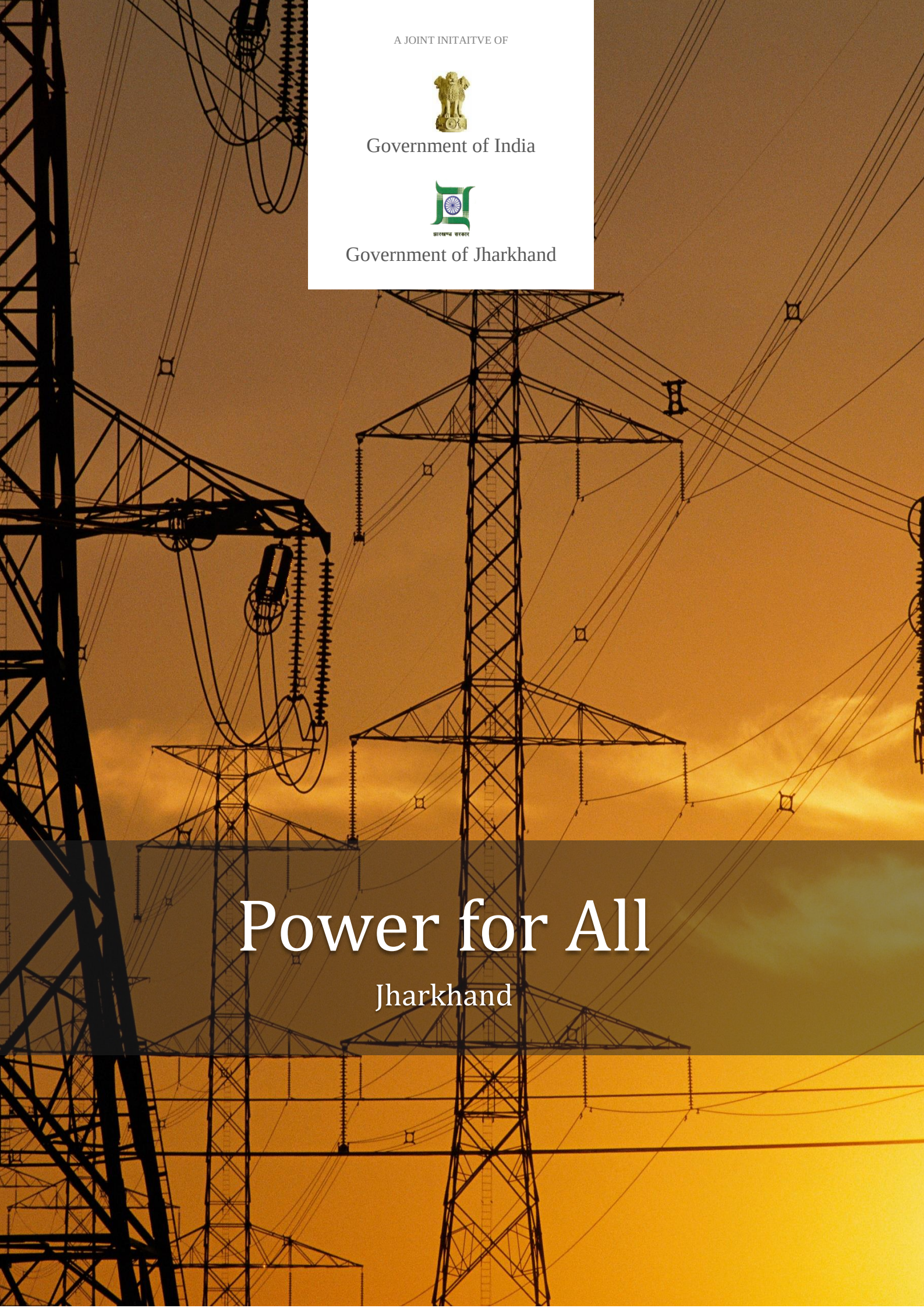
A JOINT INITAITVE OF

Government of India

Government of Jharkhand

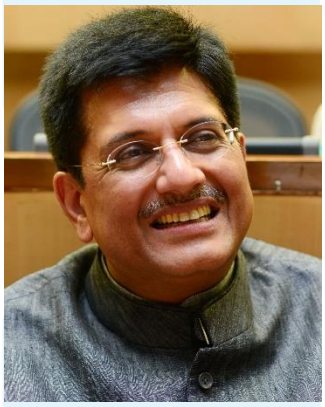


Power for All

Jharkhand

Foreword

सत्यमेव जयते
Government of India



Piyush Goyal

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

Government of India

Electricity consumption is one of the most important indices that reflects the status of development of a nation. The Government of India is committed to improving the quality of life of its citizens by ensuring adequacy of electricity availability. The aim is to provide electricity access to each household, round the clock. The 'Power for All' program is a major step in this direction.

Jharkhand is one of the richest states in terms of mineral resources and has substantial potential to become the power hub for the country. Given the recent unbundling of the State Electricity Board, the successor entities have a great opportunity to start afresh and realize the objective of ensuring access of power to each and every household.

This joint initiative of Government of India and Government of Jharkhand aims to further 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 of the State.

I compliment the Government of Jharkhand and wish them all the best for implementation of this program. The Government of India will supplement the efforts of Government of Jharkhand in bringing uninterrupted quality power to each household and other establishments in the State.

Foreword

झारखण्ड सरकार

Raghubar Das

Chief Minister

Government of Jharkhand

The State of Jharkhand is at the cusp of transforming itself into one of the most progressive states in the country. Availability of 24X7 Power for All in Jharkhand is, therefore, not only critical to improve the living standards of its citizens but also to support its plan for rapid industrialization and economic growth.

Achieving 100% household electrification will not only enrich the lives of citizens but will also help in inclusive growth by positively impacting education, awareness, health and economic development in rural and isolated areas in the State.

The State Governments will provide all necessary support to the power utilities in achieving the various milestones and targets outlined in this PFA Roadmap.

The State shall endeavor to make best use of its locational advantage and availability of natural resources not only to meet its internal demand for power but also to emerge as the power hub of the country.

I would like to thank the Government of India, Hon'ble Prime Minister and Hon'ble Union Minister of State for Power, for implementation of 'Power for All' program in the State of Jharkhand.

सत्यमेव जयते

Government of India

झारखण्ड सरकार

Government of Jharkhand

Joint Statement

24X7 Power For All Program for the State of Jharkhand will be implemented by the Government of Jharkhand with active support from the Government of India.

The Program aims at providing 24X7 supply to all electricity consumers and providing electricity access to all unconnected households in the State by FY19.

This PFA Roadmap document highlights all-encompassing interventions including generation, transmission, distribution, renewable energy and energy efficiency/ DSM measures proposed to be implemented during FY16 to FY19.

The Government of Jharkhand shall continue to support the power sector through targeted capital subsidy schemes aimed at supporting the poor and marginal consumers and elimination of regional disparities in the State.

The State Government is committed to support the utilities and other development agencies engaged in the power sector in implementation of the various measures and targets considered in the PFA Roadmap.

The State Government will put in place appropriate/ suggested State level governance mechanisms for periodic review and monitoring of the PFA Roadmap implementation.

The Ministry of Power, GoI would supplement the efforts of State on various issues to be dealt with at the Central Government level including those listed in this document. The MoP, GoI shall also endeavor to support the State in availing concessional financing arrangements for power utilities in the State.

The State Government shall endeavor to support utilities in improving/ maintaining their financial sustainability and credit worthiness.

The Central and State Governments would meet regularly over the next four years to review and monitor the progress on the rollout plan and strive to achieve the objectives of the program by taking the necessary steps as envisaged in the PFA document.

Jyoti Arora

Rahate 12/10/15

Jyoti Arora, IAS
Joint Secretary
Ministry of Power, Government of India

Sudhir Kumar G. Rahate, IAS
Principal Secretary, Energy
Government of Jharkhand

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1. Executive Summary

1.1. Introduction

The Power for All (PFA) program is a joint initiative of Government of India (GoI) and State Governments, aiming to achieve 24X7 availability of reliable power to all households, industrial, commercial establishments and all other electricity consuming entities by the end of FY19. This document sets as a roadmap to achieve the underlying objective of the PFA program in the State of Jharkhand.

Despite being endowed with rich mineral resources and potential to become a hub for power generation in India, Jharkhand is amongst the ones having high poverty level and lowest levels of rural electrification. A majority, nearly 56% of rural households (HHs) are yet to be connected to electricity and nearly 64% of total electrified rural HHs are supplied power for up to 18 hours only.

The State of Jharkhand, in January, 2014 has unbundled the erstwhile Jharkhand State Electricity Board (JSEB) into Jharkhand Urja Vikas Nigam Limited (JUVNL – Holding Company), Jharkhand Urja Utpadan Nigam Limited (JUUNL – State Genco), Jharkhand Urja Sancharan Nigam Limited (JUSNL – State Transco) and Jharkhand Bijli Vitaran Nigam Limited (JBVNL – State Discom).

One of the distinguishing features of power sector in Jharkhand is that it is being served by multiple distribution licensees viz. JBVNL, DVC, Tata Steel, JUSCO and SAIL Bokaro. Two licensees, viz. DVC and JUSCO have overlapping geographical boundaries with the State distribution utility, JBVNL. Out of the total load of 3,255 MW at the State level, about 1,810 MW is served by JBVNL, while the remaining 1,455 MW is served by the other 4 distribution licensees. It is pertinent to mention that except JBVNL, other utilities operating in the State have already achieved 100% electrification and nearly 24X7 power availability within their respective areas of operation. Accordingly, this PFA roadmap emphasizes on the role of JBVNL in ensuring 24X7 power supply to all consumers in the State.

1.2. Connecting The Unconnected

In terms of electrification, the State faces a challenge to electrify nearly 28.18 Lac (~56%) rural HHs and 1.8 Lac (~10.4%) urban HHs. Additionally, JBVNL is faced with significant demand-supply mismatch with peak deficit of ~14.6% (310 MW) and energy deficit of about 6.0%, as in FY15.

In the PFA Roadmap, JBVNL has planned to electrify about 16.4 lac HHs under new rural electrification proposals (including DDUGJY) while 11.8 Lac HHs are being covered under the RGGVY Scheme (12th Plan and spillovers from 10th & 11th Plan), over the next 4 years.

In addition to achieving 100% electrification, the State has also planned to ensure 24 hours

supply to all consumers, leading to an increase in energy consumption (sales) in JBVNL supply area from 7.6 Billion Units (BU) in FY15 to 17.3 BU in FY19, with HHs accounting for over 68% of the total consumption by FY19. The expected peak demand in JBVNL area is expected to increase to 3,778 MW in FY19. The total energy consumption in the State, with all utilities put together, is expected to increase from 16.54 BU in FY15 to nearly 28.3 BU in FY19, translating into total peak power requirement of 5,696 MW in FY19.

1.3. Power Generation and Supply Adequacy

The existing capacity tied up of JBVNL is 2,331 MW, including the 960 MW capacity from the JUUNL and TVNL. The share of JUUNL in total power purchase has reduced significantly as all units of thermal generation plant PTPS have surpassed their useful life by 4 to 24 years and out of 1,190 MW capacity only 410 MW is presently in operational condition. Going forward, from FY17 only 3 units are expected to be operational and the available capacity at PTPS is expected to reduce to only 325 MW.

JBVNL is presently dependent upon central allocation, DVC and TVNL for about 92% of its energy requirement. Presently, JUUNL is undertaking development of 1,320 MW plant in Karanpura and has also recently formed a JV with the NTPC to revive PTPS, whereby, a total of 4,000 MW generation capacity will be developed in two phases by FY23. TVNL is also in process of developing extension/ stage-2 project with an installed capacity of 1,320 MW.

The State has signed 13 MoUs with IPPs totaling over 16,081 MW, which are under various stages of development, expected to be commissioned beyond FY19. Additionally, there are 3 IPPs with total capacity of 2,280 MW expected to be commissioned by FY19, out of which 144 MW is contracted to JBVNL.

JBVNL has also PPAs/ requisitioned capacity allocation aggregating about ~5,277 MW from various upcoming inter-state generation projects, out of which PPA's totaling about 1,520 MW are in the nature of firm allocations. Capacities totaling 1,121 MW therefrom are expected to be commissioned by FY19.

Considering the firm allocations, existing generation capacities and likelihood of commissioning of future capacities, the State utility is expected to experience a deficit of 488 MW in FY16, 864 MW in FY17, 990 MW in FY18 and 1,215 MW in FY19 against the peak demand in respective years.

Since a significant proportion of upcoming capacities are expected to become available beyond FY19, JBVNL may need to rely on medium-term competitive procurement (under Case-1 route) or short term power purchase to mitigate the demand supply mismatch in the interim period.

1.4. Adequacy of Transmission Network

The State Transmission Utility, JUSNL presently has 3,690 MVA sub-station capacity at 220kV and 132kV with 30 GSS and 3,085 cKm of transmission lines. As the power demand is likely to increase more than two-folds, significant investments are required in the intra-state transmission systems of the State.

In order to meet the expected demand growth and to build in adequate redundancies in the system, JUSNL has planned various augmentation and new schemes, which would cumulatively increase the total intrastate transmission system sub-station capacity at

various voltage level to 18,310 MVA and the transmission lines to increase to 13,788 cKm by FY19. A total capital expenditure of Rs.9,148 Cr. is expected to be incurred over the next 4 years.

Additionally, the inter-state transmission capacity availability to the State is proposed to increase to 7,785 MVA in FY19 from existing 4,890 MVA in FY15.

The other transmission utility, DVC in its command area has planned to enhance the transmission capacity by adding 732 cKm of transmission lines at an investment of Rs. 606.9 Cr. by FY19.

The above capacity additions of both JUSNL and DVC are likely to place Jharkhand in a comfortable position, from transmission system availability perspective, to adequately cater to the increase in power demand.

1.5. Adequacy of Distribution Network

In order to ensure that Jharkhand achieves 24X7 power for all consumers, JBVNL, has proposed a total investment of Rs. 9,625 Cr. which shall be funded through various existing schemes, including R-APDRP Part B, RGGVY 12th Plan etc. and upcoming schemes including DDUGJY and IPDS. In case the expenditure under various upcoming schemes is approved as per the proposed NADs/DPRs, nearly Rs. 5,749 Cr. is expected to be available as grant, while the remaining amount will have to be arranged by JBVNL in form of debt and equity.

With such significant investments lined up in the distribution infrastructure, the total sub-station transformation capacity (33/ 11 kV) is likely to increase from 320 substations having 3,687 MVA in FY15 to 642 substations having 7,188 MVA in FY19. The aggregated distribution transformer capacity (11 kV/ 415 V) of JBVNL is also likely to increase from 2,582 MVA in FY15 to 10,239 MVA in FY19, along with addition of nearly 107,043 cKm of 11 kV and LT lines during the four years period.

With the proposed investments in distribution infrastructure, introduction of IT under the R-APDRP Part-A program and various other initiatives being undertaken by JBVNL, the AT&C losses are expected to reduce from 39% in FY15 to 26% in FY19, including the impact of increase in collection efficiency from 87% to 93% over the same period.

1.6. Clean Energy and Energy Efficiency

The State aims to add 2,475 MW of solar power generation capacity by FY20 with an estimated investment of Rs. 15,500 Cr. out of which 1,565 MW is expected to be commissioned by FY19. As per the draft solar policy of JREDA, the State would have first right of refusal on 50% of the proposed capacities or the applicable RPO of the utilities, whichever is higher. JREDA is also pursuing addition of 25 MW SHP capacities in the State by FY19 and additional 75 MW SHP capacity by FY22.

The State is also keen to undertake energy efficiency/ DSM programs, including the DELP Scheme, the details of which are being finalized in consultation with BEE/ EESL.

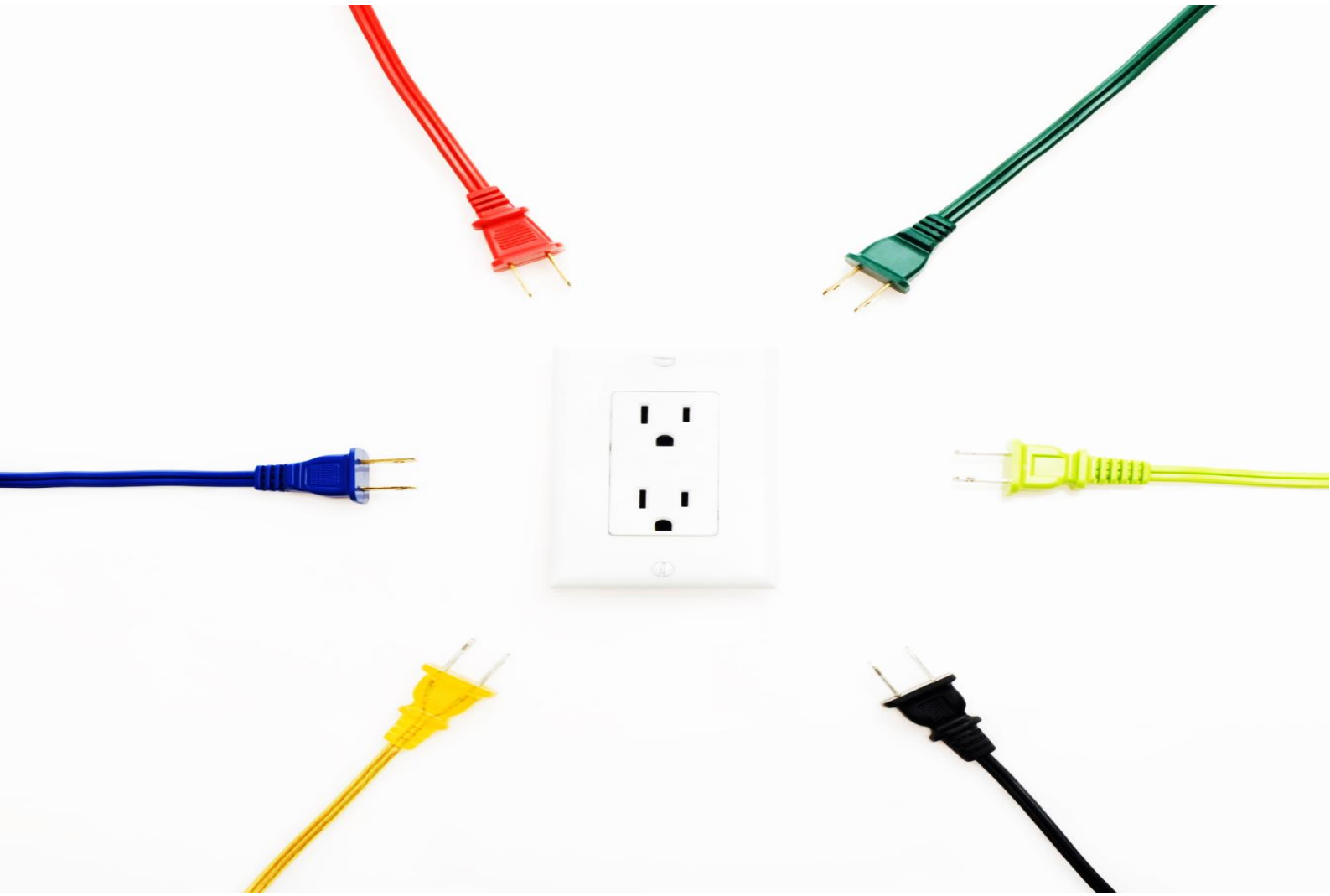
1.7. Tariff impact and financial turn-around

While the restructuring of JSEB and the associated FRP implementation has provided a clean start to the newly formed power utilities in the State, continuance of the existing gap between average cost of supply and average revenue requirement, is likely to have a

bearing on its financial viability. The expansion in consumer base, increased energy requirement and proposed infrastructure investments under the PFA program are expected to translate into a tariff implication of Rs.1.33/kWh in FY16, Rs. 1.91/ kWh in FY17, Rs. 2.31/ kWh in FY18 and 2.66/kWh in FY19. This considers achievement of AT&C loss trajectory and full availability of grants as per JBVNL's proposals.

Despite the proposed reduction in AT&C losses from 39% in FY15 to 26% in FY19, the annual financial losses of JBVNL are projected to increase to Rs.5,325 Cr. in FY19 in the absence of tariff rationalization initiatives. It is estimated that over and above the pass-through of actual increase in power purchase costs, an additional increase of nearly 17.58% YoY is required for turnaround of JBVNL by FY19.

On the basis of above considerations, a plan to achieve '24x7 Power for All' along with a proposed rollout plan has been formulated and detailed in this document.



2. Background

2.1. The State of Jharkhand

Situated in the eastern part of India, Jharkhand, known as the "land of forests" was carved out as a separate State from the southern part of Bihar in 2000. Rich in minerals predominantly coal, the State has one of the largest forest covers and is home to a large proportion of tribal population. The Table 1 presents a high-level overview of the State.

Table 1: Key Highlights of State: Jharkhand

Parameter	Information
Year of Creation	2000
Population & Demographics	Total Population at 3,2,988,134, as per 2011 census • 76% Rural, 24% Urban • Decadal population growth: 22.34%
Area	79,716 square kilometers (2.6% of country) • Forest cover – 29% • Total cropped area – 16%
Administrative Set-up	• 24 Districts • 38 sub-divisions • 260 Blocks • 32620 Villages
Natural Resources	• Overall Mineral Wealth ~ 40% of country • Coal Reserves ~ 27% of country • Iron Ore Reserves ~ 26% of country • Copper Ore Reserves ~ 18% of country • Other minerals: Uranium, Mica, Bauxite, Granite, Limestone, Silver, Graphite, Magnetite etc.
Households	Total 61,81,607 Households (46% Electrified) • Rural 46,85,965 (32% Electrified) • Urban 14,95,642 (88% Electrified)

Demographics

Jharkhand has witnessed slower urbanization rate over time as apparent in Figure 1. The population living in urban areas has increased marginally from 22% in year 2001 to only 24.1% in year 2011, which is considerably below the mark as compared to the national average at 31.2% in 2011. The State faces the challenge of having more than 40% of the population below the poverty line in rural areas as compared to the national average of nearly 26%. While on the other hand, even urban areas of Jharkhand have significantly high proportion of population living below the poverty line at 25%, as compared to national average of nearly 14%, as seen Figure 2. It is important to note that there has been an increase in urban poverty in Jharkhand from 20% in FY05 to about 25% in FY12, which renders it all the more important for the State to focus on inclusive economic growth.

Figure 1: State vs National Demographics – Urban & Rural Divide

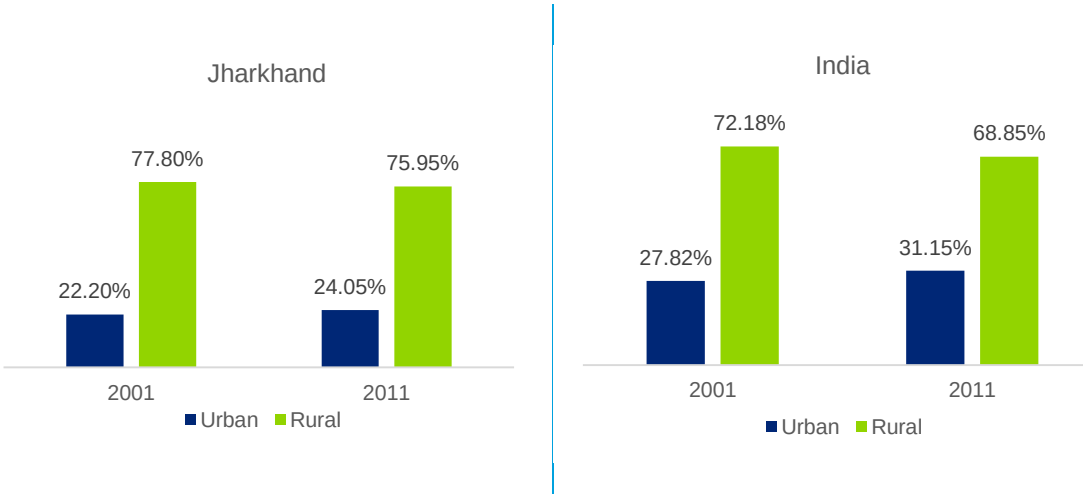
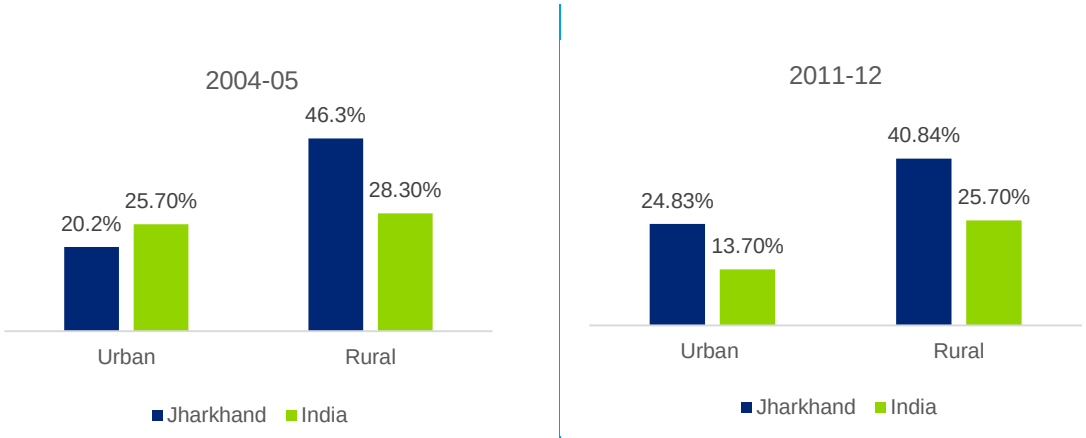


Figure 2: Population below Poverty Line



Source: Planning Commission Report, 2013

Hence, the power sector in the State needs to realize its necessary contribution to the growth of the State and channelize strategies so as to build up sufficient capabilities to support the same. Jharkhand's rural-urban divide and domination of rural population is further evident from Figure 3. It can be observed that amongst the 24 districts, only 4 districts have significant urban population. Some of the districts such as, Khunti, Lohardaga, Koderma etc, have low level of population due to uninhabitable terrain and looming internal security issues. It implies that key challenge to achieve the objectives of Power for All program would be not only to make power available in the dominant rural areas of all districts, but also keep it affordable and manage the incidental challenges such as creating distribution infrastructure, O&M, collections etc.

2.2. Jharkhand Power Sector at Glance

Table 2 provides an overview on the present status of the power sector in the State.

Figure 3: District Wise Population (Urban Vs Rural) - 2014

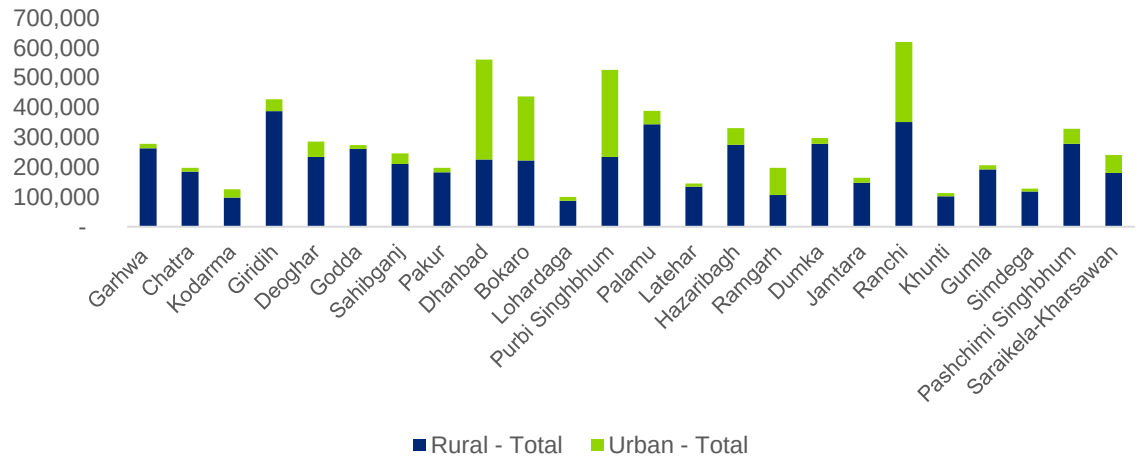


Table 2: Jharkhand Power Sector at a Glance

Aspect	Key Highlights
Demand Supply Position	Being located in the energy rich eastern region of the country, the State has had less than national average demand supply mismatch. The FY15 demand supply situation is highlighted in the table below:

Item	Peak	Energy
Requirement	2,120 MW	12,720 MU
Availability	1,810 MW	11,954 MU
Deficit	-18.5%	-6.0%

The demand supply position (both peak and energy) excludes about 1,445 MW of power demand for the command area of DVC and other three licensees including

<table>
<tr><th>Aspect</th><th>Key Highlights</th></tr>
<tr><td></td><td>JUSCO, TSL, SAIL-Bokaro., falling within Jharkhand. It is worthwhile to note that there is no demand supply mismatch in the DVC command area and areas covered by other three licensees.</td></tr>
<tr><td>Generation</td><td>
<table>
<tr><th>Mode</th><th colspan="4">Installed Capacity (MW) as on March 2015</th></tr>
<tr><th></th><th>Thermal</th><th>Hydro</th><th>RE</th><th>Total</th></tr>
<tr><td>State</td><td>1,190</td><td>130</td><td>4</td><td>1,324</td></tr>
<tr><td>Private</td><td>900</td><td>0</td><td>16</td><td>916</td></tr>
<tr><td>Central</td><td>315</td><td>71</td><td>0</td><td>386</td></tr>
<tr><td>Total</td><td>2,405</td><td>201</td><td>20</td><td>2,626</td></tr>
</table>

This excludes capacity allocated for DVC’s distribution function selling power directly to industrial consumers (with total connected load of 2052 MVA) in its Command Area.</td></tr>
<tr><td>Transmission</td><td>While the inter-state/ inter-regional connectivity of the State is through the ER systems of PGCIL, JUSNL and DVC undertake intra-state transmission of electricity for the State. The available transmission systems are depicted by the transformation capacities at various levels indicated in the table below.
<table>
<tr><th>Mode</th><th>Voltage Level</th><th>MVAs</th></tr>
<tr><td rowspan="2">Inter-State (ER)</td><td>765/400 kV</td><td>3,000</td></tr>
<tr><td>400/220 kV</td><td>1,890</td></tr>
<tr><td></td><td>Total</td><td>4,890</td></tr>
<tr><td>DVC</td><td>132 kV</td><td>4,125</td></tr>
<tr><td></td><td>Total</td><td>4,125</td></tr>
<tr><td rowspan="2">STU (JUSNL)</td><td>220 kV</td><td>1,400</td></tr>
<tr><td>132 kV</td><td>2,290</td></tr>
<tr><td></td><td>Total</td><td>3,690</td></tr>
</table>

Additionally, the State also has some 11 kV inter-change points with WBSEDCL in intertwining geographies.</td></tr>
<tr><td>Distribution</td><td>Jharkhand is amongst the few states in the country to have multiple distribution licensees with overlapping areas of supply. The license area of supply, broad level consumer mix of the 5 existing distribution licensees in the State is outlined below:
<table>
<tr><th>License</th><th>Area of Supply</th><th>Consumer Base</th></tr>
<tr><td>JBVNL</td><td>Entire State</td><td>26.3 Lakhs (92.37% Households)</td></tr>
<tr><td>DVC</td><td>DVC Command Area</td><td>171 (All HT Industrial)</td></tr>
<tr><td>Tata Steel</td><td>Jamshedpur City/ Township</td><td>46,549 (81% Households)</td></tr>
<tr><td>SAIL</td><td>Bokaro Steel City</td><td>33,065 (95% Households)</td></tr>
<tr><td>JUSCO</td><td>Saraikhela Kharsawan District</td><td>1,430 (only 759 Households)</td></tr>
</table></td></tr>
</table>

Aspect	Key Highlights
Financial Position	The last tariff order for the erstwhile JSEB was approved by JSERC in August 2013. Consequently, the restructured utilities have inherited poor tariff levels which impairs their financial viability from the day of commencement of operations. While the successor utilities have not been able to prepare/ finalize segregated annual accounts over the last 2 years, it is estimated that the cumulative losses over the last two years would exceed Rs. 2,000 cr. Outstanding dues of power suppliers has been mounting over the years and has reached Rs. 4,500 cr. towards DVC and Rs. 3,000 cr. towards TVNL, as per recent estimates. The financial position of other private utilities cannot be established as JUSCO, TSL and SAIL operate within their parent company and segregated accounts for distribution business are not prepared. While in case of DVC, the accounts are not segregated for Jharkhand and West Bengal. However, considering their consumer mix, low level of T&D losses and 100% collection efficiency and the extent of regulatory disallowances they are faced with it can be reasonably construed that they would not be faced with any major financial viability issues.

In compliance of the Electricity Act, 2003, the State has restructured the erstwhile Jharkhand State Electricity Board (JSEB) with effect from January 6, 2014, into the following 4 entities:

a) Jharkhand Urja Vikas Nigam Ltd. (Holding Company)
b) Jharkhand Urja Utpadan Nigam Ltd. (Generating Company)
c) Jharkhand Urja Sancharan Nigam Ltd. (Transmission Company & SLDC)
d) Jharkhand Bijli Vitaran Nigam Ltd. (Distribution Company)

Jharkhand State Electricity Regulatory Commission (JSERC) was established on August 22, 2002 and became operational from April 24, 2003. JSERC carries out its functions and roles in accordance with applicable provisions of the Electricity Act, 2003.

3. Power Supply Scenario

3.1. Power Supply Position

The supply of power in Jharkhand is undertaken by five distribution licensees. All utilities in the State, except JBVNL, are largely able to meet their peak requirement with no or limited instances of reported power shortages. However, the State distribution licensee, JBVNL, has faced peak deficit of nearly 310 MW during FY15. The total peak demand met in the State during FY15 was 3,225 MW and respective share of peak demand met by various distribution licensees is presented in Figure 4. Considering the peak deficit in JBVNL served areas, the total peak deficit in the State was about 310 MW. Table 3 presents the power supply position in JBVNL area, where there has been shortfall in both peak and energy terms, over the past five years.

Figure 4: Peak Demand Met by Utilities in FY15 (MW)

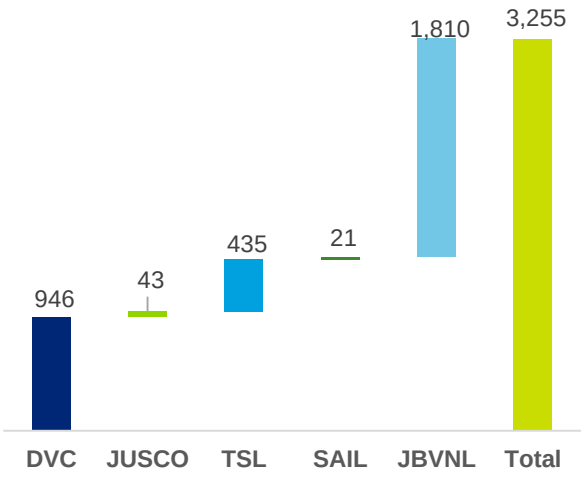


Table 3: Peak Demand Vs Supply (MW) and Energy Requirement vs Availability (MU) – JBVNL

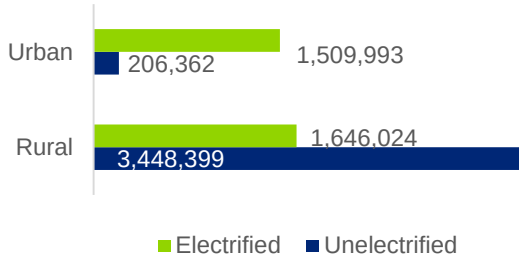
Particulars	FY11	FY12	FY13	FY14	FY15
Peak Power Demand and Supply					
Peak Demand (MW)	1,790	1,850	1,900	2,060	2,120
Peak Available (MW)	1,523	1,547	1,638	1,726	1,810
Peak Shortage (%)	14.9%	16.4%	13.8%	16.2%	14.6%
Energy Requirement and Availability					
Energy Requirement (MUs)	10,976	11,020	11,900	12,361	12,720
Energy Available (MUs)	10,103	9,988	10,912	11,631	11,954
Energy Shortage (%)	8.0%	9.4%	8.3%	5.9%	6.0%

The demand for power in JBVNL area has grown gradually at 4.3% YoY over the last few years and presently it stands at 2,120 MW during FY15. The power supply has not been able to keep pace with the demand, with peak deficit remaining consistently in the range of 14% to 16%. This may not only be attributable to irregular load requirement but also due to non-reliable generation sources, especially PTPS and SHPS and the T&D network constraints in the State. Notably, the deficit is majorly on account of transmission constraints in Sahibganj, Garhwa and Ranchi area.

In terms of energy requirement and availability, the shortfall has marginally reduced from 9.4% in FY12 to 6.0% in FY15, as can be seen in Table 3. The energy requirement has grown at a steady rate of 3.8% YoY over last 5 years, while energy availability during the same period has increased at a rate of 4.3% YoY It is important to note the energy requirement represented in Table 3 is reported/ restricted and may not be reflective of the actual energy requirement and availability position in the State.

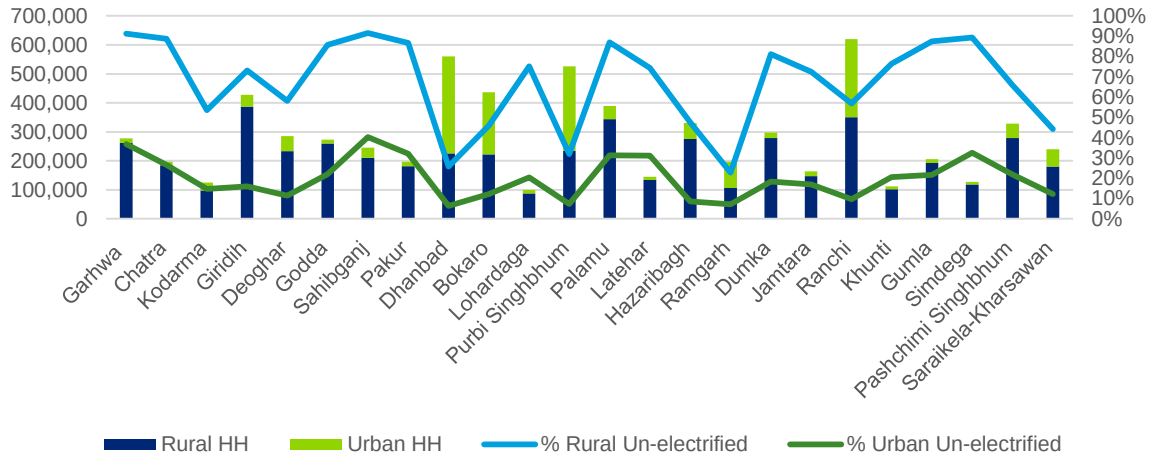
The poor power supply position in the State is substantiated by the fact that Jharkhand is amongst the states with lowest levels of electrification, especially in the rural areas. As can be seen in Figure 5, nearly two-third of the rural HHs were yet to be electrified (as per 2011 Census) and even in urban areas, 100% electrification of HHs has not been achieved.

Figure 5: Electrified Vs Non-Electrified Households (Urban and Rural, Census 2011)



A closer look at the status of electrification in various districts of the State reveals that in some of the districts, such as Garhwa, Sahibganj, Simdega etc., the HH electrification is as low as 10%. Even in the districts with high economic activity and high level of urbanization, such as Dhanbad, Ranchi etc. the un-electrified HHs range from 25% to 55%. The district-wise estimated rural and urban HH numbers and their percentage electrification is outlined in Figure 6.

Figure 6: District Wise Percentages of Rural & Urban Un-electrified Households



Further, the present power supply position in the rural area is alarming, as nearly 64% of total rural HHs in various districts of the State are supplied power for less than 18 hours in a day. There are few districts, such as Garhwa, Sahibganj etc. where power supply to rural HHs is restricted only to less than 10 hours.

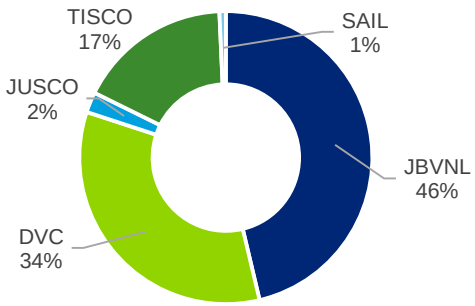
On the other hand, the other four distribution licensees in the State have already achieved 100% electrification in their respective supply areas consumer base and are also supply nearly 24X7 supply to their consumers.

3.2. Consumer and Sales Mix

The following section discusses the consumer and sales mix of various distribution utilities in the State to emphasize on their role in achieving objectives of PFA program.

Amongst the 5 distribution utilities, JBVNL with energy sales of nearly 7.7 BU in FY15 is the largest utility, while DVC with its sizeable base of industrial consumers in the DVC command area is the 2nd largest power distribution utility. Other utilities (JUSCO, Tata Steel and SAIL Bokaro) have relatively small share in their share of energy handled in the State and are operating in their respective limited license areas, as can be seen in Figure 7.

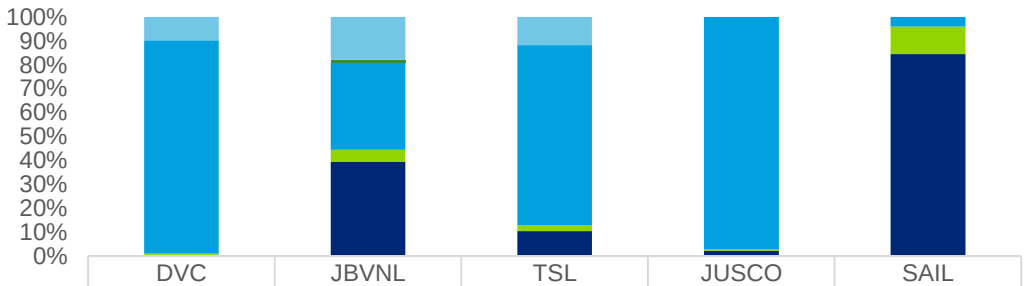
Figure 7: Share of Distribution Utilities (MU Sold, FY15)



Source: Distribution Utilities Data/Tariff Orders

In terms of total sales by all utilities in the State to different categories of consumers, JBVNL accounts for nearly 90% domestic sales and only 30% of industrial sales. Whereas, out of the total industrial sales in the State, 70% is attributable to other 4 licensees. Figure 8 summarizes the share of energy sales to different categories of consumers with respect to the total energy sold by different utilities in the State.

Figure 8: Energy Sales and Sales Mix of Different Utilities (%age & MU FY15)



	DVC	JBVNL	TSL	JUSCO	SAIL
Others	530.2	1,403.0	302.8	-	-
Agriculture	-	78.0	-	-	-
Industrial	4,843.6	2,849.0	1,928.4	290.8	4.5
Commercial	55.9	392.0	59.2	2.3	12.7
Domestic	-	3,065.0	266.4	6.5	93.7

The sales mix of JBVNL and TSL has a significant share of domestic sales, while DVC's and JUSCO's sales mix is dominated by industrial sales. In case of TISCO and SAIL the domestic sales are mainly to their own townships, while JUSCO supplies only to few domestic HHs in its license area. In terms of number of consumers in the State, out of a total 25.42 Lac consumers, nearly 24.62 Lac are served by JBVNL alone while remaining 81 thousand consumers are served by the other distribution licensees.

In line with the objective of PFA program, to provide 24X7 power to all households, the demand projection has been done separately for electrified and un-electrified rural and urban households. Whereas, for rest of the consumer categories a growth rate, based on the utilities' estimation of the expected growth along with a review/ validation with the past trend has been considered.

Since the licensees, other than JBVNL, have a limited number of HH consumers and these utilities already provide nearly 24X7 electricity to its consumers. It is expected that there would be a normal increase in demand for energy from consumers based on past CAGR, for which these utilities already have their own plan in place and they are successfully able to recover the cost through ARR/ tariff.

Therefore, the demand projections are done considering that largely, the energy demand will pertain to existing and new households as well as other category of consumers connected only to the network of JBVNL. The following steps detail out the approach adopted for the estimation of energy demand for the State.

Estimation of Rural and Urban Electrified and Un-Electrified Households

The estimation of number of HHs existing in the State at the end of FY15 is based on the available census data for 2011, extrapolated with past 10 years CAGR.

In addition to the level of electrification in rural and urban areas as per 2011 census data, the actual rural and urban HHs electrified during the period from 2011 to FY15 has been utilized to arrive at the present level of electrification. The total un-electrified HHs in the State arrived at is 1,99,381 urban and 29,66,548 rural.

Estimation of Energy Demand from Households

The energy requirement from HHs has been estimated under the following 3 broad categories:

a) Latent demand from existing HHs on account of increase in energy availability;
b) Additional energy requirement due to electrification of un-electrified HHs; and
c) Additional energy requirement due to construction of new urban and rural HHs.

In order to estimate the latent energy requirement from existing HHs, present energy consumption per HH per day both for rural and urban HHs has been estimated on the basis of the billing records of JBVNL. Since this benchmark represents suppressed demand due to outages, load restrictions and restricted supply hours, an enhanced requirement with nearly 21% YoY increase in daily per HH energy consumption for urban and 16% YoY for rural HHs has been considered for making projections under the PFA scenario.

Accordingly, the daily urban HH energy requirement is estimated to increase from 3.70 kWh in FY15 to 8.00 kWh in FY19, whereas, daily average rural HH energy requirement is estimated to increase from 1.64 kWh to 3.00 kWh over the same period. Table 4 presents the year on year increase in per HH per day consumption of electricity in urban and rural areas.

Table 4: Per Day Per HH Consumption (kWh)

Particular	FY15	FY16	FY17	FY18	FY19
Urban	3.70	4.42	5.49	6.57	8.00
Rural	1.64	1.87	2.21	2.55	3.00

The increase in per HH per day consumption may also be substantiated by the fact that average hours of electricity supply in urban areas is restricted to 18 hours and that of rural area is 12-14 hours. So nearly 1/3rd increase in urban consumption and 100% increase in rural consumption is expected to be contributed only by increase in daily supply hours to 24 for both urban and rural areas. Further, given the expected economic growth and availability of electricity, the increase in propensity to consume electricity shall contribute significantly to the increase in electricity demand in the State.

The State utility has targeted to electrify all consumers by FY19 in accordance with the targets prescribed under the PFA. After considering estimated actuals for FY15, realistic targets for FY16 in view of the status of approval of schemes and the ability of JBVNL to ramp-up electrification works, a trajectory of rural and urban household electrification, as outlined in the Table 5 has been considered for further workings under the PFA Roadmap.

Additionally, the newly constructed HHs in urban and rural area shall also be contributing to the electricity demand. The increase in new rural and urban households has been estimated based on the past CAGR of 2.11% and 3.50% for urban and rural areas respectively, considered based on census data. The corresponding energy requirement from new households is estimated based on per HH per day consumption provided in Table 4.

Estimation of Energy Requirement from other Consumer Categories

The demand from commercial and industrial consumers has been estimated separately for each category with past 5 years CAGR[1] at 5.6% YoY and 7.1% YoY respectively, for the projection period. In line with above, for other consumer categories, including agriculture, railway traction, bulk supply and street lighting, historical growth trends of five years have been considered to estimate the energy requirement.

3.3. Energy Consumption & Peak Demand Projections – JBVNL

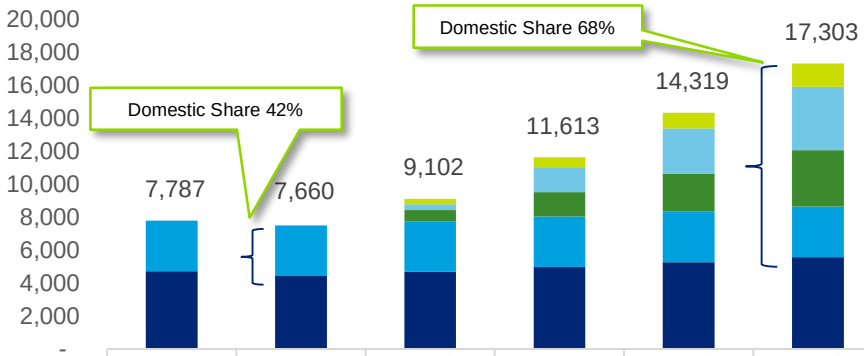
Based on above, the energy consumption by the consumers to be served by JBVNL, is expected to increase more than two folds, from nearly 7,660 MU in FY15 to 17,303 MU in FY19, as presented in Figure 10.

Table 5: YoY Electrification (Urban & Rural Households, Nos)

Particulars	FY14	FY15	FY16	FY17	FY18	FY19
Un-electrified households – Urban	199,381	179,443	149,536	99,691	49,845	-
YoY electrification – Urban		19,938	29,907	49,845	49,845	49,845
Un-electrified households – Rural	29,66,548	2,818,221	2,559,362	1,360,053	409,686	-
YoY electrification – Rural		148,327	258,859	1,199,309	950,367	409,686

[1] 3 years CAGR of 5.8%, 9.1% for commercial and industrial consumers, respectively shall lead to an increase in energy sales by nearly 330MU by FY19 and peak demand of nearly 72MW by FY19.

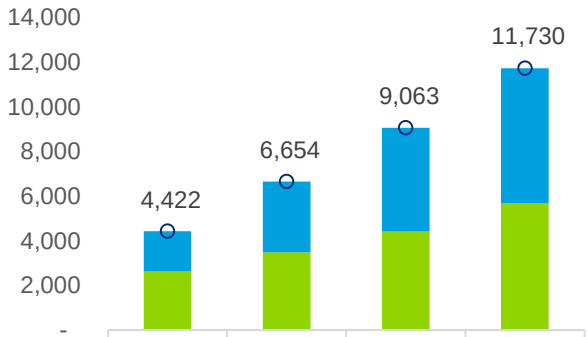
Figure 10: Energy sales projections from HHs and other categories



	FY14	FY15	FY16	FY17	FY18	FY19
Electrification of Newly constructed HHs			331	604	948	1,424
Electrification of unelectrified HHs			358	1,495	2,736	3,831
Additional sales to existing HHs			667	1,490	2,313	3,410
Domestic	3,065	3,065	3,065	3,065	3,065	3,065
Other than domestic	4,722	4,418	4,680	4,959	5,256	5,573
Total energy sales	7,787	7,660	9,102	11,613	14,319	17,303

As the level of electrification increases in the State, the share of energy demand from domestic HHs is expected to surpass the demand from other categories, from present share of nearly 40% to about 68% of total energy sales. A closer look at HH energy consumption from rural and urban consumers, as seen in Figure 9, reveals that a significant increase in energy requirement from rural HHs is expected (owing to the poor levels of access under the present scenario) and its share in domestic consumption would grow from 40% in FY16 to nearly 52% in FY19, as more and more rural HHs get access to electricity.

Figure 9: Projected HH Energy Requirement (MU)

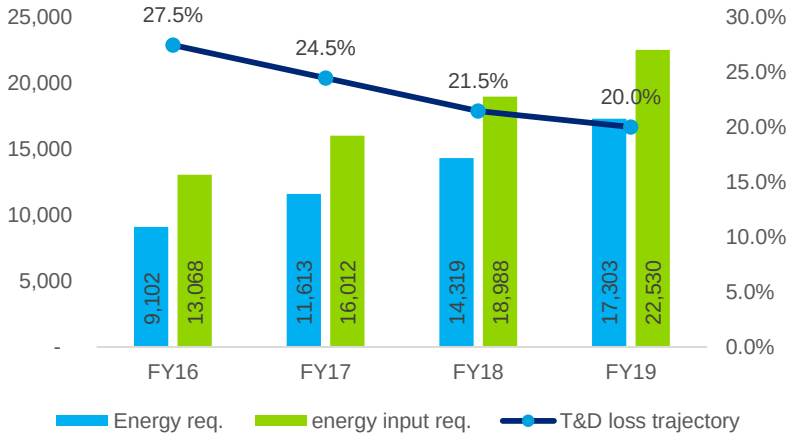


	FY16	FY17	FY18	FY19
Rural energy req.	1,802	3,181	4,651	6,040
Urban energy req.	2,620	3,473	4,412	5,690
Total domestic energy req.	4,422	6,654	9,063	11,730

The energy consumption estimated above translates into higher energy requirement, taking into account the T&D losses of the utility. As evident from Figure 11, the energy requirement at the State periphery is likely to increase from 13,068 MU in FY16 to nearly 22,530 MU in FY19 and the T&D losses are expected to reduce from 27.5% in FY16 to around 20% in FY19, owing to the numerous measures proposed by the State utility.

Considering the above energy requirement, the peak demand is estimated considering the load factor as per 18th EPS, peak demand is expected to increase from 1,810 MW in FY15 to 3,778 MW in FY19, registering a YoY growth of nearly 16%. However, the above peak demand is expected to prevail for a limited duration in a day, i.e. from 6 AM to 10 AM and from 6 PM to 10 PM, considering the existing peak demand curve. The period from 10 PM to 6 AM i.e. the lean period is expected to record a demand of 3,281 MW in FY19 , whereas the base load is expected to increase from 1,619 MW during FY15 to 3,380 MW in FY19, as can be seen in Table 6. Additionally, the power demand for other utilities viz. DVC, JUSCO, TSL and SAIL Bokaro operating in the State, has been considered separately to estimate the likely demand of the entire State as a whole, as discussed in the following sub-section.

Figure 11: T&D Loss Trajectory and Energy Input Requirement (MU)



3.4. Demand Projections – Other Utilities

The projected energy requirement and peak demand for other distribution licensees, as proposed by the respective licensees is summarized in Table 7.

Table 6: Peak Demand (MW) Projections – JBVNL

Particulars	FY15	FY16	FY17	FY18	FY19
Lean load	1,572	1,851	2,318	2,757	3,281
Base load	1,619	1,907	2,388	2,840	3,380
Peak load	1,810	2,132	2,669	3,175	3,778

Table 7: Energy Requirement & Peak Demand Projections – Other Licensees

Particulars	Units	FY15 (P)	FY16	FY17	FY18	FY19
Damodar valley corporation						
Energy Requirement	MU	5,756	6,332	6,615	6,885	7,151
Peak Demand	MW	946	1,033	1,103	1,151	1,199
JUSCO						
Energy Requirement	MU	379	388	482	496	511
Peak Demand	MW	43	44	55	57	58
TISCO/TSL						
Energy Requirement	MU	2,930	3,203	3,395	3,599	3,815
Peak Demand	MW	435	475	525	580	635
SAIL Bokaro						
Energy Requirement	MU	129	136	143	150	157
Peak Demand	MW	21	22	24	25	26

3.5. Overall Demand Projections – State

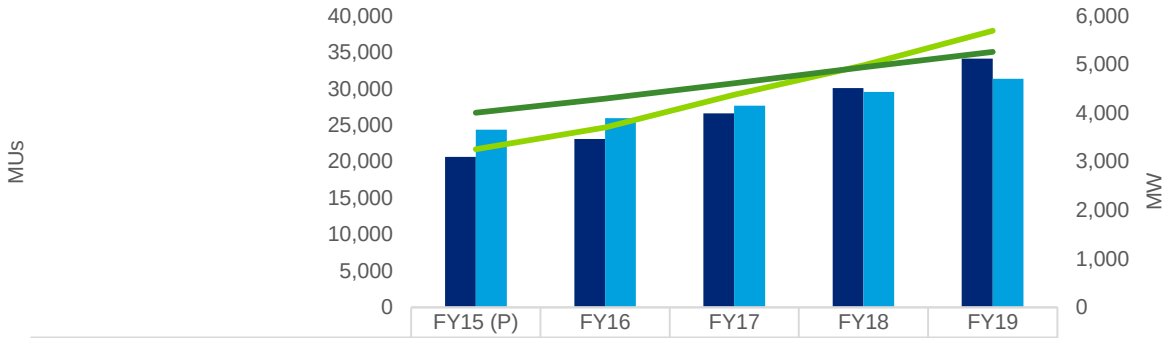
At the State level, the energy requirement in Jharkhand is projected to grow at an annual rate of 13.4% to reach at 34,164 MU in FY19 from 20,688 MU in FY15. Similarly, the peak demand is projected to grow at a similar rate of 15% p.a. reaching at 5,696 MW in FY19 from 3,255 MW in FY15.

As can be seen in Figure 12, the projected energy requirement and peak demand is expected to surpass the 18th EPS estimates from FY19 onwards. The difference in the initial years is due to the higher base considered in 18th EPS projections, while the actual energy requirement and power demand are significantly lower during FY15.

In the above backdrop, the subsequent chapters lay out the various elements of the PFA Roadmap covering power generation, transmission, distribution, RE/EE and financial viability related aspects essential for enabling achievement of PFA objectives in the State of Jharkhand.

The role of other licensees in the State i.e. DVC, Tata Steel, SAIL and JUSCO is limited by geography and/ or their consumer base. These utilities are able to meet the power requirements of their consumers and there is no energy or peaking demand supply mismatch. While the Central and State Governments shall extend their full support to these utilities in meeting their service obligations in their respective areas of supply in the future, this PFA roadmap focusses on developing an action plan for the entire State. Therefore this report deals largely with the State licensee which has the obligation of extending supply to the entire population in the State.

Figure 12: Project Peak Demand & Energy Requirement - State Vs. EPS



	FY15 (P)	FY16	FY17	FY18	FY19
Proj. Energy Req. (MU)	20,668	23,127	26,647	30,118	34,164
18th EPS Energy Req. - (MU)	24,407	25,990	27,691	29,592	31,381
Proj. Peak Demand (MW)	3,255	3,706	4,376	4,987	5,696
18th EPS Peak Demand - (MW)	4,010	4,301	4,616	4,948	5,262

4. Generation Plan

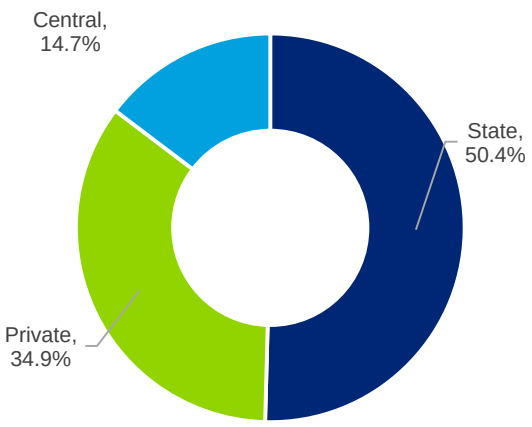
4.1. Generation Capacity Requirement

The requirement of electricity, for JBVNL, both in terms of energy requirement and peak demand are expected to increase significantly from the present level of 11,473 MU & 1,810 MW in FY15 to 22,530 MU and 3,778 MW in FY19. In order to meet the burgeoning power demand and considering the existing tied up capacity, the State needs to carefully plan for either developing its own generation capacity or tie up with Central generating stations/ IPPs, as discussed in details in the following sub sections.

4.2. Existing Generation Capacity

The total generation capacity, including central allocation, in Jharkhand as on March 31, 2015 is 2,626 MW. In addition to this, 765 MW is also available from DVC to JBVNL for the DVC command area. Owing to the proximity to large coal reserves, the fuel mix of the installed generation capacity is largely skewed towards thermal, with more than 91% of installed capacity being through coal based generation plants. The break-up by ownership and fuel mix is provided in the Table 8.

Table 8: Installed Capacity (MW) as on March 2015

Share	Ownership	Thermal	Hydro	RE	Total
	State	1,190	130	4	1,324
	Private[2]	900	0	16	916
	Central	315	71	0	386
	Total	**2,405**	**201**	**20**	**2,626**

[2] It may be noted that out of the private capacities presented above, the allocation to JBVNL is only about 216 MW

Considering the central allocations including DVC, tied up capacity from IPPs and State generation, the total tied up capacity for JBVNL is 2,331 MW. The share of State generating utilities, JUUNL and TVNL is expected to decline in the next 3 years due to the planned decommissioning of the inoperative units of PTPS. The overall capacity available and projected PLF from various existing State generating stations for period covered in the PFA roadmap, is shown in Figure 13.

The increase in PLF of PTPS would not result in increased energy generation over the period due to sharp reduction in the available capacity of the plant. On the contrary, there is expected to be a significant reduction in energy generation from PTPS in FY18 and FY19 which has been factored in for assessing the additional power purchase requirement for the State/ JBVNL. The projected power generation available from the State, central and private sector has been discussed in the following sub-sections.

4.3. Generation Plan – JUUNL & TVNL

State Sector

The generation capacities presently under various stages of development in the State total up to over 6,640 MW with JUUNL undertaking development of a plant in Karanpura with installed capacity of 1,320 MW and TVNL undertaking development of 1,320 MW Stage 2. Recently, the State utility has also entered into a JV with NTPC to revive the existing units of PTPS and develop subsequent phases as detailed in Table 9. The revival plan of PTPS involves, revival of unit 7, 9 and 10, thus reaching a total capacity of 325 MW, having improved PLF of 40%, 55% and 80% in coming three years, respectively. While the remaining units shall be phased out during this period ending FY18.

Table 9: Details of JV with NTPC

Name of Plant/ Phase	Total Capacity	Expected CoD	State's share
PTPS Phase 1	3X800MW	2019-20	85%
PTPS Phase 2	2X1600MW	2022-23	85%

While TVNL has planned to undertake the development of Tenughat TPP Phase-2 under the State route and has sought support for meeting the funding requirements, JUUNL is also undertaking development of the Karanpura project under the Case-2 competitive bidding route.

The status of development activities and readiness for the State sector projects is summarized in Table 10.

Figure 13: Projection of Performance of State Generating Station

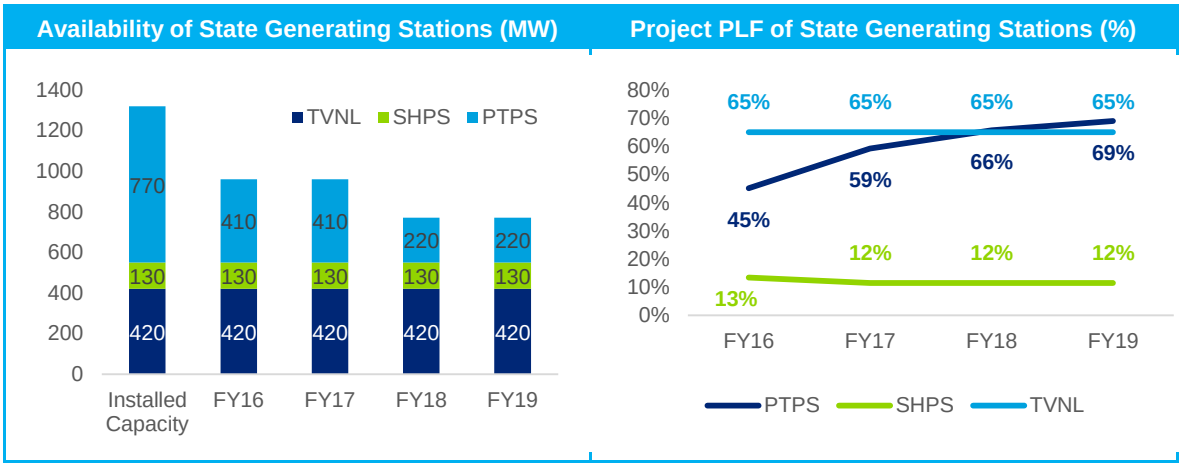


Table 10: Status of Development Activities of State Projects

Activity	JUUNL & NTPC JV (PTPS)	JUUNL (Karanpura)	TVNL (Stage-2)
Proposed Capacity	4,000 MW	1320 MW	1320 MW
Proposed CoD	2,400 MW by FY21 1,600 MW by FY23	FY19	NOT KNOWN
Mode of Development	JV Route	Case-2	State Sector
SPV Creation	NA	Done (KEL)	NA
Land Acquisition/ Availability	Available	Land Identified	NOT KNOWN
Water Allocation	Available	Assured by GoJ	NOT KNOWN
MoEF Clearance	TOR Accorded	Not Applied For	Not Applied For
Coal Availability	Banhardih Allocated to State on 24/03/2015 by MoC, GoI	Maurya Block earlier considered for the project has been deallocated	Rajbar E & D Coal Blocks have been allocated by MoC
Award of Project to Developer/ EPC	Awaited	Awaited	Awaited
Financial Closure	Not Achieved	Not Achieved	Not Achieved

Given the progress on the State sector projects summarized in Table 10, it is unlikely that the Karanpura project being pursued by JUUNL and the Stage-2 of TVNL will be achieved by the FY19. Accordingly, the utility will need to consider alternative sources of supply to meet the estimated energy requirement.

As the land, water and MoEF ToR clearance are already in place, the revival of PTPS project holds good potential of being commissioned under aggressive timelines and ensure adequate power availability by FY21.

IPPs (Jharkhand)

The Government of Jharkhand presently has 13 effective MoUs with private developers for IPPs with a total capacity of 16,081 MW in the State under the State energy policy. However, progress of development of IPPs in the State has remained slow and only 540 MW capacity (with 135 MW allocated to Jharkhand/ JBVNL) developed by Adhunik Power & Natural Resources Ltd. has been commissioned so far.

The progress on 3 additional IPPs which are presently under construction and are likely to be commissioned before FY19 is summarized in Table 11.

Table 11: Status of Development of IPPs

Plant Name	Capacity	JBNVL PPA	Expected COD	Status of Works
Matrishi Usha TPP, Phase-1 (2 X 270 MW)	540 MW	Nil	FY18	Works held-up since Nov, 2012 due to financial issues/ payment dispute with BHEL
Matrishi Usha TPP, Phase-2 (2 X 270 MW)	540 MW	Nil	FY19	Same as above
Tori Project, Essar Power (2 X 600 MW)	1200 MW	144 MW	Apr/ Oct 17	Law and order issues have delayed progress of work at site. MoEF clearance for 2nd Unit of 600 MW has been delayed.

The erstwhile JSEB had also entered into PPA for 990 MW from 1,320 MW (2 X 660 MW) power project of Dalmia Power Ltd. proposed at Chapariya, Deoghar. While ToR clearance has been obtained, the project has not progressed beyond and it is unlikely that it would be commissioned by the end of the 13th Plan.

Inter-State/ Central Sector Projects

Apart from above, the Utility has also entered into PPAs with various Central sector projects, the list of such inter-state projects along with their expected CoD and present status is provided in Table 12.

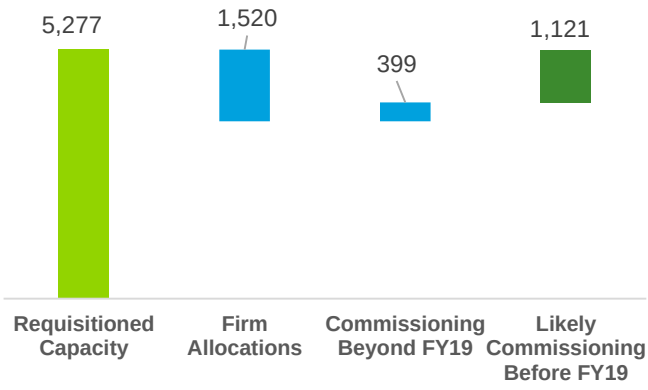
Table 12: Status of Inter-State Projects

Name of company	Fuel	Capacity (MW)	Allocated/ Requisition* (MW)	Tentative allocation (as per MoP)	Exp. CoD	Status
NTPC Darlipalli STPS	Coal	1,600	500*	125**	Feb/ Jun 18	Under Construction
NTPC Gajmara STPS	Coal	1,600	500*	125**	NA	Construction yet to start
NTPC Gajmara II STPS	Coal	1,600	500*	125**	NA	Construction yet to start
NTPC Talcher TPS-III	Coal	1,320	200*	103**	NA	Construction yet to start
NTPC Barh Stage-I	Coal	1,980	202	202	FY16-FY17	Under Construction
NTPC Barh Stage-II	Coal	1,320	80	80	Comm.	Already Commissioned
NTPC Bongaigaon	Coal	750	100	-	Jun-15	Under Construction
NTPC Nabinagar	Coal	1,980	60	60	Dec 15-Jun 17	Under Construction
NTPC North Karanpura	Coal	1,320	396*	434**	Feb 18-Feb 19	Under Construction
KBUNL Kanti TPS	Coal	195	12	12	Apr/ Dec 15	Under Construction
JIPL, Tilaiya UMPP	Coal	3,960	1,000	-	NA	PPA Terminated
UMPP, Tantiya	Coal	4,000	165	-	NA	Yet to be awarded
Sub Total (Thermal)			**3,715**	**1,266**		
Tipaimukh Mult.	Hydro	1,500	300*		NA	Construction yet to start
BSHPC	Hydro	9	9		NA	Not Known
NHPC Dibang	Hydro	3,000	1,000*	0**	NA	Construction yet to start
NHPC Teesta Proj. IV	Hydro	520	46*	46**	NA	Construction yet to start
Punatsangchhu-II HEP	Hydro	1,020	121.79	121.79	2018-19	Under construction
Mangdechhu HEP	Hydro	720	85.97	85.97	2017-18	Under construction
Sub Total (Hydro)			**1562.76**	**253.76**		
Grand Total			**5,278**	**1,519.76**		

Name of company	Fuel	Capacity (MW)	Allocated/ Requisition* (MW)	Tentative allocation (as per MoP)	Exp. CoD	Status
** Tentative allocation, based on CEA data						

Out of the total 16 requisiiton of capacity allocation by JBVNL, a significant portion of indicated capacities and are yet to be approved by the MoP and only 1,520 MW have been allocated so far. Additionally, out of these firm allocations, capacity of 399 MW pertain to projects which have not yet achieved the construction stage or are likely to be commissioned only beyond FY19. Only a total capacity of 1,121 MW out of the firm allocations, as indicated above, are likely to be commissioned by FY19. Figure 14 elaborates the break-up of the indicated capacities.

Figure 14: Likelihood of Commissioning of the Indicated Inter-State Capacities by FY19 (MW)



4.4. Anticipated Power Availability Position and Power Procurment - JBVNL

Considering the project specific availability of existing and likelihood of commissioning of the tied-up projects coming up in the future, the total installed capacity tied up for the State would increase from 2,327 MW (excluding Renewable Sources) to over 4.007 MW by the end of FY19, the details of which are provided in Table 13.

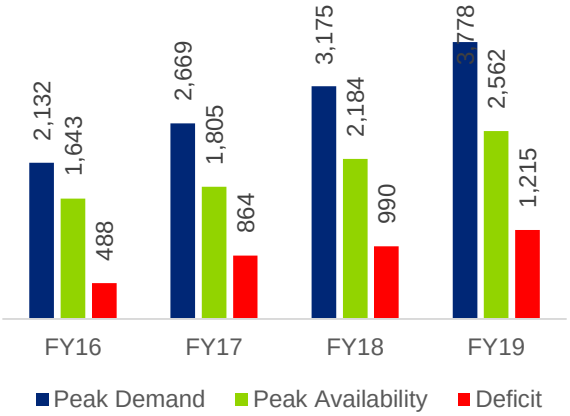
Table 13: Details of Generation Capacity Tied Up (MW)

Particulars		FY15	FY16	FY17	FY18	FY19	Details
State Sector	MW	960	960	875	875	875	PTPS, SHPS & TVNL
Private	MW	200	200	200	200	200	Adhunik, Inland and New Era
Private solar		16	16	16	16	16	Various plants
DVC	MW	765	765	765	765	765	DVC
Central - Coal	MW	315	315	315	315	315	Central allocation
Central - Hydro	MW	71	71	71	71	71	Central allocation
Sub- total (existing projects)	***MW***	***2,327***	***2,327***	***2,242***	***2,242***	***2,242***	
New - State Sector	MW	-	-	-	-	500	Karanpura
New - IPPs	MW	-	-	72	144	144	Essar - Tori
New - Interstate	MW	-	92	354	479	913	Darlipali, Talcher, Barh Stage I &II, Nabinagar, North Karanpura, KBUNL
New Hydro (Bhutan)	MW	-	-	-	42.99	146.87	Punatsangchhu-II HEP (1020W) Mangdechhu HEP (720 MW)

Particulars		FY15	FY16	FY17	FY18	FY19	Details
Sub- total (upcoming projects)	*MW*	*-*	*92*	*426*	*709*	*1,765*	
Total	MW	**2,327**	**2,419**	**2,668**	**2,951**	**4,007**	
New - Renewables	MW	4	84	340	950	1,585	Solar (1,560 MW) and Hydro (75MW)

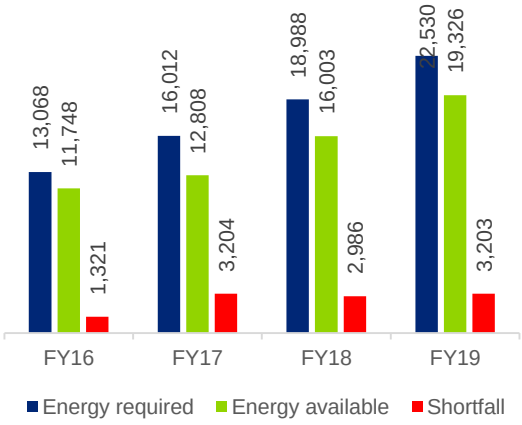
Based on the proposed availability for the existing State sector projects, availability for upcoming thermal and hydro projects as per National Electricity Policy expected in the future and accounting for the auxiliary consumption, the total power availability position vis-à-vis the expected peak load demand up to FY15 is expected to be as per Figure 16.

Figure 16: Peak Demand and Availability (MW)



The total available capacity including central sector allocation increases from 2,503 MW in FY16 to 5,592 MW in FY19, in which the share of power from renewable sources increases from 4% in FY16 to 29% in FY19 and the share of large hydro stations increases from 2.84 % in FY16 to 1.27 % in FY19. Similarly the total available energy available including energy from central sector allocation increases from 11,748 MU in FY16 to 19,326 MU in FY19, in which the share of energy from renewable sources increases from 0.4% in FY16 to 7.75 % in FY19 and the share of large hydro increases from 2.03 % in FY16 to 3.87 % in FY19.

Figure 15: Energy Required and Availability (MU)



As can be seen from Figure 16, the shortfall in power for Jharkhand is expected to be about 488 MW in FY16, 864 MW in FY17, 990 MW in FY18 and 1,215 MW in FY19. Further, upon analysis of the upcoming projects by Central and State Agencies as well as IPPs, it can be observed that a lot of these projects would not be commissioned by FY19. This could potentially impede the target of providing 24x7 power supply.

In terms of energy availability, the utility may need to explore open market purchase or requisition of additional capacity to meet the energy requirement sufficiently. The energy deficit can be seen in Figure 15, which is expected to increase to 3,203 MU in FY19 from 1,321 MU in FY16.

Although, long term PPAs are beneficial for any utility, but for the purpose of this plan, it is assumed that such energy shortfall shall be met through open market purchase, including bilateral transactions. The power purchase plan prepared for JBVNL addresses the impact of such purchases.

In order to balance the capacity becoming operational gradually by FY20 and beyond, it would be feasible for JBVNL to plan the sourcing of power for FY16 up to FY19 on medium term basis. It may be noted that the capacity indicated is independent of the capacity already planned to be purchased through long term Competitive Bidding Process.

The total quantum of power to be procured from the market on medium and short term basis to balance the upcoming capacities beyond FY20 may be finalized by JBVNL. The medium term interim procurement would shield the Utility from the price volatility of the Short Term procurement which could be a big exposure if undertaken for a large quantum, and would ensure steady power supply for its progressively increasing demand. Procurement of power on Short Term basis can be done for the balance quantum, after finalizing the Medium Term Procurement, which is ideally around 10% of the total power portfolio. The quantum of Short Term procurement shall have to be planned on year-on-year basis taking into consideration the Medium Term and Long Term availability from various sources, and with an objective to meet the peaking demands during any given year.

Furthermore, analysis of the present market dynamics reveals the markets to be in a subdued state in terms of the price. Therefore, it would be prudent for JBVNL to secure tie-ups on Medium Term basis for the interim period first and then the procurement of power on Short Term basis for any remaining quantum may be looked into. It is expected that the location of Jharkhand in the Eastern Regional Grid would also ensure the availability of power from the market and a good response in the bidding processes from the prospective bidders. Another important consideration for JBVNL should be the procurement of hydro power in order to improve its hydro-thermal mix, which is presently at a very low level of about 8%. JBVNL should plan towards including the procurement of Hydro Power in the additional quantum needed to be procured on long term basis to meet the projected deficits. This would not only result in improvement of the low hydro-thermal ratio of JBVNL's power portfolio, but would also provide clean energy for the future. The procurement of Hydro power may be easily done on cost-plus basis.

4.5. Generation Plan – Other utilities

Presently, the other utilities operating in the State, viz. DVC, JUSCO, TSL and SAIL Bokaro, are procuring power from different sources, as detailed out in Table 14.

Table 14: Power Procurement Sources (Other Utilities)

Name of utility	Power procurement sources
JUSCO	DVC & TSL
TSL	Tata Power, TSL Captive
DVC	NHPC (Rangit, Teesta) NTPC (Talcher, Farakka, Kanti) PTC (Chukha, Kurichu, Tala) Own Generation (Bokaro TPS, Chandrapura TPS, Durgapur TPS, Mejia TPS, Durgapur Steel TPS, Koderma TPS, Raghunathpur TPS) Maithon Power Ltd. (MPL)
Bokaro	DVC and SAIL Captive

It has been indicated by these utilities that these utilities already have adequate availability of power to meet the anticipated increase in power demand in the future years. The additional procurement sources may include additional allocation from the existing sources, own captive generation and short/medium term procurement.

4.6. Funding Requirement

JUUNL had earlier prepared a plan for undertaking various Renovation & Modernization works for PTPS totaling Rs.

167.13 Cr. proposed to be undertaken in FY16. However, due to the recent JV with NTPC for revival of PTPS units and capacity addition, the R&M plan has been discarded. The new JV entity will be preparing a plan in near future for R&M and assess the expenditure required.

Additionally, TVNL has also planned for certain R&M investments in the existing station for which it needs additional share capital of Rs. 800 Cr. from the State government for achieving financial closure of the 1,320 MW Stage 2 R&M Project.

The total investment planned under the State sector is outlined in Table 15.

Table 15: State Sector Investment Plan

Description (Rs. Cr.)	FY16	FY17	FY18	FY19
TVNL				
R&M of Existing Plant	20	-	-	-
1320 MW Stage-2 Project	-	700	1,400	4,900
Total	20	700	1,400	4,900

4.7. Action Plan & Support Required

As can be seen in Table 16, by FY19 JBVNL needs to tie-up 1,805 MW of additional sources of power (considering a spinning reserve of 5%) to be able to meet the demand arising for meeting the objectives outlined under the 24X7 PFA program. The year wise additional capacities required are provided in Table 16.

Table 16: Additional Generation Capacity Requirement

Description	FY16	FY17	FY18	FY19
Additional Installed MW Peak Generation Requirement (Considering 5% Spinning Reserve)	595	998	1,149	1,404
Additional Capacity to be Tied-up	765	1,283	1,478	1,805
YoY Capacity addition required	765	518	195	328

A considerate approach is required for tying up additional capacities for the demand supply mismatch envisaged during the period FY16 to FY19 in view of the subsequent phases of PTPS, proposed to be developed in JV with NTPC, with a capacity addition of 2,400 MW by FY20 and additional 1,600 MW by FY23. The utility may need to rely on short/ medium term competitive procurement (through Case-1 route) during the interim period.

In line with the above generation plan, following action points listed in Table 17 have been identified for respective stakeholders to be able to make suitable arrangements for tying up the additional power requirement:

Table 17: Stakeholder Intervention

Description	Action points
State Government	• Finalize formalities for operationalizing the JV with NTPC for development of subsequent phase of PTPS on fast track mode. Given the resource availability at the site, the first phase can be targeted for completion by FY19. • Assist in Expediting and completion of land acquisition for the 1320 MW Karanpura Energy Limited, being developed by JUUNL. • Provide equity funding support to TVNL for taking-up the proposed 1320 MW of Stage – II of TVNL project. • Provide administrative support to the Maitrishi Power Project for overcoming the law and order issues being faced at site and support in quick restart of construction works at the project site.

Description	Action points
JBVNL	• Undertake Case-1 procurement for sourcing power in the medium term from available/ untied sources of power, till such time the tied-up sources get commissioned. • Make payments to TVNL (also DVC) to improve its financial viability and thereby make it easier for it to achieve financial closure of the stage-2.
Government of India	• Allocation of the requisitioned capacities to JBVNL from Darlipalli and North Karanpur Projects which are likely to be commissioned by FY19. • Re-allotment of the Maurya Coal Block to the State enable development of the 1320 MW Karanpura Project by the JUUNL.

5. Transmission Plan

5.1. Transmission capacity requirement

The intrastate transfer of power within the State of Jharkhand is being done by JUSNL or DVC, while the inter-state transfer is largely done by the Inter State Transmission system (ISTS) of ER grid and to some extent by DVC. A well planned and strong transmission system will not only ensure optimal utilization of transmission capacities but also of the generation facilities and would also facilitate achieving ultimate objective of cost effective delivery of reliable power to end consumers.

Both energy and peak demand in the State of Jharkhand (for all utilities together) is expected to increase significantly from the present level of 20,667 MU & 3,255 MW in FY15 to 34,164 MU and 5,696 MW in FY19, requiring a robust intra-state and interstate transmission network.

5.2. Existing Transmission System – JUSNL

Intra State Transmission System

At the time of creation of the State of Jharkhand in 2001, the total transformation capacity of the erstwhile JSEB was 1,435.4 MVA at 220kV and 132 kV level with 18 GSS supported by 1,502.7 km (2,122 ckm) transmission lines. Over the years new GSS have been constructed and augmentation of existing GSS has been done. In addition DVC has its own transmission network in Jharkhand for transmission of power from its generating stations to various GSS from where it supplies power to JUSNL as well as other HT consumers in the DVC Command Area falling within the State.

The total grid substation capacity of JUSNL as on January 2015 was 3,690 MVA at 220kV and 132kV with 30 GSS, as outlined in Table 18.

Table 18: Intra-State Transmission System – JUSNL (Jan, 2015)

Voltage	Transformation Capacity (MVA)	Line Length (cKm)
400 /220 kV	-	180
220 /132 kV	1,400	839
132 /66kV	2,290	1,836
Total	3,690	2,855

Since creation of the State of Jharkhand around 1,352 cKm of transmission lines have been added. Currently, the grid substations are connected through 400/220/132 kV transmission lines having the total line length of 2,855 cKm.

The intra-state transmission is adequate for meeting the existing demand of the distribution utilities in the State and operates at an annual average availability of 98% and at a technical loss of approximately 5%.

Inter-state Transmission System

POWERGRID, at present, owns and operates 4 nos. of sub-stations with transformation

capacity of 4,890 MVA linked through about 4,587 ckm of high capacity lines as listed below.

- Ranchi – 630 MVA
- Ranchi (New) – 3,000 MVA
- Jamshedpur – 630 MVA
- Chaibasa – 630 MVA

The abstract of inter-state transmission system has been detailed in Table 19.

Table 19: Inter-state Transmission System

Voltage	Transformation Capacity (MVA)	Line Length (cKm)
765/400 kV	3,000	303
400/220 kV	1,890	4,284
Total	4,890	4,587

The existing inter-state transmission network is adequate to handle the existing power flows of the State.

5.3. Existing Transmission System – DVC

Intra State Transmission System

The total grid substation capacity of DVC in the State of Jharkhand as on March 2015 was 4,125 MVA at 132kV with 17 GSS. The abstract of the intra-state transmission system is provided in Table 20.

Table 20: Intra-State Transmission System - DVC (March, 2015)

Voltage	Transformation Capacity (MVA)	Line Length (cKm)	No. of Intra-state Transmission Lines
220/132 kV	-	662	6
132/66 kV	4,125	1,363	28
Total	4,125	2,025	34

The details of the existing intra-state transmission system of DVC is shown in the Annexure 1.

DVC's intrastate transmission systems are used for supplying electricity to various consumers of DVC at 33 kV and above level and also to supply bulk power to JBVNL at various inter-connection points.

Inter-state Transmission System

The abstract of the inter-state transmission system of DVC is provided in Table 21.

Table 21: Inter-state Transmission System (Jan, 2015)

Voltage	Line Length (cKm)	No. of Inter-state Transmission Lines
220/132 kV	522	3
132/66 kV	1,013	12
Total	1,535	15

The existing length of DVC interstate transmission lines is 1,535 cKm out of which around 66% is at 132 kV class. The existing installed capacities of the inter-state transmission network of DVC is adequate to handle the existing power flows in DVC command area.

The inter-state transmission lines of DVC in the State of Jharkhand are mainly used for evacuation of power from various DVC's power projects to the ER interconnection points for onward supply to bulk procurers located in various parts of the country. Additionally, the DVC command area cuts across the State of Jharkhand and West Bengal, thus necessitating DVC to set-up transmission systems for facilitating inter-state flow of power within its command area.

5.4. Intra-state Transmission Plan - JUSNL

Ongoing schemes

JUSNL has undertaken in-house as well as execution of schemes through PGCIL for enhancement/augmentation of transmission

capacity to meet the downstream load of JBVNL which has increased substantially over past few years. The load is likely to increase further due to implementation of upcoming projects in distribution segment viz. DDUGJY, RGGVY, IPDS and other state funded schemes and for meeting the 24X7 PFA objectives listed in this roadmap document.

JUSNL has identified the projects in order to meet the following requirements:

a) Meet demand for power arising from existing and future end-consumers in various load centers/ pockets in the State;

b) Providing connectivity for evacuation of power from various upcoming intra and inter-state power plants and for onward delivery of such power to load centers/ drawl points;

c) Improving the availability and reliability of the intra-state transmission systems in the state; and

d) Improving efficiency by way of reducing technical losses in the intra-state transmission systems.

The summarized list of ongoing schemes and proposed capacity addition for various voltage levels is given in Table 22.

Table 22: Ongoing Schemes of JUSNL

Parameter	FY16	FY17	Total
Substations (Nos)	12	4	16
Transformation Capacity (MVA)	3,860	1,300	5,160
400/220 kV	1,260	-	1,260
220/132 kV	1,800	900	2,700
132/66 kV	800	400	1,200
Lines (ckm)	2,297	1,018	3,315
400 kV	270	-	270
220 kV	1,088	738	1,826
132 kV	939	280	1,219

Total 16 GSS are presently under various stages of development having a proposed transformation capacity of 5,160 MVA. The total project cost of under construction GSS is Rs 1,088.2 Cr., details of which are provided in Annexure 2.

The construction of above mentioned GSS are likely to be completed by FY16 except four GSS viz. Bokaro, Giridih, Jasidih and Saria which will be completed by FY17. The detailed list of under construction GSS is shown in the Annexure 2.

Presently, around 32 sections of intra-state transmission lines are under construction having a proposed total length of 3,315 cKm. The total estimated cost of the schemes is Rs 970 Cr. The detailed list of under construction transmission lines is shown in the Annexure **3**.

Proposed New Schemes

JUSNL has planned to add additional 34 new GSS which will enhance the transformation capacity by 4,270 MVA in the State. Further, around 4,180 cKm of new transmission lines have been planned to be added by FY19 apart from ongoing transmission lines works. The total project cost for planned GSS and transmission systems is Rs 2,380 Cr.

The summarized list of planned schemes and proposed capacity addition for various voltage levels is given in Table 23 and Table 24.

Table 23: Additional New Schemes Planned by JUSNL

Parameter	FY17	FY18	FY19	Total
Substations (Nos)	3	19	16	38
Transformation Capacity (MVA)	270	2,300	1,700	4,270
400/220 kV	-	-	-	-
220/132 kV	-	600	600	1,200

Parameter	FY17	FY18	FY19	Total
132/66 kV	270	1,700	1,100	3,070
Lines (cKm)	-	2,004	2,176	4,180
400 kV	-	40	-	40
220 kV	-	88	486	574
132 kV	-	1,876	1,690	3,566

Augumentation schemes

The size of power transformers in JUSNL's system range from 150 MVA to 20 MVA. There are 17 power transformer which are proposed for replacement having capacity of 20MVA each. In addition new transformers are proposed for installation in existing GSS for enhancement of capacity. The year wise capacity addition after implementation of augmentation schemes will result in overall capacity addition of 2,250 MVA out of which 1,950 MVA is scheduled to be achieved by FY19. The total project cost for augmentation of existing grid substation is Rs.835.25 Cr. Details of the projects is provided in Table 24.

Large proportion of JUSNL's lines are single circuit and almost lived out its useful life due to which the lines are operated at sub optimal capacity and subject to frequent break down. These lines have been planned for re-conductoring with high current capacity conductors with lesser weight to utilize the same tower structure and corridor due to cost considerations and ROW issue involved in construction of new lines. The total project cost for augmentation of existing transmission lines is Rs.294.61 Cr.

Table 24: Augmentation Schemes Planned by JUSNL

Parameter	FY16	FY17	FY18	FY19	Total
Capacity (MVA)					
400/220 kV	-	-	-	-	-
220/132 kV	-	300	150	750	900
132/66 kV	400	350	350	-	1,100
Re-conductoring (ckm)					
400 kV	-	-	-	-	-
220 kV	60	195	205	99	559
132 kV	130	245	390	232	997

Apart from augmentation of GSS, other measures like replacement and refurbishment of equipment, implementation of SCADA, energy management and auditing, implementation of asset management system, GIS mapping etc. have been proposed to bring about overall improvement in performance of transmission system and reduce downtime and losses.

Schemes proposed for implementation under PPP mode

The State has planned to implement 3 GSS and 5 transmission lines under PPP mode wherein the entire investment is to be made by private concessionaires. The estimated cost for such schemes is Rs 652 Cr. The mode of execution will be Tariff Based Competitive Bidding (TBCB) with provision of Viability Gap Funding (VGF).

Consultant has been appointed for preparation of feasibility for execution of these projects in PPP mode.

Evacuation & Inter-connection Projects

JUSNL has planned 9 schemes totaling Rs. 1,358 Cr. for power evacuation arrangements for generating stations coming in the State. These projects are to be taken up for execution in line with construction of upcoming thermal power plants and the commissioning is proposed to be linked with such plants.

5.5. Intra-state Transmission Plan - DVC

Ongoing / Proposed schemes

DVC has undertaken enhancement of transmission capacity to meet the downstream load which has increased substantially over the past few years. The summarized list of ongoing schemes and proposed capacity addition at various voltage levels is given in Table 25.

Table 25: Ongoing Schemes of DVC

Parameter	FY16	FY17	FY18	Total
Substations (Nos)	-	-	2	2
Transformation Capacity (MVA)	-	-	320	320
400/220 kV	-	-	-	-
220/33 kV	-	-	320	320
132 kV	-	-	-	-
Lines (ckm)	-	262	178	440
400 kV	-	-	-	-
220 kV	-	220	178	398
132 kV	-	42	-	42

Two 220/33 kV GSS have been planned by DVC having a proposed transformation capacity of 320 MVA. The total project cost of proposed GSS at Gola and Mugma is Rs 133.8 Cr. The construction of above mentioned GSS are likely to be completed by FY18.

Presently, around 4 sections of intra-state transmission lines have been proposed of which around two lines are under construction. The total length of proposed lines is 440 cKm. The total estimated cost of the schemes is Rs 146 Cr. The detailed list of ongoing and proposed Transmission Lines is shown below:

a) Ongoing Schemes

i. 220 kV D/C Giridih-Koderma line (220 ckm)

ii. 220 kV D/C Gola – Ranchi line (112 ckm)

b) Proposed Schemes

i. 220 KV D/C LILO of BTPS-JSR line at Gola S/S (66 ckm)

ii. 132 KV D/C Dhanbad – Govindpuri line (42 ckm)

5.6. Inter-state Transmission System Plan - PGCIL

It has been planned to add about 2,400 ckm of ISTS lines and augmentation of about 1,945 MVA transformation capacity including two new 400/220 kV Sub stations in Jharkhand.

The proposed inter-state transmission system would facilitate evacuation of power from different upcoming generation projects in the State as well as disperse power from the National Grid to the State. PGCIL is also contributing by way of implementation of sub-transmission schemes in Jharkhand as a consultancy work. The list of proposed works under ISTS is shown below:

a) Ongoing Schemes

i. Two new 400/220 kV Sub stations with total capacity of 1,630 MVA (Daltonganj - 630 MVA, and Dhanbad – 1,000 MVA)

ii. Augmentation of 400/220 kV transformation capacity by 315 MVA at Jamshedpur Sub station

iii. One new 220/132kV sub-station at Daltonganj with capacity of 320 MVA

iv. New transmission line aprrox. 2233 ckm (765 kV – 861 ckm, 400 kV – 1052 ckm and 132 kV – 240 ckm)

b) Generation linked schemes

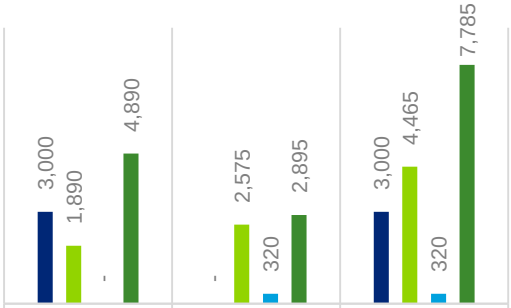
i. 400 kV lines to evacuate 1980 MW from North Karanpura STPP (420 ckm)

ii. 765 kV lines to evacuate 4000 MW from Tillaya UMPP (850 ckm)

iii. 765 kV (330 ckm) and 400 kV (398 ckm) lines to associated with Phase – I generation projects in Jharkhand & West Bengal.

It is expected that by the end of FY19 the inter-state transmission capacity will be 7,155 MVA from existing 4,890 MVA. The MVA growth in the inter-state network in view of the proposed capacity additions is outlined in Figure 17.

Figure 17: Inter-state Capacity Addition



	Existing	Planned upto FY19	Inter State Capacity by FY19
765 kV	3,000	-	3,000
400 kV	1,890	2,575	4,465
220 kV	-	320	320
Total	4,890	2,895	7,785

Given the status of development of upcoming plants in the State and the quantum of inter-state capacities from where JBVNL is likely to source power in the near future, the total capacity of 7,785 MVA in the inter-state network should be adequate to address the needs of the State.

5.7. Inter-state Transmission System Plan - DVC

Presently, two transmission lines are under construction having a proposed length of 732 cKm and the construction is likely to be completed by FY16. The estimated cost for these two lines is Rs 606.9 Cr. The list of under construction lines is as below:

a) 400 KV D/C RTPS – Ranchi line (316 ckm)

b) 220 KV D/C MTPS – Gola – Ramgarh line (416 ckm)

5.8. Adequacy of intra state Transmission Planning

The total intra state transmission capacity (including existing GSS and Lines) after implementation of all schemes which are expected to be completed by end of FY19 is detailed in Table 26.

With the total anticipated demand for power reaching 3,778 MW in FY19 in JBVNL supply area, the proposed transmission capacity additions by JUSNL appear to be adequately placed to cater to the increased load and also improve reliability of the system by building in redundancies in the system. However, the utility shall carry out load flow studies to verify the adequacy of the planned intra-state transmission system as per the projected load for FY19.

5.9. Fund requirement (intra-state)

The total project cost for all the ongoing and planned schemes is Rs.9,148 Cr. The breakup estimated cost for such schemes is detailed in Table 27.

Table 26: Total Capacity Post Implementation of Schemes

Particulars	Existing	Additions after implementation of Schemes				Cumulative Capacity
		FY16	FY17	FY18	FY19	Till FY19
Grid Substations (Nos)	30	12	7	19	16	84
Transformation Capacity (MVA)						
400/220 KV	-	1,260	-	-	1,890	3,150
220/132 KV	1,400	1,800	1,200	750	2,250	7,400
132/66 KV	2,290	1,200	1,020	2,050	1,200	7,760
Sub Total	3,690	4,260	2,220	2,800	5,340	18,310
Transmission Lines	**(cKm)**					
400 KV	180	270	0	40	2,668	3,158
220 KV	839	726	738	88	1,026	3,417
132 KV	1,836	1,301	280	1,876	1,690	6,983
Sub Total	2,855	2,297	1,018	2,004	5,384	13,558

Table 27: Year-Wise Fund Requirement

Sl.	Name of Intra State Scheme	FY16	FY17	FY18	FY19	Total
1	Planned Ongoing Schemes	723	310	-	-	1,033
2	Proposed Planned Schemes	-	1,017	1,406	1,589	4,012
3	Augmentation Schemes	130	260	340	400	1,130
4	Schemes Proposed For Implementation Under PPP Mode	466	332	-	-	798
5	Schemes Proposed For Availing Power From Upcoming Power Plants In Jharkhand	-	-	1,153	1,022	2,175
	Total	1,319	1,919	2,899	3,011	9,148

5.10. Government Interventions

JUSNL is a newly created company under unbundling scheme as per Electricity Act 2003 and does not have sufficient resources to take up the project required for ensuring 24X7 power supply .The resources of State government is also scarce . The capital outlay required is very high and cannot be met through market funding or equity contribution by JUSNL alone.

The equity capital of JUSNL is minimal and its asset base largely comprises of depreciated fixed assets which operate at sub optimal capacity. Therefore JUSNL requests financial assistance through 100% central govt. grant funds. Additionally, the assistance of central govt. is required for ensuring timely statutory clearances such as environment clearance etc.

5.11. Action Plan

JUSNL has proposed a twofold action plan for ensuring timely implementation of the proposed investments in the intra-state transmission systems:

a) Bridging of the funding gap: Given that only about Rs. 2,000 crores is expected to be made available from the State resources to JUSNL towards the proposed investments in the intra-state transmission systems, thereby leaving a gap of about Rs. 7,148 crores. The State

would undertake the following steps for arranging necessary funding for the proposed investments:

i. Identify investments which are incidental to the inter-state systems and can therefore be covered under IPDS. JUSNL would make such assessments and initiate project approval request under IPDS by September, 2015.

ii. Requisition for funding support from PFC/ REC. PFC and REC to assess lending limit to JUSNL and communicate to JUSNL by August 30, 2015. JUSNL to make application within 30 days of same.

iii. Initiate process for seeking long-tenure funding support from the World Bank. JUSNL to apply for DEA approval by August 30, 2015.

b) Given the quantum of investments proposed in the intra-state transmission systems, JUSNL is keen to entrust the project management of the proposed works to a competent national / international agency, to be selected through international competitive bidding process.

6. Distribution Plan

6.1. Objectives of the Distribution Plan

The significant increase in power demand catered in the State (corresponding to JBVNL system) from 11,473 MU & 1,810 MW in FY15 to 22,530 MU and 3,778 MW in FY19) would require commensurate investments in the sub-transmission and distribution infrastructure.

Accordingly, the objectives of the distribution plan, in accordance with the 24X7 PFA, includes the following:

a) Making provision for 24X7 supply to all connected consumers through capacity augmentations and building redundancies in the upstream network for improving reliability of supply;

b) Ensuring provision of electricity access to the over 32.78 Lakhs rural and urban unconnected households in the State;

c) Provision of 24X7 supply to demand growth from existing consumers and that arising from new consumer growth in the State; and

d) Making system improvements for reducing AT&C losses in accordance with the targets agreed with the MoP; and

e) Adopting appropriate technologies and systems to support RE integration and EE/ DSM measures in the State.

6.2. Existing Distribution System – JBVNL

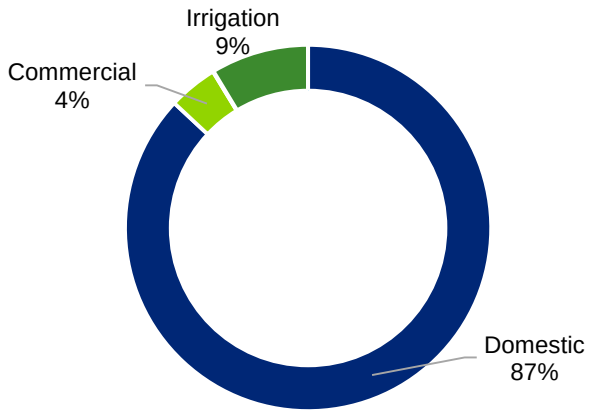
JBVNL's systems comprise of 33 KV sub-transmission systems which forms the distribution backbone at the district level and 11 KV and LT distribution systems which delivers electricity to the majority of the end consumers. The abstract of JBVNL's network in terms of installed transformation capacity and line lengths of feeders at various voltage levels is provided in Table 28.

Table 28: JBVNL's Network (April, 2015)

Particulars	Numbers	Capacity (MVA)
Transformation Capacity		
33 KV / 11 KV Substations	320	3,565
11 KV/ LT Distribution Transformers	66,836	3,448
Lines		
33 KV Feeders	375	6,264 cKm
11 KV Feeders	1,076	50,220 cKm
Distribution Feeders	-	75,174 cKm

JBVNL has achieved metering of over 87.5% of its existing consumer base. All Industrial (LT & HT), Traction consumers are metered in the State. Out of the over 2.6 lakh un-metered consumers in the State, over 2.4 lakh are rural/ BPL domestic consumers covered under the initial phase of the RGGVY program. JBVNL has proposed to cover metering for all un-metered consumers as well as replacement of identified defective meter cases within the first two years as covered under the PFA

Figure 18: Break-up of Un-metered Consumers



Roadmap. Figure 18 outlines the break up of un-metered consumers in the State.

JBVNL regulates supply to rural areas to around 12-14 hours on an average. The districts with large number of villages i.e. largely rural districts are getting lesser power supply vis-à-vis districts with fewer villages. The significant difference amongst districts in terms of the rural hours of supply is highlighted in Figure 19.

JBVNL endeavors to supply 24X7 electricity to urban and town areas, however, the same is limited by distribution network and power availability constraints. Additionally, there are significant failures in the distribution system which adversely impact the power availability at the consumer level. An indication of the same is about 5% DT failures recorded during the year FY15.

Significant works have been completed under the RGGVY Scheme in the State of Jharkhand since the 10th plan period. Out of total sanctioned scheme value of Rs. 3,496.8 Cr., works pertaining to Rs. 3,076.4 Cr. have been completed so far by JSEB/ JBVNL, NTPC Electricity Supply Company Ltd. and DVC. The scheme has benefited the State through electrification of 17,902 un-electrified villages, intensive electrification in 6,050 electrified villages, providing electricity connections to

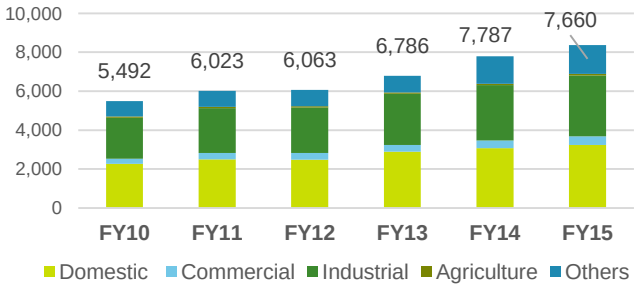
Figure 19: District Wise Rural Hours of Supply (Jan-Feb, 2015)

over 12.67 lakh BPL consumers and setting-up of 89 substations in the state.

The State has proposed significant works under the RAPDRP scheme for 30 towns. However, the actual progress on works covered under both Part-A and Part-B has remained slow so far. Out of the total approved project cost of Rs. 1,301 Cr. under Part-B, Rs. 1,181.46 Cr. have been disbursed as on April 30, 2015. The RAPDRP Part-B works, if completed on time, would contribute significantly to meeting the 24X7 PFA objectives in the given set of 30 towns.

The distribution infrastructure of JBVNL presently caters to nearly 26.62 lacs of consumers and handling a total energy supply of nearly 7,660 MU during FY15. Even though the State utility has witnessed a flight of industrial consumers to other parallel license' network including DVC and JUSCO over the last few years, the present consumer mix with nearly 40% of industrial sales, is significantly better than most of the State utilities in the country. Figure 20 presents the sales mix of JBVNL over the years.

Figure 20: Category Wise Energy Sales (in MU)



The consumer mix assumes an important role, whereby balance of subsidizing and subsidized consumers ensures reduction of burden over the utility's finances. However, despite the significant advantage of having large industrial consumer mix, JBVNL has not been able to contain its commercial and financial losses.

Going forward, as the consumer mix of utility skews further towards the domestic (rural and urban) consumption, it is utmost important for JBVNL to reduce regulatory disallowance, enhance collection efficiency and contain its AT&C losses by building a robust sub transmission and distribution network.

6.3. Existing Distribution System – Other utilities

DVC is supplying power to its consumer at 33kV and above voltage level, and has no sub-transmission and distribution infrastructure in its command area. In case of utilities other than JBVNL and DVC, the geographical area of operations is limited. The existing distribution infrastructure of these utilities is provided in Table 29.

Table 29: Existing Sub-transmission & Distribution Infrastructure (Other Utilities)

Utility	Particulars	Numbers	Capacity
JUSCO	**Transformation Capacity**		
	132/33 KV / 11 KV Substations	3	168 MVA
	33 /11 KV substation	3	60 MVA
	Lines		
	11kV, 33 KV and above lines	-	300 cKm
	LT lines	-	53 cKm

6.4. Connecting the un-connected – Proposed Electrification Plan

Presently, out of the 29,494 inhabited villages in Jharkhand, 26,795 have been electrified under central and State scheme, while remaining 2,699 villages are yet to be electrified, which shall be covered under

various ongoing and proposed schemes, as detailed in Table 30.

Table 30: Village Electrification Plan

Particulars	Numbers
No. of inhabited villages	29,494
Villages electrified before RGGVY	8,559
Villages covered under 10th & 11th Plan	17,902
Villages covered under RE State plan	334
Un-electrified villages	**2,699**
Villages to be covered in 10th & 11th Plan / RGGVY	970
Villages to be covered in 12th Plan RGGVY	308
Villages to be covered under DDG scheme	477
Villages to be covered under DDUGJY	259
Villages to be covered under RE State plan	685

In addition to above the utility has also prepared a plan for electrification of all rural and urban HHs over the next 4 years, as detailed in Table 31. The utility aims to cover nearly 11.8 Lac rural HHs under 12th Plan RGGVY, while remaining 16.4 Lac rural HHs are planned to be covered under the DDUGJY scheme. Further, the remaining 1.8 Lac un-electrified urban HHs are planned to be covered under IPDS scheme, details of which are provided in Annexure 8. A detailed quarterly electrification plan for all districts for both urban and rural HHs has been provided under action plan detailed in Table 38.

Table 31: Electrification Plan - Rural HHs

Particulars	Numbers
No. of rural HHs	49,89,086
No of un-electrified rural HHs (Beginning of FY16)	28,18,221
Electrification of rural HHs under proposed 12th Plan/ RGGVY	11,79,476
Electrification of rural HHs proposed under DDUGJY	16,38,745
Total HHs proposed to be electrified	**28,18,221**
Rural HHs to be electrified in FY16	2,58,829
Rural HHs to be electrified in FY17	11,99,309
Rural HHs to be electrified in FY18	9,50,367
Rural HHs to be electrified in FY19	4,09,686

In order to materialize the above electrification objectives of the utility, significant addition in distribution infrastructure will be required.

6.5. Proposed Distribution Infrastructure Addition Plan

In view of the burgeoning power demand to fulfill the 24X7 PFA objectives, the distribution utility of Jharkhand has prepared a comprehensive distribution system capacity addition plan encompassing around two fold increase in the existing infrastructure. As can be seen in Figure 21, the number of sub stations is expected to increase to 642 with nearly 7,188 MVA capacity from existing number of 320 sub-station with 3,687 MVA capacity.

In order to ensure that all HHs, whether urban or rural, are connected and supplied with adequate energy, a significant increase in distribution lines and distribution transformation capacity is planned, with over 107,043 cKm of 11 KV and LT lines to be laid and DT capacity of around 7,657 MVA to be added over the period FY16 to FY19. The year-wise phasing details of distribution infrastructure is provided in Table 32.

In addition to the network capacity additions, the provision of providing electricity access to over 32 lakh connections would also require an estimated investment of about Rs. 914 Cr. towards metering.

Figure 21: Proposed Distribution Infrastructure

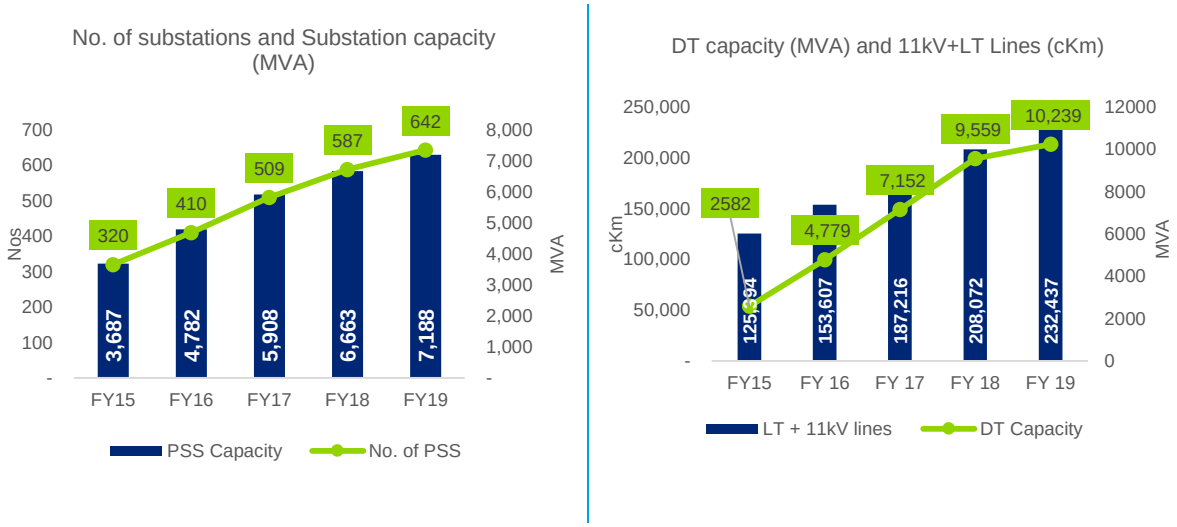


Table 32: Year-Wise Phasing of Distribution Infrastructure

Particulars	Units	FY16	FY17	FY18	FY19	Total
No. of PSS	No	90	99	78	55	323
PSS Capacity	MVA	1,095	1,126	755	525	3,501
33 kV Lines	Kms	844	1,195	1,022	739	3,800
11 kV Lines	Kms	15,365	18,572	11,682	14,485	60,103
11 kV Feeder	Kms	967	796	605	-	2,368
11 kV Feeder Bay	No.s	101	79	49	-	229
Total DTR	No.	32,963	37,139	20,959	25,516	116,578
DTR Capacity	MVA	2,197	2,373	2,406	680	7,656
LT Lines	CKm	12,849	15,037	9,175	9,879	46,940

To achieve the PFA objectives, JBVNL is actively participating in central/State government funded schemes to boost its distribution infrastructure. A total capital expenditure of Rs. 9,625 Cr. has been envisaged over the next four years and is partially covered under approved DPRs for various programs of the Central/State Government. These already approved schemes and the proposed infrastructure development under the respective schemes have been discussed in the following sub-section. Additionally, to meet the objectives of 24X7 PFA program encompassing 100% electrification of rural HHs and enhancing the infrastructure in urban areas the utility has proposed significant investments, part of which are likely to be covered under central government schemes including DDUGJY and IPDS.

Distribution Infrastructure Addition Under Existing Schemes

The collective objective of all the Central/ State Government schemes has been to enhance the reach, reliability and quality of electricity to end consumers and to improve the financial position of utility by way of reducing the AT&C losses. The following schemes are presently underway various stages of implementation in Jharkhand, which not only provide the funding assistance but

also aim towards enhancing the technical capacity of utilities.

R-APDRP Part B

Under Part-B of the RAPDRP scheme, the State has planned to invest Rs. 1,301 Cr. to revamp the distribution infrastructure of 30 identified towns. Increasing substation capacity, expanding distribution lines and increasing the transformation capacity of distribution transformers would be the primary investment area. The abstract of the proposed infrastructure development plan is provided in Table 33 and the district/circle-wise details of the scheme are provided as Annexure 4.1, 4.2 and 4.3 of this report.

Table 33: RAPDRP Proposed Infrastructure Plan

Particulars	Numbers	Capacity
Transformation Capacity		
33 KV / 11 KV Substations (MVA)	25	305
Renovated Capacity	45	375
11 KV/ LT Distribution Transformers (MVA)	7,571	4,451
Lines		
33 KV Feeders (cKm)	-	504
11 KV Feeders (cKm)	-	3,705
LT Feeders (cKm)	-	3,032

Atal Gram Jyoti Yoijna

The utility has sanctioned the works with an investment of Rs.50 Cr. under the Atal Gram Jyoti Yojna scheme for FY16, whereby connection to rural HHs will be provided.

Rural Electrification – State Plan and RGGVY (12th Plan)

Apart from the Central Govt. schemes, the State Government has also allocated Rs. 160 Cr. towards the strengthening of distribution infrastructure focusing on 7 cities including the capital Ranchi and eyes completion of the project within a year. The proposed infrastructure plan is provided in Table 34 and the district-wise details are provided in the Annexure 5.

Table 34: Proposed Infrastructure Plan by the State Government

Particulars	Numbers	Capacity
Transformation Capacity (MVA)		
33 KV / 11 KV Substations	12	90
Augmentation of Substation	26	130
11 KV/ LT Distribution Transformers	1,173	92
Augmented Distribution Transformers	797	26
Lines (ckm)		
33 KV Feeders	-	
11 KV Feeders	-	1,030
LT Feeders	-	610

In addition to the above, the State has been allocated Rs. 1,261 Crs. under the 12th Plan which primarily focusses on rural electrification of 308 un-electrified villages and 18,308 partially electrified villages. The proposed project will be executed over a period of four years and the funds will be released simultaneously. The summary of the proposed infrastructure is provided in Table 35 and the district-wise details of distribution infrastructure covered under this scheme is provided in Annexure 6.

Table 35: 12th State Plan - Proposed Infrastructure Plan

Particulars	Numbers	Capacity
Transformation Capacity (MVA)		
33 KV / 11 KV Substations	51	851
11 KV/ LT Distribution Transformers	22,473	572
Lines (ckm)		
33 KV Feeders	-	34

Particulars	Numbers	Capacity
11 KV Feeders	-	8,685
LT Feeders	-	8,046

Tilka Majhi Scheme – Agricultural Connections (State Scheme)

The scheme, introduced by the State Government aims at providing free agricultural power connections to the unconnected agricultural consumers and builds upon the infrastructure created under DDUGJY scheme. A total of 6,87,671 agricultural connections are expected to be provided by FY20.

Distrbution Infrastructure Addition Under Proposed New Schemes

Proposed Rural Electrification

Considering the requirement of electrification of nearly 16.4 Lac households not covered under 12th Plan, the utility has proposed additional infrastructure at a proposed investment of Rs. 5813 Cr. to cover village electrification, providing electricity access to BPL households, revamping sub-transmission and distribution network in the rural areas.

It is expected that out of the proposed investment outlay of Rs.5,813 Cr., a significant part may be covered under DDUGJY, the NAD document preparation for which is presently underway. The abstract of the proposed investment is provided in Table 36 and the district-wise details of distribution infrastructure is provided in Annexure 7.

Table 36: Proposed Infrastructure Plan – Rural Electrification

Particulars	Numbers	Capacity
Transformation Capacity		
33 KV / 11 KV Substations (MVA)	133	1,390
11 KV/ LT Distribution Transformers (MVA)	82,428	2,061
Lines		
33 KV Feeders (cKm.)	-	2,400
11 KV Feeders (cKm)	-	44,850
LT Feeders (cKm)	-	31,305

Proposed Urban Infrastructure

The State utility has identified nearly 40 towns under 15 circles, with a total investment outlay of Rs.1,040 Cr. over the next 4 years. Three major cities namely, Ranchi, Jamshedpur and Dhanbad attract about 40% of the total proposed investment. Metering, distribution lines and substation capacity in urban areas would be covered to ensure 24X7 power for urban HHs. It is pertinent to mention that out of the total proposed investment of Rs.1,040 Cr., the DPR of nearly Rs.735 Cr. has been approved, translating into a grant availability of nearly Rs.496 Cr. during four year period ending FY19. Whereas, the remaining expenditure shall be required to be funded by the utility by its own by way of debt and equity.

The abstract of the proposed infrastructure development plan is provide in Table 37 and the town wise details prepared are provided as Annexure 8 of this report.

Table 37: Urban Electrification – Proposed Infrastructure Plan

Particulars	Numbers	Capacity
Transformation Capacity		
33 KV / 11 KV Substations (MVA)	31	310
11 KV/ LT Distribution Transformers (MVA)	2,136	419
Lines		
33 KV Feeders (cKm)	-	586
11 KV Feeders (cKm)	-	1,440
LT Feeders (cKm)	-	3,337

6.6. Action Plan

District Wise Rollout Plan

The utility has prepared year-on-year roll out plan for all the districts of the State, for both urban and rural population, as provided in Table 38.

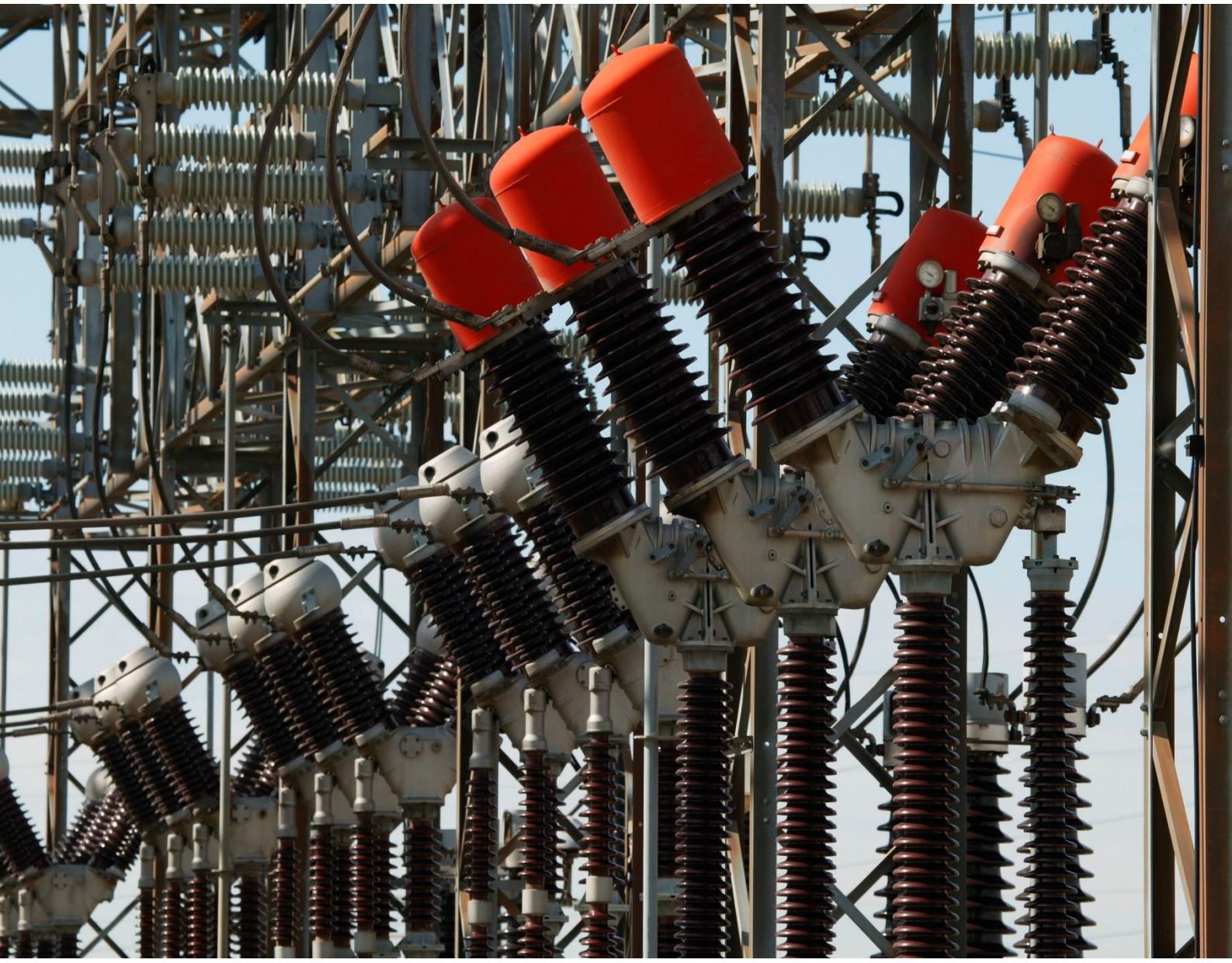


Table 38: District-wise Electrification Plan

Rural	Electrification target	FY16				FY17				FY18				FY19			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Garhwa	145,240	-	-	3,039	10,301	13,341	13,341	17,563	17,563	17,563	14,524	8,445	8,445	8,445	4,223	4,223	4,223
Chatra	102,385	-	-	2,142	7,262	9,404	9,404	12,381	12,381	12,381	10,238	5,953	5,953	5,953	2,977	2,977	2,977
Kodarma	54,252	-	-	1,135	3,848	4,983	4,983	6,560	6,560	6,560	5,425	3,155	3,155	3,155	1,577	1,577	1,577
Giridih	214,253	-	-	4,483	15,196	19,680	19,680	25,909	25,909	25,909	21,425	12,458	12,458	12,458	6,229	6,229	6,229
Deoghar	129,242	-	-	2,705	9,167	11,871	11,871	15,629	15,629	15,629	12,924	7,515	7,515	7,515	3,758	3,758	3,758
Godda	144,039	-	-	3,014	10,216	13,230	13,230	17,418	17,418	17,418	14,404	8,376	8,376	8,376	4,188	4,188	4,188
Sahibganj	116,560	-	-	2,439	8,267	10,706	10,706	14,095	14,095	14,095	11,656	6,778	6,778	6,778	3,389	3,389	3,389
Pakur	100,654	-	-	2,106	7,139	9,245	9,245	12,172	12,172	12,172	10,065	5,853	5,853	5,853	2,926	2,926	2,926
Dhanbad	124,588	-	-	2,607	8,837	11,444	11,444	15,066	15,066	15,066	12,459	7,245	7,245	7,245	3,622	3,622	3,622
Bokaro	122,702	-	-	2,568	8,703	11,270	11,270	14,838	14,838	14,838	12,270	7,135	7,135	7,135	3,567	3,567	3,567
Lohardaga	48,291	-	-	1,011	3,425	4,436	4,436	5,840	5,840	5,840	4,829	2,808	2,808	2,808	1,404	1,404	1,404
Purbi Singhbhum	129,711	-	-	2,714	9,200	11,914	11,914	15,685	15,685	15,685	12,971	7,542	7,542	7,542	3,771	3,771	3,771
Palamu	190,129	-	-	3,979	13,485	17,464	17,464	22,992	22,992	22,992	19,013	11,056	11,056	11,056	5,528	5,528	5,528
Latehar	73,915	-	-	1,547	5,243	6,789	6,789	8,938	8,938	8,938	7,392	4,298	4,298	4,298	2,149	2,149	2,149
Hazaribagh	152,081	-	-	3,182	10,786	13,969	13,969	18,391	18,391	18,391	15,208	8,843	8,843	8,843	4,422	4,422	4,422
Ramgarh	58,872	-	-	1,232	4,176	5,408	5,408	7,119	7,119	7,119	5,887	3,423	3,423	3,423	1,712	1,712	1,712
Dumka	153,918	-	-	3,221	10,917	14,138	14,138	18,613	18,613	18,613	15,392	8,950	8,950	8,950	4,475	4,475	4,475
Jamtara	81,516	-	-	1,706	5,782	7,487	7,487	9,857	9,857	9,857	8,152	4,740	4,740	4,740	2,370	2,370	2,370
Ranchi	194,065	-	-	4,061	13,764	17,825	17,825	23,467	23,467	23,467	19,406	11,285	11,285	11,285	5,642	5,642	5,642
Khunti	56,390	-	-	1,180	4,000	5,180	5,180	6,819	6,819	6,819	5,639	3,279	3,279	3,279	1,639	1,639	1,639
Gumla	106,313	-	-	2,225	7,540	9,765	9,765	12,856	12,856	12,856	10,631	6,182	6,182	6,182	3,091	3,091	3,091

Rural	Electrification target	FY16				FY17				FY18				FY19			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Simdega	65,364	-	-	1,368	4,636	6,004	6,004	7,904	7,904	7,904	6,536	3,801	3,801	3,801	1,900	1,900	1,900
Pashchimi Singhbhum	153,974	-	-	3,222	10,921	14,143	14,143	18,619	18,619	18,619	15,397	8,953	8,953	8,953	4,477	4,477	4,477
Saraikela-Kharsawan	99,765	-	-	2,088	7,076	9,164	9,164	12,064	12,064	12,064	9,976	5,801	5,801	5,801	2,901	2,901	2,901
Total HH to be electrified	2,818,221	-	-	58,974	199,885	258,859	258,859	340,796	340,796	340,796	281,822	163,874	163,874	163,874	81,937	81,937	81,937

It is important to note that the utility has planned to electrify the above HHs under various schemes as discussed above. The details of works to be carried out in various districts / circles / towns under each of these scheme are provided in their respective annexures.

Circle Wise AT&C Loss Reduction Plan

In order to achieve 24X7 power for all consumers, the utility has formulated a circle-wise AT&C loss reduction trajectory, as detailed in Table 39.

Table 39: Circle-Wise AT&C Loss Reduction Trajectory

Name of Circle	AT&C Loss reduction trajectory (%age)			
	FY16	FY17	FY18	FY19
Jamshedpur Circle	35.26	33.76	31.76	29.76
Chaibasa Circle	41.54	40.04	38.04	36.04
Ranchi Circle	40.79	39.29	37.29	35.29
Gumla Circle	48.47	46.97	44.97	42.97
Dhanbad Circle	41.74	40.24	38.24	36.24
Chas Circle	26.04	24.54	22.54	20.54
Hazaribagh Circle	26.91	25.41	23.41	21.41
Ramgarh Circle	25.56	24.06	22.06	20.06
Koderman Circle	53.12	51.62	49.62	47.62
Giridih Circle	27.39	25.89	23.89	21.89
Deoghar Circle	36.01	34.51	32.51	30.51
Dumka Circle	38.41	36.91	34.91	32.91
Sahebganj Circle	35.15	33.65	31.65	29.65
Daltonganj Circle	74.84	73.34	71.34	69.34
Garwha Circle	77.96	76.46	74.46	72.46

6.7. Fund Requirement

As the utility plans for significant distribution infrastructure addition, the total fund requirement is expected to the tune of Rs. 9,625 Cr. Considering the proposed investment outlay under various schemes is approved and grants are made available under respective schemes, nearly Rs. 5,749 Cr. are expected to be available by way of grants by FY19, whereas the balance requirement needs to be funded through additional sanctions under the ongoing schemes or in form of mix of equity by the State Government and debt from financial institutions. Figure 22 presents the total fund availability under various Central and State Government schemes and the shortfall that needs to be addressed to in view of the PFA Roadmap. The yearly phasing of total fund requirement as against fund available under various schemes over the next four years has

Figure 22: Total Fund Requirement and Availability of Grants Under Various Schemes (Rs. Cr.)

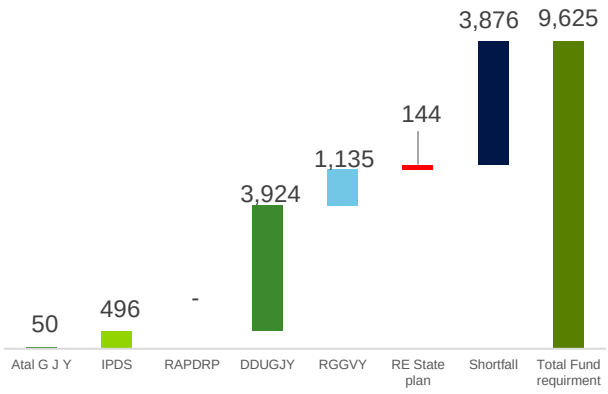
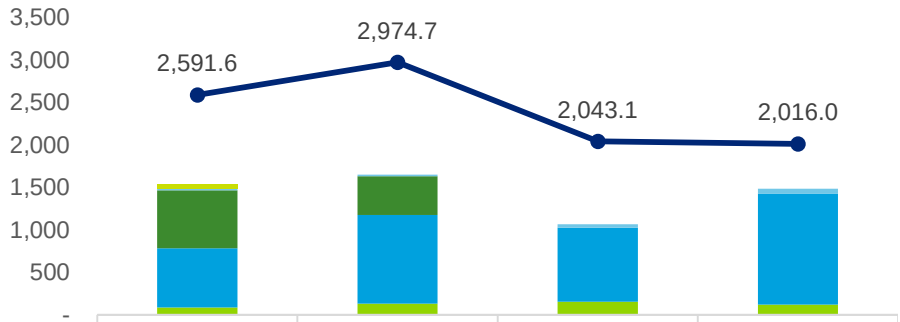


Figure 23: Yearly Fund Requirement and Availability of Funds (Rs. Cr.)



	FY16	FY17	FY18	FY19
Atal G J Y	50.00	-	-	-
RE State Plan	21.60	21.60	43.20	57.60
RGGVY	680.90	453.93	-	-
DDUGJY	697.62	1,046.42	872.02	1,308.03
IPDS	88.20	132.30	154.35	121.28
Total Fund requirement	2,591.55	2,974.71	2,043.10	2,016.04

been presented in Figure 23. It is important to note that majority of the funding will be available as grant coming from various government funded schemes and rest is going to be covered by the State via 70:30 ratio of debt and equity.

6.8. Government intervention

Support required from Central and State Government

- Timely execution of schemes has been a challenge for Jharkhand in the past. While Project Management Agency (PMA) support has been provided in the central sector schemes, additional assistance by the means of deputation of officials from the CPSUs to man a central project management office in JBVNL would be extremely helpful in adopting a focused approach for timely execution of the works listed under the PFA Roadmap.

- Attracting competent contractors for T&D works has been a challenge since JSEB times. While JBVNL is revamping its procurement processes and is also keen to engage with industry bodies and reputed vendors, the process may take time. Hence, JBVNL may need to initiate most of the works in FY16 under the departmental route. The Ministry of Power along with the nodal agencies for various schemes (REC and PFC) will need to consider the same for approval/ sanction of schemes, implementation mechanisms and subsequent disbursements.

Framing Right of way policies for getting consent of the land owner/ occupier, MOEF, Railway, State Highway Authorities etc. for putting up the power line. Power Line being a linear project passes through land / premises of several private, public and MOEF land. Getting the consent of each of the land owners takes excessive time and efforts, anywhere between few months to 5 years. Intervention of both State and central government is needed to frame the policies, rules, procedures for helping DISCOMs getting faster RoW permission.

7. Renewable Energy Plan

7.1. RE Requirement

The energy requirement in the State of Jharkhand is largely catered from conventional sources of generation. The installed capacity of RE sources in the State stands at 20.05 MW which is 0.76% of the total installed capacity in the State. This is dismal in comparison to the national level of 11.84% of installed RE capacities on the overall installed base.

Jharkhand Renewable Energy Development Agency (JREDA), functioning under the Department of Energy, Government of Jharkhand is the nodal agency for promotion of new and renewable sources of energy in the State.

In the last tariff order issued by JSERC for JBVNL, it has set a Renewable Energy Purchase Obligation (RPO) target of 3.08% from new and renewable energy sources and separately 1.0% from solar power generating units.

Given the status of RE development in the State so far JSEB/ JBVNL have not been able to meet the RPO targets and are consequently imposed with regulatory penalties and are also forced to buy RECs at higher/ unpredictable prices.

The Government of Jharkhand (GoJ) recognizes the increasing concern related to climate change, global warming and the urgent need to address these issues. JREDA has started developing plans and establishing enabling policy and institutional mechanisms to promote RE projects in the State.

The subsequent sub-sections elaborate the RE development plans for the State for the period covered under the PFA Roadmap.

Recently, the Ministry of New and Renewable Energy (MNRE) has proposed state-wise targets of RE capacity additions totaling to 175 GW by 2022. Accordingly, the State Nodal Agency will align the proposed capacity addition with the MNRE stipulated targets by the end of year 2015.

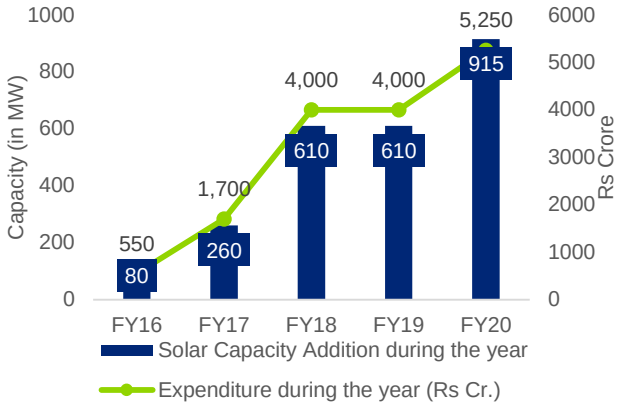
7.2. Solar Power

The State has high solar insolation around 300 days of clear sun and offers good sites having potential of more than 4.5 to 5.5 kWh/m2/day, which the State intends to harness to support the energy requirements of the State. As per MNRE, the total solar power generation potential in the State is 18.18 GWp.

The State has prepared draft Solar Power Policy 2015 with the objective to encourage participation of Private Sector to set up solar power based projects in the State.

The State has prepared plan to add solar power generation capacity of 2,475 MW by FY20 with estimated cost of Rs 15,500 Cr. The year on year break up of planned solar capacity addition by the State along with the proposed investments is shown in Figure 24.

Figure 24: Solar Power Development Plan – Jharkhand



The State nodal agency JREDA is carrying out the work of installation of Solar Power Plant in Block and Panchayat offices of Jharkhand. In this scheme 2,685 Panchayats have been included.

7.3. Small Hydel Power (SHP)

The State has also prepared a plan to add small hydro plants totaling 25 MW every year from FY19 to FY22 with a total estimated cost of Rs 3,400 Cr. With this nearly 100 MW of small hydro generating capacity is expected to be added in the State. A total of 68 sites have been already identified for the development of hydro generation capacity, however, such development is expected to be achieved only from FY19 onwards.

7.4. Decentralized Distributed Generation (DDG)

JREDA has identified over 579 villages under solar based DDG projects out of which JBVNL has recommended to proceed for 447 villages. JREDA has prepared DPR for 402 villages and 213 of the same has been submitted to REC for implementation of the first phase.

Under IREP, district administration and Discom had identified nearly 8 villages, for which JREDA prepared the DPRs. Based on the approved DPRs, REC, the implementing agency has awarded EPC and maintenance contracts for implementation of micro grids in 8 villages to different projects developers and work has been completed in 5 villages as of March, 2015. The abstract of the projects is provided in Table 40.

Table 40: DDG Project Details

Sl.	Villages Name	District	Capacity (kWp)	Cost (Rs. Cr)
1	Mohanpur	Koderma	37.50	0.95
2	Koyenardih	Ranchi	23.75	0.67
3	Kendar Kutti	Saraikela Kharsawan	5.00	0.11
4	Raija Ma	Saraikela Kharsawan	5.00	0.11
5	Holong*	Ranchi	5.00	0.11
6	Buddha Gujju	Ranchi	6.00	0.15
7	Gomiadih*	Saraikela Kharsawan	28.75	0.66
8	Amarpur*	Godda	37.50	0.74
Total				**3.50**

In order to promote clean energy and create awareness among the population of the State, JREDA decided on setting up solar power plants in 4,423 Block & Panchayat offices of Jharkhand and 260 block offices were listed down for implementation. As on March 2015, supply, installation, testing, commissioning of SPV Power plants of 2 kWp in 251 block and 1 kWp in 2,310 panchayat offices has been completed. Details of the solar power plants installation projects and their work progress has been provided in Annexure 9.

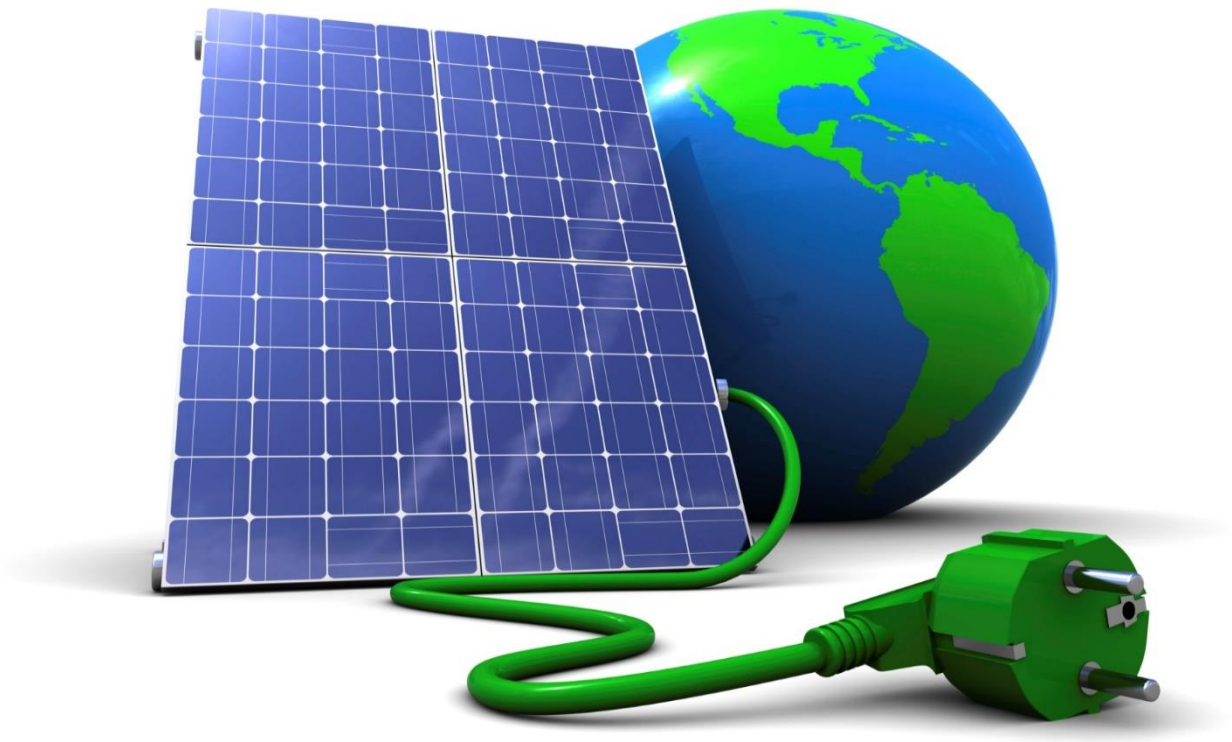
7.5. Fund requirement

As the State plans to grow its portfolio of renewable energy sources, significant investments are required, as detailed out in Table 41.

The proposed investment in renewable energy is likely to be met from various sources including Central Financial Assistance from MNRE and MoP/ GoI under various schemes, Grants provided by State government and private developers

Table 41: Fund Requirement for Renewable Energy (Rs. Cr.)

Particulars	FY16	FY17	FY18	FY19
Solar energy	550	1,700	4,000	4,000
Small hydro	-	-	-	800
Total	**550**	**1,700**	**4,000**	**4,800**



8. Energy Efficiency Plan

8.1. EE Plan

JREDA/ Energy Department of the State has identified the following interventions to promote energy efficiency and DSM measures in the State:

a) Lighting sector DSM for domestic projects under Bachat Lamp Yojana;

b) Energy Conservation Building Code (ECBC) and efficiency measures in government buildings;

c) Implementation of municipal DSM project, including LED based street lighting under PPP; and

d) Agriculture DSM project.

As a stepping stone towards promoting energy efficiency in the State, following initiatives have been undertaken.

1. State Energy Conservation Fund (SECF) has been created, with BEE's contribution of Rs. 2.0 Crore and State govt. has also provided matching grant of Rs. 2.0 Crore

2. 6 Cities (Ranchi, Deoghar, Hazaribagh, Dumka, Medininagar & Jamshedpur) have been selected for DELP program, based on bill-financing model, having minimal burden on the utility finances.

3. Tendering for 1,400 (1, 2 & 5 HP) efficient agricultural pumps is presently underway, which will be provided as new connections.

Additionally, Following Demonstration Projects for EE have been taken up:

1. Revamping of Ranchi Drinking Water System at Rukka, Ranchi.

2. LED Village Campaign- replacement of GLS bulb with LED bulbs in Gagi village, Kanke, Ranchi.

3. Replacement of Sodium Vepour Street Light of 250 watt with 90 watt LED Street Light from Rajbhawan to Booti More, Ranchi.

4. LED Village Campaign:- replacement of GLS bulbs with LED bulbs and installation of LED Street Light in Childag village, Ranchi and Suryapura village, Hazaribagh.

8.2. Domestic Efficient Lighting Program (DELP)

The total energy consumption of households in Jharkhand is around 3,065 MU for FY15. A large numbers of incandescent lamps are still used in households to serve the lighting needs. Incandescent lamps are highly inefficient as 95% of electricity used by them is converted to heat. They can be replaced by LED lamps, which are 90% more energy efficient.

Penetration of efficient lights in households is constrained by the initial high cost barrier. The incandescent lamps are available at Rs. 10-15 while LED lamps sell at Rs, 400-500 and as a

result the penetration of LED bulbs in household sector is less than 1%.

EESL has developed and implemented a scheme called Domestic Efficient Lighting Scheme (DELP) to provide energy efficient LED lighting to grid-connected consumers in the domestic sector across Indian cities and states where high quality LED bulbs are given to households at an affordable price to encourage them to invest in energy efficiency. The large-scale replacement of incandescent lamps and CFL's with LEDs leads to savings in peak power for DISCOMs and lower power consumption of households. An independent mechanism for monitoring and verification of savings shall be established.

A 7 W LED could replace a 60 W incandescent lamp and a 14 W CFL. Through distribution of two LED's under DELP in the domestic sector of Jharkhand, considering all domestic consumers avail the scheme, the estimated overall reduction of demand shall be 147.80 MW and the annual total energy savings shall be 188.81 MU. The scheme shall result into an estimated annual power procurement cost savings of INR 77.60 Crores. A plan to cover the entire State having 24.62 lakh households has been prepared as per Table 43, indicating the estimated annual energy savings and estimated annual savings in power procurement cost.

Table 42: DELP Program details

Particulars	Units	Details
No. of domestic consumer	Lac	24.62
No. of bulbs offered per HH	No.	2
Total No of LED bulbs offered	Lac	49.2
Energy saved per LED bulb per year	kWh	38.325
Annual energy saving	MU	188.81
Average PPC	INR per kWh	4.11
Annual savings	Rs. Cr.	77.60

8.3. Action Plan

Table 43 indicates the responsible agencies for preparing a detailed implementation plans/ DPRs for mentioned schemes.

JREDA shall ensure that the implementation plans are prepared with the objective of realizing the energy savings/ benefits from the above schemes by/ before FY19. The scheme wise milestones and associated timelines shall form part of the PFA Monitoring to be held at MoP level.

Table 43: EE/ DSM Action Plan

Program	Targeted Coverage	Finalization of Resource Requirement & Implementation Plan/ DPR	Responsibility
DELP	24.62 Lac HHs	Apply for JSERC approval by November, 2015	JBVNL/ EESL/ JREDA
Street Ligthing Systems – LED Replacement PPP Project	All Towns with Municipal Corporation/ Municipality	December, 2015	MoUHD - GoJ/ EESL
Agriculture DSM Project	Public Water Works	January, 2015	PWW/ JREDA/ EESL

9. Financial Position of Utilities

9.1. Introduction

The erstwhile JSEB had been witnessing continued high losses as well as huge regulatory disallowances since the last decade. On one hand the retail tariffs have not been reflective of the actual cost of supply, on the other the utility collection efficiencies have remained rather low, leading to significant cash deficit and financial losses. At the time of unbundling, as per the scheme of transfer notified on 6th January 2014, segregated balance sheets for FY12, with opening balance sheets for FY13, have been prepared for all 4 utilities and the accumulated losses were wiped out clean from the books of newly formed entities.

It is important to note that subsequently the segregated annual accounts for unbundled utilities for FY13 and FY14 have not been prepared and only consolidated accounts for erstwhile JSEB exist for up to FY13. The following sub-section briefly presents the commercial and financial position of the State utilities, based on the last available annual accounts and provides an estimate on the future financial position.

9.2. Commercial Viability

The electricity tariffs in Jharkhand are amongst the lowest in the country and have been consistently lower than the real average cost of supply, leading to accumulation of losses. The key reasons for poor tariff approvals have been significant regulatory disallowances on the following grounds:

a) Wide gap between JSERC set target level of T&D losses (which has at 19% for FY13) and the actual performance of JBVNL. While JSERC has continued with historically set targets which JSEB was not able to meet and was facing disallowances in power purchase cost of about Rs. 1,100 Cr annually attributable to the higher than approved T&D loss levels. While no fresh tariff order has been issued since the inception of JBVNL, the applicable tariff which were determined on these principles has left it cash starved from the day of assuming operations.

b) There are significant disallowances due to the poor PLF, SHR and auxiliary consumption levels achieved at PTPS vis-à-vis the targets set by JSERC.

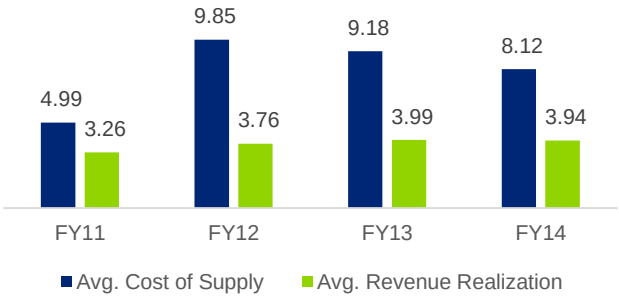
c) JSEB was not able to capitalize a very sizeable portion of the capital works undertaken by it since 2001. This led to very significant disallowances on interest and finance charges approved by JSERC for the purpose of tariff determination.

d) JSERC regulations do not recognize AT&C losses and continue to determine ARR/ Retail tariffs based on T&D losses only. With the expanding consumer base of JSEB in the rural areas, collection efficiencies have suffered thereby

increasing the financial losses over the years. Going forward, as the complete electrification is achieved, the average realization may further deteriorate due to the change in consumer mix, as the number of subsidized/ cross-subsidized consumer increases. Presently, the gap between the average cost of supply & average realization is widening and has risen from Rs.1.73/kWh in FY11 to Rs.4.18/kWh in FY14, reflecting financial unsustainability over a long period of time, as evident from Figure 25. It may be noted that the average cost of supply includes the impact of prior period items, as appearing in the books of accounts of the utility.

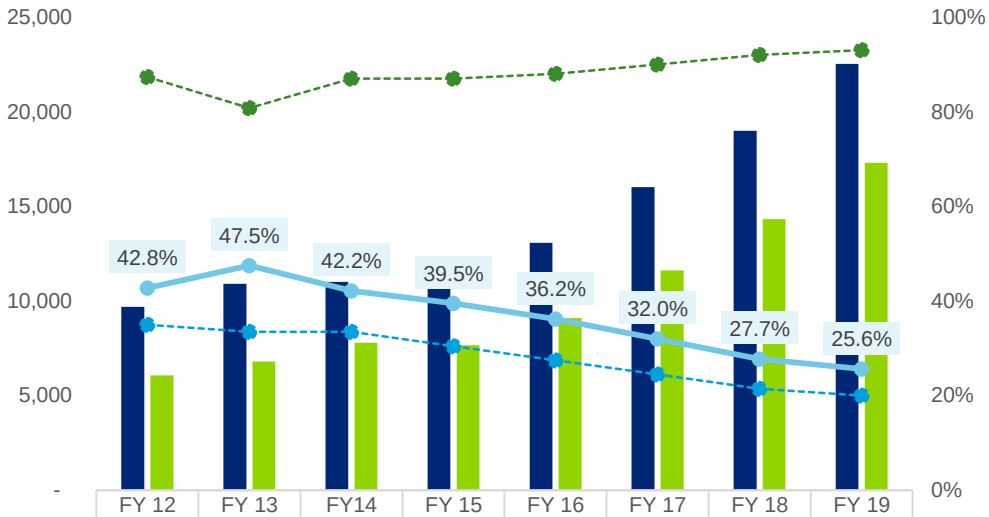
A substantial portion of the higher cost of supply and lower realization is attributable to the significantly high level of AT&C losses in JBVNL supply area. The AT&C losses although have improved over the last few

Figure 25: Average Cost of Supply vs. Average Revenue Realization (Rs/ units)



years, as seen in Figure 26, but is still amongst the highest in the country. The utility has also considered appointment of Distribution Franchisees (DF) in rural areas amongst various measures to improve the AT&C losses with focus on revenue collection and improvements in the payment mechanism. The existing DF framework includes O&M in the franchisee contract, extending for a period of maximum 2 years.

Figure 26: AT&C Losses (%), Energy Input & Sales (MU)



	FY 12	FY 13	FY14	FY 15	FY 16	FY 17	FY 18	FY 19
Energy Input (MU)	9,688	10,912	11,000	11,473	13,068	16,012	18,988	22,530
Energy Sold (MU)	6,063	6,786	7,787	7,660	9,102	11,613	14,319	17,303
T&D Loss (%)	35%	33%	33%	30%	27%	24%	21%	20%
Collection Efficiency	87.4%	80.8%	87.0%	87%	88%	90%	92%	93%
AT&C Loss	42.8%	47.5%	42.2%	39.5%	36.2%	32.0%	27.7%	25.6%

Over the last 4 years, DFs have been appointed for 18 sub-divisions. Taking cue from other successful DF models like Bhwandi, the utility has now decided to shift towards the input based franchisee model extending for a longer tenure and involving capital expenditure intervention from the private operator, with clearly defined service level agreements/ commitments. The high level of current AT&C losses gives significance to the PFA 24X7 program as the utility plans to reduce AT&C losses from 39% in FY15 to 26% in FY19. This trajectory will require considerable investment under various central and State schemes along with various efficiency improvement interventions including DF.

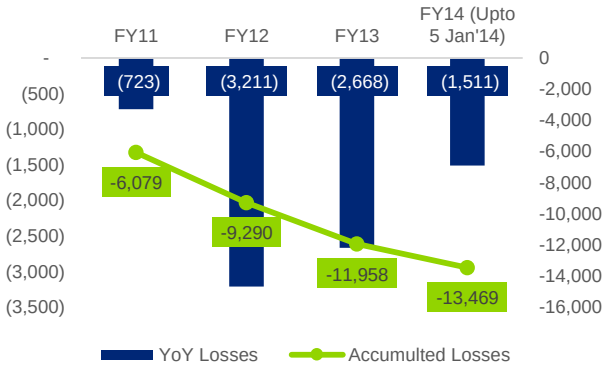
In the post unbundling scenario, it is felt that JBVNL needs support from State government and JSERC to deal with the financial unsustainability created by the wide gap between cost of supply and retail tariffs. Further, there is an urgent need for rationalization of tariffs to reflect the actual cost of supply. The gap between cost of supply and retail tariffs should reduce in order to make the utility financially viable. JSERC may have to intervene in the regulatory area by means of regular tariff orders and hikes to ensure adequate cash flow to the utility.

Further, during the transition period, an appropriate support mechanism for a period 5-7 years may be developed upfront and agreed between JBVNL and the Government of Jharkhand for time bound improvement in AT&C losses and other inefficiencies and the State Government should compensate for the any regulatory disallowances during such period. Thus, providing support to JBVNL during the transition period to improve its operational efficiencies.

9.3. Financial Performance

As mentioned above, the financial position of unbundled entities cannot be gauged due to non-availability of segregated annual accounts. However, Figure 27 captures the year on year financial losses of erstwhile JSEB, for the last four years (based on the annual accounts available). The losses of FY14 (up to 5th January 2014) stood at Rs.1,511 Cr., whereas the cumulative losses for erstwhile JSEB comes to Rs.13,469 Cr., as also illustrated in Figure 27.

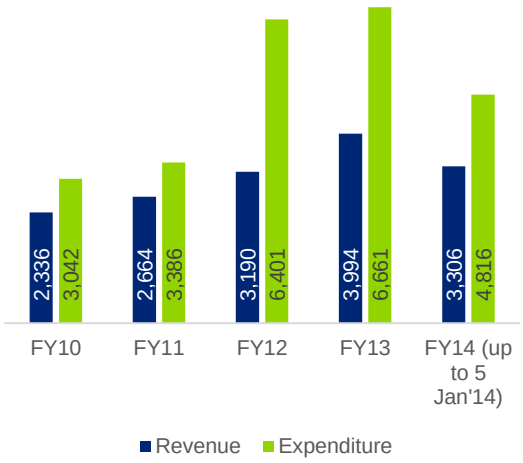
Figure 27: Financial Losses (Rs. Cr.)



The revenue of erstwhile JSEB has witnessed an annual increase of 20%, whereas the expenses (including prior period expenses) have accelerated at a CAGR of 30% over the past four years ending FY13. This explains the state of poor financial health due to large gap, as can be seen in Figure 28.

A closer look at the constituents of revenue reveals that the revenue from the sale of power has been increasing at a CAGR of 19.6% from FY10 to FY13, a growing chunk of receipts have come in from grants in aid of debt service, which has increased to Rs.1,100 Cr. in FY13 increasing from Rs.400 Cr. in FY10, indicating increasing financial burden on the State Government. The revenue gap funding has increased to Rs. 2,160 Cr. in current FY15.

Figure 28: Revenue and Expenditure (Rs. Cr.)



9.4. Financial Projections

In order to estimate the impact of PFA program on the financials of a utility, it is pertinent to assess the incidental cost of the program vis-à-vis the potential of generating additional revenue due to increase in energy sales. As the utility progresses on achieving reduction in AT&C losses, the gap between average cost of supply and average realization is expected to shrink. In line with above, an analysis has been carried out to assess the cost impact of PFA program on tariff as well as financials of the utility and the assumptions in Table 44 form the basis for such projection.

Table 44: Key Common Assumptions Underlying Financial Analysis

Particulars	Assumptions
Power purchase	• The allocation from the Central Generating Stations shall remain stable at current levels over the period of projection • Commissioning of new plants in State sector assumed as per State's projections • Commissioning of new plants of central sector as per CEA's projections • Any shortfall in energy available during the four year's period is expected to be met through medium term and short term power purchase with a limit of 10% of total power purchase portfolio for short term power purchase
Power purchase rate	• Power purchase rate for existing sources based on the actual power purchase rate for FY14 or FY15, escalated at 5% YoY to account for increase during the period till FY15 and also includes RLDC and PGCIL charges etc. • For projection period, no escalation in power purchase cost has been considered. • Transmission charges based on ARR submitted by utility for FY13, escalated by 5%p.a. to arrive at per kWh charges for FY15, based on energy input. Power purchase rate to include the transmission charges. • Power purchase rate from upcoming plants considered at Rs.4.50/kWh for thermal, Rs.6.5/kWh for Solar, Rs.3.50/kWh for small hydro, Rs. 4.00/kWh for medium term power purchase and Rs.4.01/kWh for short term power purchase.
Sales growth and revenue	• Sales growth of domestic consumer is based on the increase in per HH per day consumption for Rural and Urban HHs, electrification of un-electrified HHs and newly constructed HHs in the State. • Energy sales growth of other than domestic consumers is considered at historic 5 years CAGR • The average billing rate (ABR) for different consumer categories has been considered based on the actual ABR for FY14, as per annual accounts (available up to Jan 5, 2014. • Other income considered to have annual increase of 5% on baseline of FY14. • Subsidies continue to be available to JBVNL at existing level of Rs. 2,160 Cr. (for FY15) YoY utilized purely towards funding the resource gap and not considered for reduction in tariff by the regulator.

Particulars	Assumptions
AT&C losses	• Inter-state transmission losses of 3.04%, based on ARR submission by utility for FY13, have been considered to estimate the energy available at State periphery. • T&D loss projections as per State's targets (20% in FY19), which is slightly aggressive than MoP targets. • Intra-state transmission losses are considered at 4%. • Collection efficiency trajectory, as provided by the utility, expected to reach 93% by FY19.
Employee cost, R&M, A&G costs	• Employee expenses and A&G cost, escalated at a rate of 10.% and 6%, respectively for FY16 onwards based on CPI and WPI index. • R&M cost for existing assets based on the actual percentage of GFA as per past 2 years average. • R&M cost for new assets as 1% of GFA.
Depreciation	• Depreciation for existing assets based on the existing actual depreciation • Depreciation for new assets based on JSERC rate of 5.28%p.a.
Capex & capitalization	• Capex as per budgeted plans of the utility • Capitalization within two years (60% in first and 40% in second year)
Funding of capex, debt and equity	• Grants under various schemes are considered based on approved schemes to the tune of 60% and additional 15% after 2 years. In case of schemes, where approved amount is not known, amount proposed by the utility has been considered for estimating grants. • For un-approved part of capital expenditure schemes, funding by way of debt and equity in the ratio of 70:30 has been considered. • Debt repayment schedule of 10 years with 12.50% annual rate of interest. • No existing debt has been considered, in line with the transfer scheme 6th January 2014, as Govt. of Jharkhand has subsumed past loans.
Working capital and interest	• Working capital as per regulatory provisions. • Working capital loan assumed at 14.5%. • Cash deficits have been funded through short term loan at an interest rate of 14.5%.
Past Losses	• The accumulated losses have not been considered for recovery in the financial projections, as the transfer scheme dated 6th January 2014 provides a cleaned up financial statements with past losses up to FY12 having been assumed by the Government of Jharkhand.
Financial Statements	• Presently, JBVNL's financial statements for FY14 or FY15 are not available as segregated accounts have not been prepared. • The profit and loss statement has been prepared based on the estimation of key items. • Values for FY14 have been extrapolated based on 9 months actual data to arrive at the power purchase (MU) and energy sales (MU).

Considering the assumptions in Table 44, the impact of PFA program on the overall financial health of the sector can be gauged from the impact on tariff due to incidental power purchase and additional capital expenditure to be incurred by JBVNL. The details of additional capital expenditure, sources of funding and incidental costs of such expenditure are provided in Table 45.

Table 45: Impact of Asset Additions (Rs. Cr.)

Particulars	FY16	FY17	FY18	FY19
Capital expenditure	2,592	2,975	2,043	2,016
Grants	1,538	1,654	1,070	1,487
Debt	786	979	650	320
Equity	267	342	323	209
Incidental cost of capital expenditure due to PFA				
Depreciation on additional assets	81	111	181	228
Interest on debt – corresponding to PFA capex	44	139	214	243
Return on equity - corresponding to PFA capex	21	70	123	166
Total capex related cost	**146**	**320**	**518**	**637**

The State utility has prepared capital expenditure plans according to the need and adequacy of network for achieving the HH electrification and consumption targets set under the 24X7 PFA roadmap. The utility has proposed to fund the capital expenditure plan under various Central and State government schemes and with the support of State government and multilateral banks. The base case assumes that the funding from State and central government schemes in form of grants will be available but for any unapproved scheme, the utility will arrange its own funds by means of borrowings from banks, including NBFCs, commercial and multilateral institutions. The debt to equity ratio is considered to be 70:30, considering that the utility will be able to arrange equity from the State government. In addition to above, the capital expenditure related cost, other revenue and expenditure related parameters considered for base case are summarized in Table 46.

Table 46: Parameters for Base Case

Particulars	Units	FY16	FY17	FY18	FY19
Energy related parameters					
Energy demand	MU	13,068	16,012	18,988	22,530
Sales	MU	9,102	11,613	14,319	17,303
Intra-state transmission loses	%age	4.0%	4.0%	4.0%	4.0%
Distribution losses	%age	27.5%	24.5%	21.5%	20.0%
AT&C Losses	%age	36.2%	32.0%	27.7%	25.6%
Power purchase cost (inc transmission charges)	Rs./kWh	4.13	4.21	4.36	4.49
Revenue & expenditure parameters					
Tariff Increase	%age	0.0%	0.0%	0.0%	0.0%
Collection efficiency	%age	88.0%	90.0%	92.0%	93.0%
Average billing rate - Domestic	Rs./kWh	1.42	1.42	1.42	1.42
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	5.24	5.24	5.24	5.24
Employee cost escalation	%age	10%	10%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%

Based on the parameters outlined in Table 46, the per kWh gap of incidental cost of providing additional power and revenue generated due to increase in energy sales, is estimated to assess the likely impact of PFA program on the tariff in the state, as summarized in Table 47.

The impact on tariff due to PFA capital expenditure is expected to increase from Rs.1.33/kWh in FY16 to Rs.2.66/kWh in FY19 as reflected in Table 47. The key reason behind the increase in tariff impact, despite reduction in AT&C losses, is mainly on account of reduction in overall average realization due to increase in share of domestic consumption.

The impact of tariff will be reflected in the financials of the utility, as the utility is expected to incur significant capital expenditure, while the additional recovery shall be limited due to higher AT&C losses and prevailing difference in average cost of supply and average recovery. Therefore, as a base case, the profit and loss statement of JBVNL has been prepared considering that the existing power purchase cost and existing tariff shall remain at the present levels only, while the impact of additional capital expenditure is accounted.

Table 47: Impact on Tariff Due to PFA

Particulars	Derivation	FY16	FY17	FY18	FY19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	280.9	718.2	1,207.4	1,743.6
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	1,346.4	2,614.6	4,002.1	5,716.5
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	146.4	320.1	518.4	637.1
Gap of additional cost and additional recovery	C=(B+B1-A)	1,211.9	2,216.6	3,313.2	4,609.9
Energy sales (MU)	D	9,102	11,613	14,319	17,303
Impact on tariff (Rs./kWh)	**CX10/D**	1.33	1.91	2.31	2.66

Table 48: Projected Profit and Loss Statement – Base Case (Rs. Cr.)

Profit and Loss statement	Projected			
	FY16	FY17	FY18	FY19
Revenue				
Revenue from Sale of Power	3,077	3,540	4,037	4,582
Revenue subsidy	2,160	2,160	2,160	2,160
Others	265	278	292	307
Total revenue	**5,502**	**5,978**	**6,489**	**7,048**
Expenditure				
Power Purchase cost	5,395	6,747	8,277	10,123
O&M Cost	293	336	386	433
Employee cost	*194*	*213*	*234*	*258*
A&G expenses	*31*	*33*	*35*	*37*
R&M expenses	*68*	*90*	*116*	*138*
EBIDTA	**(186)**	**(1,105)**	**(2,173)**	**(3,508)**

Profit and Loss statement		Projected			
		FY16	FY17	FY18	FY19
	Depreciation	193	223	293	340
	Interest and finance charges	154	406	839	1,477
	PBT	**(533)**	**(1,735)**	**(3,305)**	**(5,325)**
	Provision for tax	-	-	-	-
	PAT	**(533)**	**(1,735)**	**(3,305)**	**(5,325)**

As can be seen in the P&L statement in Table 48, the incremental cost due to PFA program may adversely impact the financial position of the utility. The financial losses are likely to increase to Rs. 5,325 Cr. in FY19 as the energy input increases and the recovery is not adequate enough to cover the operational cost. The accumulated loss during the four year period ending FY19 is expected to be Rs. 10,898 Cr.

9.5. Scenario Analysis

Any change in tariff or under achievement of AT&C loss trajectory considered for the base case or non-availability of funding in form of grants will translate into additional impact on the financial position of the utility. Therefore, following three scenarios have been analyzed.

1. Increase in tariff to ensure that utility becomes viable by FY19
2. Non-Availability of grants under the schemes where DPRs are not finalized (available only to the extent approved as per DPR) to fund the capital expenditure.
3. Under achievement of AT&C loss targets: Only 1% annual reduction in T&D losses to reach AT&C loss level of 26.5% in FY19.

Scenario 1: Increase in tariff required for the utility to become viable

As the existing gap between average cost of supply and average realization is significant, an increase in tariff may be required immediately, which must be over and above any increase in power purchase cost from the existing level. Table 49 summarizes the key parameters considered for scenario 1.

Table 49: Parameters for Scenario 1 (Tariff increase)

Particulars	Units	FY16	FY17	FY18	FY19
Energy related parameters					
Energy demand	MU	13,068	16,012	18,988	22,530
Sales	MU	9,102	11,613	14,319	17,303
Intra-state transmission losses	%age	4.0%	4.0%	4.0%	4.0%
Distribution losses	%age	27.5%	24.5%	21.5%	20.0%
AT&C Losses	%age	36.2%	32.0%	27.7%	25.6%
Power purchase cost	Rs./kWh	4.13	4.21	4.36	4.49
Revenue & expenditure parameters					
Tariff Increase	%age	17.58%	17.58%	17.58%	17.58%
Collection efficiency	%age	88.0%	90.0%	92.0%	93.0%
Average billing rate - Domestic	Rs./kWh	1.67	1.96	2.31	2.71
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	6.16	7.24	8.51	10.01

Particulars	Units	FY16	FY17	FY18	FY19
Employee cost escalation	%age	8.00%	10.00%	10.00%	10.00%
A&G cost escalation	%age	6.00%	6.00%	6.00%	6.00%
Capital expenditure funding					
Capital expenditure	Rs. Cr.	2,592	2,975	2,043	2,016
Grants	Rs. Cr.	1,538	1,654	1,070	1,487
Debt	Rs. Cr.	786	979	650	320
Equity	Rs. Cr.	267	342	323	209

Table 50: Profit and Loss statement - Scenario 1 (Rs. Cr.)

Profit and Loss statement	Projected			
	FY16	FY17	FY18	FY19
Revenue				
Revenue from Sale of Power	3,619	4,894	6,563	8,757
Revenue subsidy	2,160	2,160	2,160	2,160
Others	265	278	292	307
Total revenue	**6,043**	**7,332**	**9,015**	**11,224**
Expenditure				
Power Purchase cost	5,395	6,747	8,277	10,123
O&M Cost	293	336	386	433
Employee cost	194	213	234	258
A&G expenses	31	33	35	37
R&M expenses	68	90	116	138
EBIDTA	**355**	**249**	**352**	**667**
Depreciation	193	223	293	340
Interest and finance charges	110	206	300	326
PBT	**52**	**(180)**	**(241)**	**1**
Provision for tax	18	-	-	0
PAT	34	(180)	(241)	1

In order to achieve financial viability by FY19, the utility requires an annual tariff increase of 17.58%, over and above a complete pass through of increase in power purchase cost. The resultant P&L account under this scenario is presented in Table 50.

Scenario 2: Non-Availability of grants (funding of capital expenditure through grants under various government schemes)

The dependence of utility on funding of the proposed schemes through various state and central government schemes can be assessed by the impact on utility's finances if grant funding is not available. Essentially, for the upcoming central government schemes including IPDS and DDUGJY, where the DPRs have not been finalized, the grant availability has been considered to be nil. While, for the ongoing schemes where the funds have already been committed by the State or central government the grants are considered to be as envisaged in the respective schemes. Table 51 summarizes the key parameters underlying the analysis.

Table 51: Parameters for Scenario 2 (Non-Availability of Grants)

Particulars	Units	FY16	FY17	FY18	FY19
Energy related parameters					
Energy demand	MU	13,068	16,012	18,988	22,530
Sales	MU	9,102	11,613	14,319	17,303
Inter-state transmission losses	%age	4.0%	4.0%	4.0%	4.0%
Distribution losses	%age	27.5%	24.5%	21.5%	20.0%
AT&C Losses	%age	36.2%	32.0%	27.7%	25.6%
Power purchase cost	Rs./kWh	4.13	4.21	4.36	4.49
Revenue & expenditure parameters					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	88%	90%	92%	93%
Average billing rate - Domestic	Rs./kWh	1.42	1.42	1.42	1.42
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	5.24	5.24	5.24	5.24
Employee cost escalation	%age	10%	10%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%
Capital expenditure funding					
Capital expenditure	Rs. Cr.	2,592	2,975	2,043	2,016
Grants	Rs. Cr.	753	476	43	58
Debt	Rs. Cr.	1,310	1,765	1,400	1,371
Equity	Rs. Cr.	529	735	600	588

Based on the parameters in Table 51, the per kWh gap of incidental cost of PFA program is estimated. The impact of availability of grants for funding the capital expenditure on tariffs is summarized in Table 52.

As can be seen in Table 52, the impact on tariff is expected to increase due to non-availability of grants to fund the capital expenditure vis-à-vis funding of complete capital expenditure through debt and equity. The tariff impact for in such scenario is estimated to range between Rs.1.41/kWh to Rs. 3.03/kWh as against the range of Rs.1.33/kWh to Rs.2.66/kWh in base case scenario.

As the burden of arranging the funds for capital expenditure in form of commercial borrowings and equity contribution increases, the financial position of utility is likely to see an adverse impact. Table 53 presents the projected profit and loss statement of JBVNL under this scenario.

Table 52: Impact on Tariff due to PFA – Scenario 2

Particulars	Derivation	FY16	FY17	FY18	FY19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	281	718	1,207	1,744
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	1,346	2,615	4,002	5,716

Particulars	Derivation	FY16	FY17	FY18	FY19
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	222	572	956	1,275
Gap of additional cost and additional recovery	C=(B+B1-A)	1,287	2,469	3,751	5,247
Energy sales (MU)	D	9,102	11,613	14,319	17,303
Impact on tariff (Rs./kWh)	**CX10/D**	1.41	2.13	2.62	3.03

Table 53: Profit and Loss statement - Scenario 2 (Rs. Cr.)

Profit and Loss statement	Projected			
	FY16	FY17	FY18	FY19
Revenue				
Revenue from Sale of Power	3,077	3,540	4,037	4,582
Revenue subsidy	2,160	2,160	2,160	2,160
Others	265	278	292	307
Total revenue	**5,502**	**5,978**	**6,489**	**7,048**
Expenditure				
Power Purchase cost	5,395	6,747	8,277	10,123
O&M Cost	**293**	**336**	**386**	**433**
Employee cost	194	213	234	258
A&G expenses	31	33	35	37
R&M expenses	68	90	116	138
EBIDTA	**(186)**	**(1,105)**	**(2,173)**	**(3,508)**
Depreciation	218	302	429	544
Interest and finance charges	188	526	1,063	1,828
PBT	**(591)**	**(1,933)**	**(3,665)**	**(5,879)**
Provision for tax	-	-	-	-
PAT	(591)	(1,933)	(3,665)	(5,879)

As can be seen in Table 53, the annual financial losses of JBVNL are expected to increase to Rs.5,879 Cr. in FY19 as against Rs.5,325 Cr. under the base case. The accumulated losses for the four year period ending FY19 is expected to be Rs.12,069 Cr.

Further, as the utility's cost of funding increases due to non-availability of grants, the tariff hike required to achieve the financial viability is likely to increase to 19.05% p.a. as against 17.58% tariff hike required in base case.

Scenario 3: Under achievement of AT&C loss reduction trajectory

One of the key assumptions in the base case analysis, scenario 1 and scenario 2 is the achievement of AT&C loss trajectory by the utility. However, in case the utility misses T&D loss reduction and achieves only 1% yearly reduction to reach at T&D loss level of only 26.5% by FY19, the impact on financial position is going to be significant. Table 54 summarizes the key parameters underlying the analysis of Scenario 3.

Table 54: Parameters for Scenario 3 (Under-achievement of T&D losses)

Particulars	Units	FY16	FY17	FY18	FY19
Energy related parameters					
Energy demand	MU	13,439	16,907	20,559	24,505
Sales	MU	9,102	11,613	14,319	17,303
Inter-state transmission losses	%age	4.0%	4.0%	4.0%	4.0%
Distribution losses	%age	29.5%	28.5%	27.5%	26.5%
AT&C Losses	%age	37.9%	35.6%	33.3%	31.6%
Power purchase cost (inc. transmission charges)	Rs./kWh	4.13	4.22	4.35	4.48
Revenue & expenditure parameters					
Tariff Increase	%age	0.00%	0.00%	0.00%	0.00%
Collection efficiency	%age	88%	90%	92%	93%
Average billing rate - Domestic	Rs./kWh	1.42	1.42	1.42	1.42
Average billing rate - Other than domestic (weighted avg.)	Rs./kWh	5.24	5.24	5.24	5.24
Employee cost escalation	%age	10%	10%	10%	10%
A&G cost escalation	%age	6%	6%	6%	6%
Capital expenditure funding					
Capital expenditure	Rs. Cr.	2,592	2,975	2,043	2,016
Grants	Rs. Cr.	1,538	1,654	873	1,192
Debt	Rs. Cr.	786	979	847	614
Equity	Rs. Cr.	267	342	323	209

It may also be important to note that in this scenario, the capital expenditure is assumed to be funded through grants and unapproved part through debt and equity.

The impact on tariff is expected to increase further vis-à-vis the base case to increase to the range of Rs.1.50/kWh to Rs.3.20/kWh from FY16 to FY19 as against the range of Rs.1.33/kWh to Rs.2.66/kWh under the base case, as summarized in Table 55.

Due to additional cost and under-achievement of T&D loss trajectory there is an adverse impact on the financials of the utility, as presented in the following table. As can be seen in Table 56, the annual financial losses of utility are expected to increase to nearly Rs.6,541 Cr. in FY19 vis-à-vis Rs. 5,325 Cr. in FY19 under base case, thus emphasizing the need for focusing on reduction in AT&C losses. The accumulated losses for the four year period ending FY19 is expected to be Rs. 13,583 Cr.

In order to achieve financial turn-around of the utility, a YoY tariff increase of 20.72% will be required for financial turn-around of the utility, as against 17.58% under the base case.

Table 55: Impact on Tariff - Scenario 3 (Under-Achievement of T&D Loss Targets)

Particulars	Derivation	FY16	FY17	FY18	FY19
Additional recovery due to incremental energy sales (Rs. Cr.)	A	281	718	1,207	1,744

Particulars	Derivation	FY16	FY17	FY18	FY19
Incremental power purchase cost (inc. transmission charges and incremental transmission cost due to PFA program (Rs. Cr.)	B	1,501	2,995	4,681	6,580
Add: Cost related to capital expenditure (interest, depreciation and equity return, Rs. Cr.)	B1	146	320	536	694
Gap of additional cost and additional recovery	C=(B+B1-A)	1,366	2,597	4,009	5,531
Energy sales (MU)	D	9,102	11,613	14,319	17,303
Impact on tariff (Rs./kWh)	CX10/D	1.50	2.24	2.80	3.20

Table 56: Profit and Loss Statement - Scenario 3 (In Rs. Cr.)

Profit and Loss statement		Projected			
		FY16	FY17	FY18	FY19
Revenue					
	Revenue from Sale of Power	3,077	3,540	4,037	4,582
	Revenue subsidy	2,160	2,160	2,160	2,160
	Others	265	278	292	307
	Total revenue	**5,502**	**5,978**	**6,489**	**7,048**
Expenditure					
	Power Purchase cost	5,554	7,131	8,950	10,970
	O&M Cost	**293**	**336**	**386**	**433**
	Employee cost	194	213	234	258
	A&G expenses	31	33	35	37
	R&M expenses	68	90	116	138
	EBIDTA	**(345)**	**(1,489)**	**(2,847)**	**(4,355)**
	Depreciation	193	223	299	360
	Interest and finance charges	169	469	1,010	1,825
	PBT	**(706)**	**(2,181)**	**(4,155)**	**(6,541)**
	Provision for tax	-	-	-	-
	PAT	(706)	(2,181)	(4,155)	(6,541)

9.6. Action Points for GoJ/ Utilities

The action points listed in Table 57, must be considered by the both government as well as the State utility.

9.7. Support requested from Govt. of India

The Government of India may facilitate the availability of projected fund requirement under various schemes and ensure timely disbursement of fund to avoid any delays.

Further, the State utilities (both JUSNL and JBVNL) have planned for significant capital expenditure, part of which is yet to be tied up for funding. The utilities would like to seek support from the central government to facilitate low cost funding from multilateral agencies, such as the World Bank and ADB etc.

9.8. Recommended Turn-Around

In addition to the above scenarios, a turn-around scenario has been created to evaluate the level of support required from various stakeholders, to turn-around the utility into a financially sustainable entity. The details of such plan are provided in Figure 29.

Table 57: Action Points (Utility & GoJ)

Agency	Details
State Government	• Presently, the utility is facing double whammy of higher disallowance in form of lower AT&C loss trajectory being considered by the State commission, as well as the resource gap funding support provided by the State government is being considered to reduce the admitted ARR of JBVNL. The State Govt., in line with the other State, specify the priority order for adjustment of such support already being provided to JBVNL. • Transition support, in form of grants/ subsidy may be provided during the interim period, to ensure self-sustainability of the utility in long run.
Utility	• Utility must agree on an internal quarterly timeline for achievement of works proposed under various schemes • Must emphasize on AT&C loss reduction and an internal review committee may be formed to monitor the implementation of measures for AT&C loss reduction • Utility must work closely with the State regulator to agree on a revised AT&C loss trajectory, which is more representative of actual loss levels prevailing in the State.

Figure 29: Recommended Turn-around Plan

Recommended Turnaround Plan

Historically, the key reasons behind the reeling losses of erstwhile JSEB have been the high regulatory disallowances on account of AT&C losses and internal operational inefficiencies. As the utility prepares itself for PFA Program and being a recently restructured entity, it is imperative that it endeavors to become a self-sustaining and financially viable entity.

The key imperatives for a financial turnaround may include:

1. JBVNL must initiate a dialogue with the JSERC to align the AT&C loss reduction trajectory with that envisaged for this PFA Roadmap, to avoid power purchase cost disallowances.
2. An indispensable annual tariff hike of about 13.5% over the next four years is required with tariff rationalization across consumer categories, to reduce the gap between ABR and ACS.
3. The State Government is required to increase the transition support from Rs.2,160 Cr. to about Rs. 2,240 Cr. in FY16, Rs.2,670 Cr in FY17 and Rs.3,025 Cr. in FY18 and Rs.3,270 Cr. in FY19, which should first be adjusted towards the regulatory disallowances, followed by tariff reduction for particular category of consumers.
4. The utility must ensure efficiency improvement in its operations and implement strict cost optimization mechanisms along with setting up monitorable targets to achieve objectives of PFA Program.

10. Roll Out Plan

The year wise roll out plan for overall power sector in Jharkhand has been provided in Table 58.

Table 58: Year-Wise Roll Out Plan

Particular	Units	FY16	FY17	FY18	FY19	Total
ELECTRIFICATION ROLL OUT						
Urban HHs	No.	29,907	49,845	49,845	49,845	179,443
Rural HHs	No.	258,859	1,199,309	950,367	409,686	2,818,221
Total HHs	No.	288,766	1,249,154	1,000,212	459,532	2,997,664
GENERATION CAPACITY (PEAK AVAILABILITY)						
Existing State Projects	MW	524.6	484.6	484.6	484.6	-
Existing IPPs	MW	134.4	134.4	134.4	134.4	-
DVC	MW	601.5	601.5	601.5	601.5	-
Central Sector Projects	MW	309.4	309.4	309.4	309.4	-
Upcoming	MW	67.5	243.6	514.6	691.2	-
Renewables	MW	6.0	31.5	96.8	194.5	
Total Availability – Peak Availability	MW	**1,643.3**	**1,805.0**	**2,141.2**	**2,415.6**	**-**
Peak Demand	MW	2,132	2,669	3,175	3,778	-
TRANSMISSION						
Intra-State and Inter-state Lines addition						
765kV	ckm	-	-	4,000	4,330	8,330
400 KV	ckm	-	-	1,410	1,808	3,218
220 KV	ckm	270	220	218	2,668	3,376
132 KV	ckm	726	780	88	1,026	2,620
Sub-Stations	No.	**12**	**9**	**23**	**17**	**61**
Intra-State & Inter-state Capacity Addition						
400 KV	MVA	1,260	1,260	315	2,890	5,725
220 KV	MVA	1,800	1,200	1,390	2,250	6,640
132 KV	MVA	800	1,020	2,050	1,600	5,470
DISTRIBUTION						
No. of PSS	No.	90	99	78	55	642
PSS Capacity	MVA	1,095	1,126	755	525	7,188
33 kV Lines	ckm	844	1,195	1,022	739	11,206

Particular	Units	FY16	FY17	FY18	FY19	Total
11 kV Feeders	Ckm	15,365	18,572	11,682	14,485	112,762
DTR	No.	32,963	37,139	20,959	25,516	185,329
DT Capacity	MVA	2,197	2,373	2,406	680	11,418
LT Line	kVA	12,849	15,037	9,175	9,879	126,308

11. List of Abbreviations

Abbreviation	Full Form
ARR	Annual Revenue Requirement
AT&C	Aggregate Technical & Commercial
BPL	Below Poverty Line
BSHPC	Bihar State Hydroelectric Power Corporation
BTPS	Bokaro Thermal Power station
BU	Billion Units
CAGR	Compound Annual Growth Rate
CKM	Circuit Kilometers
CoD	Commercial Operation Date
DDG	Decentralized Distributed Generation
DDUGJY	Deendayal Upadhyaya Gram Jyoti Yojana
DELP	Domestic Efficient Lighting Programme
DPR	Detailed Project Report
DSM	Demand Side Management
DT	Distribution Transformer
DVC	Damodar Valley Corporation
EBIDTA	Earnings Before Interest Depreciation Taxes and Amortization
ECBC	Energy Conservation Building Code
EE	Energy Efficiency
EPC	Engineering, Procurement and Construction
EPS	Electric Power Survey
ER	Eastern Region
FRP	Financial Restructuring Plan
FY	Financial Year
FY15	Financial year ending 2014-15
GFA	Gross Fixed Assets
GoI	Government of India
GoJ	Government of Jharkhand
GSS	Grid Substation
GWp	Giga Watt Peak
HH	Household
IPDS	Integrated Power Development Scheme
IPP	Independent Power Producer

Abbreviation	Full Form
IREP	Integrated Rural Energy Planning
ISTS	Inter/Intra State Transmission System
JBVNL	Jharkhand Bijli Vitran Nigam Limited
JREDA	Jharkhand Renewable Energy Development Agency
JSEB	Jharkhand State Electricity Board
JSERC	Jharkhand State Electricity Regulatory Commission
JUSCO	Jamshedpur Utilities & Services Company
JUSNL	Jharkhand Urja Vikas Nigam Ltd.
JUUNL	Jharkhand Urja Utpadan Nigam Ltd
KBUNL	Kanti Bijlee Utpadan Nigam Ltd
LED	Light-emitting diode
LILO	Loop In Loop Out
LT	Low Tension
MNRE	Ministry of New and Renewable Energy
MoC	Ministry of Coal
MoEF	Ministry of Environment & Forests
MU	Million Units
MVA	Mega Volt Ampere
MW	Mega Watt
NAD	Need Assessment Document
NESCL	NTPC Electric Supply Company Limited
NHPC	National Hydroelectric Power Corporation
NTPC	National Thermal Power Corporation
O&M	Operation & Maintenance
PAT	Profit After Taxes
PBT	Profit Before Taxes
PFA	Power For All
PFC	Power Finance Corporation
PGCIL	Power Grid Corporation of India Limited
PLF	Plant Load Factor
PMA	Project Management Agency
PPA	Power Purchase Agreement
PPP	Public–private partnership
PTPS	Patratu Thermal Power Station
R-APDRP	Restructured Accelerated Power Development & Reforms Programme
R&M	Renovation & Modernization
RE	Renewable Energy
REC	Rural Electrification Corporation
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
ROW	Right of Way

Abbreviation	Full Form
RPO	Renewable Energy Purchase Obligation
SAIL	Steel Authority of India
SCADA	Supervisory Control and Data Acquisition
SHP	Small Hydel Plants
SHPS	Sikidiri Hydel Power Station
SHR	Station Heat Rate
SLDC	State Load Dispatch Center
SPV	Special Purpose Vehicle
STPS	Santaldih Thermal Power Station
T&D	Transmission & Distribution
TBCB	Tariff Based Competitive Bidding
ToR	Terms of Reference
TPS	Thermal Power Station
TSL	Tata Steel Ltd.
TVNL	Tenughat Vidyut Nigam Ltd.
UMPP	Ultra Mega Power Projects
VGF	Viability Gap Funding
WBSEDCL	West Bengal State Electricity Distribution Company
YoY	Year on Year

12. Annexures

Annexure 1: List of existing intra-state and inter-state transmission system (DVC)

Sl.	Voltage Level	Name of Transmission Lines	Line Length (ckm)
	Intra State Lines		
1	220 KV	CTPS - A to Dhanbad	91
2	220 KV	CTPS - B to BTPS - B	64
3	220 KV	BTPS - B to Jamshedpur	307
4	220 KV	BTPS - B to Ramgarh	110
5	220 KV	CTPS - A to CTPS - B	1
6	220 KV	Dhanbad to Giridhi	89
	Sub - Total		**662**
1	132 KV	Jamshedpur to Chandil	87
2	132 KV	Jamshedpur to Mosabani	79
3	132 KV	Chandil to Gola	172
4	132 KV	CTPS to Gola	119
5	132 KV	N'Karanpura to ECR RAY	0
6	132 KV	Putki to Patherdhi	45
7	132 KV	MGTS to Patherdhi	78
8	132 KV	Gola to SER Muri	0
9	132 KV	CTPS to Putki	58
10	132 KV	Barhi to KTPP	61
11	132 KV	Putki to Nimiaghat	90
12	132 KV	Patherdhi to Sindri	6
13	132 KV	Gola to Ramgarh	51
14	132 KV	CTPS to Rajabera	0
15	132 KV	CTPS to Putki	60
16	132 KV	Kumardhubi to Panchet	10
17	132 KV	Ramgarh to Patratu	25
18	132 KV	BTPS 'B' to Konar	25
19	132 KV	BTPS 'B' to Barhi	80
20	132 KV	Patratu to N'Karanpura	64

Sl.	Voltage Level	Name of Transmission Lines	Line Length (ckm)
21	132 KV	Konar to Barhi	61
22	132 KV	Patratu to PTPS (JSEB)	0
23	132 KV	Nimiaghat to Giridih	82
24	132 KV	Sindri to Pradhankanta (Rail)	0
25	132 KV	Barhi to Hazaribagh	72
26	132 KV	Konar to Hazaribagh Rd. (Rail)	0
27	132 KV	Mosabani to JSEB (Dhalbhumgarh)	0
28	132 KV	KTPP to Koderma	37
	Sub - Total		**1,363**
	Total		**2,025**

Inter-state transmission lines

Sl.	Voltage Level	Name of Transmission Lines	Inter linking State	Line Length (ckm)
	Inter State Lines			
1	220 KV	CTPS (new) to Kalyaneswari	West Bengal	284
2	220 KV	Dhanbad to Pithakari	West Bengal	104
3	220 KV	Jamshedpur to Joda	Odisha	135
	Sub - Total			**522**
1	132 KV	MHS to Kumardhubi	West Bengal	5
2	132 KV	MHS to Panchet	West Bengal	15
3	132 KV	CTPS to Ram kanali	West Bengal	60
4	132 KV	CTPS to DTPS	West Bengal	136
5	132 KV	MHS to JSEB (Sultanganj)	West Bengal	108
6	132 KV	Jamshedpur to Purulia	West Bengal	174
7	132 KV	Panchet to Ramkanali	West Bengal	29
8	132 KV	CTPS to Purulia	West Bengal	119
9	132 KV	MHS to MGTS	West Bengal	3
10	132 KV	Kharagpur to Mosabani	West Bengal	190
11	132 KV	Barhi to B'sari (BSEB)	Bihar	95
12	132 KV	Barhi to Rajgir (BSEB)	Bihar	80
	Sub - Total			**1,013**
	Total			**1,536**

Annexure 2: List of Grid Substations under construction

Sl.	Name of GSS	Completion Year	400KV	220KV	132KV	Total
1	400/220/132 KV GSS at Latehar (PG)	FY16	630	300		930
2	400/220 KV GSS at Patratu and 400 KV D/C PTPS-Namkum (PG) TL (PG)51.5KM	FY16	630			630
3	220/132/33 kV Grid Sub-Station at Chatra	FY16		300	100	400
4	220/132/33KV Grid Sub-Station Govindpur (PG)2x150 MVA+2x50 MVA,	FY16		300	100	400
5	220/132/33KV Grid Sub-Station Chaibasa (PG)2x150 MVA+2x50 MVA,	FY16		300	100	400
6	2x150MVA,220/132 KV Grid Sub-Station Dumka (PG)	FY16		300		300
7	220/132 KV, (2x150)MVA GSS at Lohardagga (PG)	FY16		300		300
8	132/33 kV Grid Sub-Station at Tamar and its LILO with Hatia - Chandil trans. line 3.5KM	FY16			100	100
9	132/33KV Grid Sub-Station Manoharpur (PG)2x50MVA,	FY16			100	100
10	132/33KV Grid Sub-Station Mango (PG)2x50 MVA,	FY16			100	100
11	132/33KV Grid Sub-Station Ramchandrapur (PG)2x50 MVA,	FY16			100	100
12	132/33KV Grid Sub-Station Madhupur (PG) 2x50MVA,	FY16			100	100
	Sub Total (A)		***1,260***	***1,800***	***800***	***3,860***
1	220/132/33KV Grid Sub-Station Bokaro 2x150 MVA+2x50 MVA,	FY17		300	100	400
2	220/132/33KV Grid Sub-Station Jasidih 2x150 MVA+2x50 MVA,	FY17		300	100	400
3	220/132/33 kV (2x150 MVA + 2x50 MVA) GSS at Giridih	FY17		300	100	400
4	132/33 kV (2x50 MVA) GSS at Saria	FY17			100	100
	Sub Total (B)			***900***	***400***	***1,300***
	Total (= A + B)		**1,260**	**2,700**	**1,200**	**5,160**

Annexure 3: List of Transmission Lines under construction

Sl.	Name of Transmission Lines	Completion Year	Length (In KM)	Length (In ckm)			Total
				400 kV	220 kV	132 kV	
1	400 KV D/C Latehar (JSEB) to 400 KV PTPS G/S/S (PG)	FY16	90	180			180
2	400 KV D/C ESSAR (Latehar)-JSEB 400 KV G/S/S (Latehar) TL by Quad Moose conductor (PG)	FY16	45	90			90
3	220 kV D/C Daltonganj - Garhwa Transmission line	FY16	32		64		64
4	220 kV D/C Chatra - Latehar transmission line	FY16	104		208		208
5	220 kV D/C Chatra - PBCMP (Barkagaon) transmission line	FY16	57		114		114
6	220 KV D/C Hatia-Namkum (PGCIL) transmission line (PG)	FY16	35		70		70
7	220 KV D/C Link Line from 220 KV Lohardagga-Latehar TL near 132/33 KV GSS to 220 KV Lohardagga GSS (PG)	FY16	2		4		4
8	220 KV D/C Link Line from 400 KV JSEB S/S to existing Lohardagga-Latehar TL near 132/33 KV Latehar GSS (PG)	FY16	2		4		4
9	220 KV D/C TTPS-Govindpur transmission line (PG)	FY16	97		194		194
10	220 KV D/C Govindpur – Dumka transmission line (PG)	FY16	103		206		206
11	220 KV D/C Rupnarayanpur (PGCIL) – Dumka transmission line (PG)	FY16	74		148		148
12	220 KV D/C Ramchandrapur – Chaibasa transmission line (PG)	FY16	38		76		76
13	LILO of 220 kV TTPS - Govindpur trans. line at proposed GSS Bokaro	FY16	35		70		70
14	220 kV D/C 3 phase Jasidih - Dumka (220 kV) transmission line	FY16	80		160		160
15	220 kV D/C Jasidih -Giridih Transmission line	FY16	80		160		160
16	220 kV D/C Govindpur- Giridih Transmission line	FY16	130		260		260
17	220 kV D/C 3 Ph. Chaibasa -Chaibasa (PG) Transmission line	FY16	14		28		28
18	220 KV Construction of LILO of 220 kV 3 Ph. D/C Chatra -Abhijeet Transmission line	FY16	30		60		60
19	132 kV D/C Garhwa -Japla Transmission line	FY16	43			86	86
20	132 kV D/C Hatia - Kanke Transmission line	FY16	43			86	86
21	LILO of 132KV Goelkera-Rourkela transmission line at proposed GSS Manoharpur (including rerouting and connectivity at Rourkela new GSS) (PG)	FY16	20			40	40
22	132 KV D/C Simdega-Manoharpur transmission line (PG)	FY16	112			224	224
23	132 KV D/C Ramchandrapur-Jadugora transmission line (PG)	FY16	45			90	90

Sl.	Name of Transmission Lines	Completion Year	Length (In KM)	Length (In ckm)			Total
				400 kV	220 kV	132 kV	
24	132KV Chaibasa-Manoharpur transmission line (PG)	FY16	93			186	186
25	132KV Jadugora – Dalbhumgarh transmission line (PG)	FY16	32			64	64
26	132 KV Link Line from 400/220/132 KV JSEB G/S/S to existing 132/33 KV Latehar GSS (PG)	FY16	2			4	4
27	132 KV Link Line from 132/33 KV Lohardagga GSS to 220 KV D/C Hatia-Lohardagga TL near existing 132/33 KV Hatia GSS (PG)	FY16	2			4	4
28	132 KV Link Line from 220 KV Hatia-Lohardagga TL (near existing 220 KV Hatia) to 132/33 KV Hatia GSS (PG)	FY16	2			2	2
29	132 KV trans. line from location no.78 of Hatia-Sikidri 3rd CKT at 132/33 kV GSS Namkum (PG)	FY16	26			52	52
30	132 kV D/C Jamtara – Madhupur transmission line (PG)	FY16	50.5			101	101
	Sub Total (A)		***1,518***	***270***	***1,826***	***939***	***3,035***
31	132 kV D/C 3 phase Jasidih - Madhupur transmission line	FY17	40			80	80
32	132 kV D/C 3 phase Jasidih - Deoghar transmission line	FY17	10			20	20
33	132 kV D/C Giridih -Jamua trans. line	FY17	45			90	90
	Sub Total (B)		***95***	***-***	***-***	***190***	***190***
34	132 kV D/C Giridih -Saria trans. line	FY18	45			90	90
	Sub Total (C)		***45***	***-***	***-***	***90***	***90***
	Total (= A + B + C)		**1,658**	**270**	**1,826**	**1,219**	**3,315**

Annexure 4.1 – Town-wise RAPDRP Scheme Details (33kV)

Sl.	Name of Towns	New 33/ 11 KV PSS (Nos.)	New Capacity (MVA)	Renovation in PSS (No.)	Renovated Capacity (MVA)	33 KV			
						Feeder bifurcation (Km)	Reconductoring (Km)	Bay Extension	Under-ground Cabling 33 KV (Km)
1	Ranchi	11	110	14	120	29	112	6	10
2	Gumla			1	5			1	
3	Lohardaga								
4	Simdega			1					
5	Dhanbad	1	50	13	120	18	124		8
6	Chirkunda			1	10	1	20		
7	Bokaro			3	30				15
8	Gomia			1	5		4		
9	Phusro								
10	Jamshedpur	10	100			148	64	8	2
11	Chakhardharpur						25		
12	Chibasa								
13	Ghatshila			1	5				
14	Musabani					15			
15	Dumka	1	25			18			
16	Deoghar			1	10		10		
17	Madhupur						27		
18	Godda			1	5		28	1	
19	Mihijam								
20	Sahebganj			1	10	5	4		
21	Pakur								
22	Hazaribagh	1	10	2	20	4			
23	Chatra								

Sl.	Name of Towns	New 33/ 11 KV PSS (Nos.)	New Capacity (MVA)	Renovation in PSS (No.)	Renovated Capacity (MVA)	33 KV			
						Feeder bifurcation (Km)	Reconductoring (Km)	Bay Extension	Under-ground Cabling 33 KV (Km)
24	Ramgarh					16			
25	Saunda								
26	Patratu								
27	Giridih	1	10	1	10	4	4		
28	Koderma					4			
29	Daltonganj			3	20		33	1	
30	Garhwa			1	5		16	1	
Total		**25**	**305**	**45**	**375**	**262**	**470**	**18**	**34**

Annexure 4.2 – Town-wise RAPDRP Scheme Details (11kV)

Sl.	Name of Towns	11 KV				R & M of 11/ .4 KV DSS (Nos.)
		Feeder Bifurcation (Km)	Reconductoring (Km)	Bay Extension	Under-ground Cabling 11 KV (Km)	
1	Ranchi	365	624	20	33	21
2	Gumla	18				1
3	Lohardaga	15	29			
4	Simdega	9	9			1
5	Dhanbad	282	216	16	8	20
6	Chirkunda	32	30	3		4
7	Bokaro	70	39	10	10	7
8	Gomia	17	27	1		1
9	Phusro	16	34	2		1
10	Jamshedpur	199	308	29	38	18
11	Chakhardharpur	15	21	2		3
12	Chibasa	21	10	2		
13	Ghatshila		10			
14	Musabani	31	36	3		
15	Dumka	36	28	1		
16	Deoghar	30	88	6	23	3
17	Madhupur	48	101	1		1
18	Godda	37	96	1		1
19	Mihijam	14	5	1		
20	Sahebganj	16	16	3		
21	Pakur	15	2	1		4
22	Hazaribagh	60	28	6		2
23	Chatra	5	18	1		
24	Ramgarh	24	10	4	3	1
25	Saunda	2	5			
26	Patratu	4	5			
27	Giridih	54		2		
28	Koderma	37	49	6		10
29	Daltonganj	33	37	1		3
30	Garhwa	8	12			1
Total		**1,513**	**1,895**	**122**	**115**	**103**

Annexure 4.3 – Town-wise RAPDRP Scheme Details (LT)

Sl.	Name of Towns	Installation of New DT (No.)	Capacity of DT (MVA)	Capacity Enhancement of LT Sub Station (No.)	Capacitor Bank (KVAR)	Areal Bunch Cable (km)	Metering (No.)
1	Ranchi	3,758	241	94	107	1,000	49,591
2	Gumla	74	139			60	1,501
3	Lohardaga	72	135				1,899
4	Simdega	47	134				587
5	Dhanbad	679	256	198	53	411	25,085
6	Chirkunda	87	142	11	7	60	1,966
7	Bokaro	153	145	25	14	177	4,136
8	Gomia	61	136			24	806
9	Phusro	61	135			22	1,635
10	Jamshedpur	783	225	18	75	441	43,492
11	Chakhardharpur	66	136			29	1,249
12	Chibasa	63	138			27	2,249
13	Ghatshila	17	136	5		2	1,572
14	Musabani	82	141	5		28	610
15	Dumka	73	141	8		67	1,593
16	Deoghar	237	137		10	149	7,112
17	Madhupur	110	135				1,031
18	Godda	84	135				1,773
19	Mihijam	31	136		1	28	1,149
20	Sahebganj	38	139	8	1	45	1,465
21	Pakur	50	137	5	2	77	1,553
22	Hazaribagh	114	142	3	4	97	7,724
23	Chatra	11	135				636
24	Ramgarh	57	142	3		15	1,502
25	Saunda	8	135			5	657
26	Patratu	18	135			6	973
27	Giridih	100	142	3	6	101	2,386
28	Koderma	103	148	12		69	2,686
29	Daltonganj	174	139		7	92	2,050
30	Garhwa	59	135	52			723
Total		**7,442**	**4,451**	**450**	**287**	**3,032**	**1,71,391**

Annexure 5 – RE State Plan Details

Sl.	Name of Work		Unit	Unit Rate (In lacs)	Ranchi	HZB	Giridih	JSR	Dhanbad	Dumka	M,nagar	Total Qty	Amount (Rs. Crs.)
1	Construction of P/S/S New and Spill over with all equipments	P/S/S (Manned) includes 5 MVA/ 10 MVA Power Tr., Structures, VCBs, etc. & labour charges	Nos.	110	2	2	1	2	2	2	1	12	13
		33 KV line includes Rail Pole & 33 KV Matching materials & labour charges	Ckm.	8	8	8	4	8	8	8	4	48	4
		Civil work (Manned)	Lac Rs.	1	90	60	45	80	80	65	50	470	5
2	Additional/ Augmentation of 33/11 KV P/S/S	5 MVA to 10 MVA	Nos.	48	2	1	1	1	2	2	1	10	5
		Additional 5 MVA	Nos.	26	5	1	2	2	2	2	2	16	4
3	Construction of 04 Nos. 33 KV feeder from G.S.S Kanke, Ranchi (Balance Work amount)		LS/ Rs.	As per Sanctioned estimate	690	-	-	-	-	-	-	690	7
4	Construction of 11 KV new line at all district of Jharkhand		Ckm.	2.5	100	80	60	80	60	100	60	540	14
5	Stray Extension of 11 KV line at all district of Jharkhand		Ckm.	2.5	50	110	80	5	45	120	80	490	12
6	Construction of LT line & Stay Extension of LT line at all district of Jharkhand		Ckm.	2.0	100	100	70	100	50	100	90	610	12
7	Installation of Distribution Transformer	(a) 500 KVA	Nos.	5.4	4	1	1	1	1	1	1	10	1
		(b) 200 KVA	Nos.	2.2	44	25	18	20	29	30	16	182	4
		(c) 100 KVA	Nos.	1.4	50	56	15	40	40	40	30	271	4
		(d) 63 KVA	Nos.	1.1	23	23	18	18	23	27	18	150	2
		(e) 25 KVA	Nos.	0.66	70	90	60	75	70	95	100	560	4
8	Augmentation of Distribution Transformer (Purchase of Transformer)	(a) 200 to 500 KVA	Nos.	4.4	2	2	-	2	2	2	-	10	0
		(b) 100 to 200 KVA	Nos.	1.92	24	14	10	20	20	20	10	118	2
		(c) 63 to 100 KVA	Nos.	1.2	40	42	13	36	36	36	26	229	3

Sl.	Name of Work		Unit	Unit Rate (In lacs)	Ranchi	HZB	Giridih	JSR	Dhanbad	Dumka	M,nagar	Total Qty	Amount (Rs. Crs.)
		(d)10 & 16 KVA(RGGVY) to 25 KVA with line	Nos.	1.5	60	70	40	50	60	75	85	440	7
9	Service connection at all district of Jharkhand	DS & CS with Single Phase Meter	Nos.	0.01	13,550	14,100	4,000	11,550	5,350	14,750	9,100	72,400	7
		LTIS with 3 Phase Meter (Whole current/ LTCT Meter)	Nos.	0.20	403	308	163	338	223	433	197	2,065	4
10	MRT/ establishment or improvement (Equipments and tools & plants)		LS/ Rs.	1	5	4	3	3	3	4	3	25	0
11	Establishment/ Improvement of transformer repair workshop (TRW) power transformer unit	(a) Estab. of New TRW including civil works & Spill over works	LS/ Rs.	1	120	120	50	120	120	120	120	770	8
		(b) Tr. oil filter m/c	Nos.	3.8	1	1	1	1	1	1	1	7	0
12	System improvement	Provision for 33 KV VCB, 11 KV VCB and its spares, AB Switches, XLPE Cable with jointing kit.	LS/ Rs.	LS	257	190	161	202	181	203	155	1,349	13
		AB Cable, replacement of conductor by higher sizes and provision of earthing in 33 KV, 11 KV, LT lines, P/S/S & D/S/S (At all district of Jharkhand), guarding, lacing, etc.	LS/ Rs.	LS	80	65	70	72	70	80	63	500	5
13	DPC Al. wire and Al. Strip		MT	2.14	50	45	35	40	45	45	40	300	6
14	Transformer Oil		KL	0.853	158	116	80	126	120	116	84	800	7
15	Operation of building management service (BMS) and annual maintenance control (AMC) of non IT infra installed at Data Centre, Kusai Colony, Doranda, Ranchi		LS/ Rs.	LS	125	-	-	-	-	-	-	125	1
16	Spill over work for PSS		LS/ Rs.	LS	85	60	40	60	60	60	40	405	4
17	Construction of Pole factory & fabrication infrastructure at Dhurwa, Ranchi		LS/ Rs.	LS	100	-	-	-	-	-	-	100	1
18	Adoption of New Technology		LS/ Rs.	LS								110	1
				Total									**160**

Annexure 6 – District-wise details of 12th Plan Scheme Details

Sl.	District	UE Villages	PE Villages	UE Habitations	PE Habitations	Rural Households	BPL Connections	P/S/S	PSS Capacity (MVA)	33 kV Lines (Km)	11 kV Lines (Km)	11 kV Feeder (Km)	11 kV Feeder Bay (No.s)	(Distribution Transformers)	DT - 63 kVA	DT - 25 kVA	DT Capacity (MVA)	LT line (Km)	Others (No.s)	Amount (Rs. Crs)
1	Bokaro	-	485	29	2,233	66,912	30,001	4	25	-	662	-	-	2,272	123	2,149	61	882	1,696	111
2	Deoghar	-	1,790	457	2,813	37,716	17,731	1	20	-	648	-	-	1,762	2	1,760	44	786	1,724	92
3	Dhanbad	-	1,013	4	2,442	49,014	19,058	3	5	-	373	-	-	1,403	17	1,386	36	554	1,056	68
4	Giridih	6	2,384	697	2,725	2,26,760	44,213	8	95	-	486	157	14	2,036	-	2,036	51	376	5	96
5	Godda	-	2,041	-	3,815	81,343	4,840	6	66	-	403	-	-	1,186	11	1,175	30	483	1,050	62
6	Gumla	-	128	216	-	7,623	3,702	4	20	-	568	-	-	248	22	226	7	418	5,587	48
7	Hazaribagh	-	1,057	1,777	855	1,13,842	48,799	6	145	34	728	142	14	2,576	-	2,576	64	543	22	137
8	Jamtara	-	998	64	2,021	20,650	13,114	2	10	-	516	-	-	1,110	2	1,108	28	600	-	64
9	Khunti	50	675	639	794	64,203	12,502	2	50	-	306	66	7	1,101	-	1,101	28	281	12	49
10	Koderma	16	515	50	832	44,720	24,693	2	60	-	262	104	18	981	-	981	25	185	19	50
11	Lohardaga	1	293	282	690	44,969	12,991	3	70	-	191	43	11	560	-	560	14	148	204	35
12	Pakur	-	1,158	-	2,380	52,213	15,063	-	-	-	456	-	-	1,191	38	1,153	31	544	1,021	68
13	Ramgarh	6	289	411	450	47,215	47,215	2	85	-	193	126	24	689	-	689	17	73	7	51
14	Ranchi	46	1,250	1,601	1,890	180,,703	45,934	6	175	-	935	217	19	2,754	-	2,754	69	858	204	148
15	Sahibganj	-	1,602	55	1,972	86,719	58,344	-	-	-	400	-	-	1,067	48	1,019	28	552	808	73
16	East Singhbhum	-	1,542	40	2,937	50,234	31,668	1	17	-	604	-	-	1,277	-	1,277	32	645	1,761	80
17	SKLA	-	1,088	6	2,946	65,721	42,104	1	8	-	100	-	-	260	-	260	7	117	260	27
Total		125	18,308	6,328	31,795	12,40,557	4,71,972	51	851	34	7,830	855	107	22,473	263	22,210	572	8,046	15,436	1,261

Annexure 7 – District wise DDUGJY Scheme Details

Sl.	District	UE	UE Habitation	PE	PE Habitation	BPI	P/S/S	Total Capacity (MVA)	33 kV line (Km)	11 kV line (Km)	Distribution Transformers	DT Capacity (KVA)	LT line (Km)	Amount (Rs. Cr.)
1	Singh (E)	-	-	71	125	46,846	6	60	75	1,612	2,551	63,775	1,133	224
2	Singh (W)	31	123	117	368	73,307	4	40	50	2,796	4,268	1,06,700	1,791	325
3	Saraikela	-	-	3	7	14,352	3	30	38	687	1,913	47,825	897	138
4	Lateher	33	67	547	1,132	27,017	6	60	75	2,798	5,100	1,27,500	1,802	317
5	Garhwa	12	51	746	2,338	1,89,174	8	80	100	3,189	6,948	1,73,700	2,113	479
6	Palamau	36	61	1,379	3,739	2,09,510	14	160	175	4,938	9,304	2,32,600	3,519	667
7	Dhanbad	1	1	11	14	44,056	4	40	43	816	1,357	33,925	565	123
8	Koderma	8	8	-	-	8,217	4	40	50	631	1,141	28,525	401	95
9	Bokaro	1	1	58	281	23,827	2	20	728	1,035	1,737	43,425	728	129
10	Gumla	2	5	179	462	30,467	3	30	38	2,270	4,663	1,16,575	1,621	275
11	Simdega	18	59	93	211	50,908	6	60	84	1,497	2,622	65,550	1,042	200
12	Chatra	22	55	893	2,540	48,014	4	40	57	3,208	5,972	1,49,300	2,315	367
13	Hazaribagh	10	28	385	808	38,371	6	60	84	2,478	3,772	94,300	1,707	298
14	Ramgarh	-	-	193	398	6,561	5	50	63	588	1,028	25,700	381	94
15	Giridih	24	26	131	283	79,145	3	30	32	2,899	6,276	1,56,900	2,083	389
16	Jamtara	-	-	23	56	11,887	6	60	68	922	1,686	42,150	659	124
17	Deoghar	-	-	141	397	5,663	6	60	99	1,223	2,606	65,150	884	166
18	Dumka	3	3	347	540	24,637	5	50	58	2,341	4,081	1,02,025	1,612	263
19	Godda	-	-	1	1	10,383	7	70	96	1,223	2,162	54,050	873	155
20	Lohardaga	55	200	31	71	9,164	5	50	68	1,221	1,727	43,175	740	138
21	Pakur	2	8	57	101	12,208	3	30	42	1,128	1,852	46,300	808	132
22	Ranchi	1	1	267	701	94,248	13	170	163	3,016	5,130	1,28,250	2,033	414
23	Khunti	-	-	81	159	26,639	5	50	63	1,349	2,786	69,650	923	179
24	Sahebganj	-	-	49	54	10,452	5	50	55	986	1,746	43,650	676	123
Total		259	697	5,803	14,786	10,95,053	133	1,390	2,400	44,850	82,428	20,60,700	31,305	5,813

Annexure 8 – Circle/ District-wise IPDS Scheme Details

Circle	District	Town Name	33 kV Lines (km)	33 kV UG (km)	11 kV Line km)	11 kV UG (km)	LT AB Cable (km)	Solar Panel (kW)	New PSS (No.)	Capacity of P/S/S (MVA)	New DSS (No.s)	500 kVA	200 kVA	100 kVA	63 kVA	25 kVA	LT Line (km)	DT Capacity	Consumer Metering (No.s)	Project Cost (Rs. Cr.)
Hazaribagh	Chatra	Chatra (NP)	6	-	21	0	10	10	1	10	21	1	8	12	-	-	16		2,026	11.7
	Hazaribagh	Hazaribag (NP)	6	-	40	9	40	30	1	10	47	5	32	10	-	-	40		2,840	29.9
Hazaribagh			**12**	**-**	**61**	**9**	**50**	**40**	**2**	**20**	**68**	**6**	**40**	**22**	**-**	**-**	**56**		**4,866**	**41.6**
Koderma	Kodarma	Kodarma (NP)	3	-	5	-	25	5	1	10	18	3	5	10	-	-	-		3,005	11.5
		Jhumri Tilaiya (NP)	15	5	10	6	150	15	-	-	24	5	11	8	-	-	-		2,500	29.0
Koderma			**18**	**5**	**15**	**6**	**175**	**20**	**1**	**10**	**42**	**8**	**16**	**18**	**-**	**-**	**-**		**5,505**	**40.5**
Ramgarh	Ramgarh	Ramgarh Cantonment (CB)	15	**-**	**1**	**1**	**68**	**5**	**-**	**-**	**50**	**40**	**10**	**-**	**-**	**-**	**-**		**4,000**	21.1
Deoghar	Deoghar	Deoghar (M Corp.)	10	2	37	13	50	9	3	30	40	10	20	10	-	-	20		10,000	40.3
		Madhupur (NP)	10		50	15	60	6	1	10	24	4	10	10	-	-	-		2,000	25.6
	Godda	Godda (NP)	-	-	18	4	70	5	-	-	91	-	20	40	31	-	-		4,000	19.3
Deoghar			**20**	**2**	**105**	**32**	**180**	**20**	**4**	**40**	**155**	**14**	**50**	**60**	**31**	**-**	**20**		**16,000**	**85.2**
Dumka	Dumka	Basukinath (NP)	-	-	12	8	18	-	-	-	5	-	-	5	-	-	5		600	7.4
		Dumka (NP)	30	-	9	18	30	5	-	-	20	-	-	20	-	-	9		1,500	19.5
	Jamtara	Jamtara (NP)	-	-	9	4	14	5	-	-	35	-	10	5	20		15		2,410	9.7
		Mihijam (NP)	-	-	15	1	30	5	-	-	-	-	-	-	-	-	-		683	5.5
Dumka			**30**	**-**	**45**	**31**	**92**	**15**	**-**	**-**	**60**	**-**	**10**	**30**	**20**	**-**	**29**		**5,193**	**42.2**
Sahebganj	Sahibganj	Sahibganj (NP)	14	6	48	25	50	15	2	20	84	-	22	60	2	-	40		4,000	45.2
		Pakaur (NP)	-	-	27	6	30	5	-	-	79	4	30	45	-	-	-		4,000	20.1
		Rajmahal (NP)	6	-	14	25	20	10	1	10	35	-	15	20			5		2,400	26.3

Circle	District	Town Name	33 kV Lines (km)	33 kV UG (km)	11 kV Line km)	11 kV UG (km)	LT AB Cable (km)	Solar Panel (kW)	New PSS (No.)	Capacity of P/S/S (MVA)	New DSS (No.s)	500 kVA	200 kVA	100 kVA	63 kVA	25 kVA	LT Line (km)	DT Capacity	Consumer Metering (No.s)	Project Cost (Rs. Cr.)
Sahebganj			**20**	**6**	**89**	**56**	**100**	**30**	**3**	**30**	**198**	**4**	**67**	**125**	**2**	**-**	**45**		**10,400**	**91.5**
Garhwa	Garhwa	Majhion (NP)	40	-	30	-	110	5	1	10	16		4	12		-	-		779	23.8
		Garhwa (NP)	20	-	15	1	100	5	1	10	5	-	5	-	-	-	-		1,000	22.1
Garhwa			**60**	**-**	**45**	**1**	**210**	**10**	**2**	**20**	**21**	**-**	**9**	**12**	**-**	**-**	**-**		**1,779**	**45.9**
Daltonganj	Palamu	Hussainabad (NP)	8	-	40	1	150	3	1	10	25	-	3	7	5	10	-		2,236	27.6
		Bishrampur (NP)	-	-	5	20	10	25	-	-	10		6	4			-		3,411	16.2
		Medininagar (NP)	3	10	12	40	120	6	1	10	60	20	20	20			12		4,315	45.9
	Latehar	Latehar (NP)	3	-	10	1	8	10	1	10	6	-	2	-	4	-	-		724	9.4
Daltonganj			**14**	**10**	**67**	**62**	**288**	**44**	**3**	**30**	**101**	**20**	**31**	**31**	**9**	**10**	**12**		**10,686**	**99.2**
Giridih	Giridih	Giridih (NP)	**17**	**3**	**10**	**20**	**120**	**15**	**2**	**20**	**124**	**4**	**60**	**60**	**-**	**-**	**-**		**5,000**	**53.7**
Ranchi	Ranchi	Ranchi	90	8	44	10	210	100	4	40	400	200		200			-		5,000	142.1
		Bundu	42	-	104	-	37	10	1	10	45		12	18	15		-		4,292	36.5
	Khunti	Khunti	15	-	20	-	25	10	1	10	25			15	5	5	5		470	22.1
Ranchi			**147**	**8**	**168**	**10**	**272**	**120**	**6**	**60**	**470**	**200**	**12**	**233**	**20**	**5**	**5**		**9,762**	**200.6**
Dhanbad	Dhanbad	Dhanbad	12	3	195	16	450	30	3	30	255	50	85	120			30		17,186	113.9
		Chirkunda	3	-	30	3	150	10	-	-	70		10	40	20		10		3,580	26.0
Dhanbad			**15**	**3**	**225**	**19**	**600**	**40**	**3**	**30**	**325**	**50**	**95**	**160**	**20**	**-**	**40**		**20,766**	**139.9**
Chas	Bokaro	Chas	31	-	17	15	50	9	-	-	33	15	18				250		6,218	27.8
		Phusro	-	-	9	-	-	5	-	-	17	2	5	10			40		2,587	5.7
Chas			**31**	**-**	**26**	**15**	**50**	**14**	**-**	**-**	**50**	**17**	**23**	**10**	**-**	**-**	**290**		**8,805**	**33.5**
Chaibasa	Singhbhum West	Chaibasa	14	1	14	10	30	5	1	10	20		10	10			25		3,126	25.2
		Chakradharpur	40	1	20	4	20	5	1	10	25		15	10			23		2,005	21.7

Circle	District	Town Name	33 kV Lines (km)	33 kV UG (km)	11 kV Line km)	11 kV UG (km)	LT AB Cable (km)	Solar Panel (kW)	New PSS (No.)	Capacity of P/S/S (MVA)	New DSS (No.s)	500 kVA	200 kVA	100 kVA	63 kVA	25 kVA	LT Line (km)	DT Capacity	Consumer Metering (No.s)	Project Cost (Rs. Cr.)
	Saraikela Kharsawan	Saraikela	24	2	12	3	20	5	-	-	14		6	8			12		615	15.7
Chaibasa			**78**	**4**	**46**	**17**	**70**	**15**	**2**	**20**	**59**	**-**	**31**	**28**	**-**	**-**	**60**		**5,746**	**62.6**
Jamshedpur	Jamshedpur	Mango (NAC)	26	2	20	13	50	2	-	-	42	10	12	20			45		10,200	30.1
		Jamshedpur	4	5	20	12	10	10	-	-	45	10	15	20	-	-	48		5,100	20.8
		Jugsalai (M)	8	1	10	25	15	2	-	-	28	3	10	15			17		2,510	16.7
	Saraikela Kharsawan	Adityapur	7	2	25	10	60	2	-	-	50	5	20	25			30		6,090	19.6
	Chakulia	Chakulia	13	1	16	1	-	2	-	-	47	5	17	25			25		530	16.8
Jamshedpur			**32**	**11**	**91**	**61**	**135**	**18**	**-**	**-**	**212**	**33**	**74**	**105**	**-**	**-**	**165**		**24,430**	**103.9**
Gumla	Gumla	Gumla	17	5	40	15	-	15	2	20	64	2	12	15	25	10	15		1,500	32.0
	Simdega	Simdega	-	-	10	5	-	5	-	-	47	2	10	15	15	5	-		697	7.1
	Lohardaga	Lohardaga	4		32	5	132	10	1	10	90	4	5	16	22	43	58		794	26.3
Gumla			**21**	**5**	**82**	**25**	**132**	**30**	**3**	**30**	**201**	**8**	**27**	**46**	**62**	**58**	**73**		**2,991**	**65.4**
Total			**530**	**57**	**1,076**	**364**	**2,542**	**436**	**31**	**310**	**2,136**	**404**	**555**	**940**	**164**	**73**	**795**	**419**	**135,929**	**1,126.7**

Annexure 9: Details of Solar Power Plants Installation in Block and Panchayat Offices

Name of Division	Name of District	No. of Blocks	Work Progress in Blocks	No. of Panchayats	Work Progress in Panchayat
Dumka	Sahebganj	9	9	166	158
	Pakur	6	6	128	121
	Godda	9	9	201	140
	Dumka	10	10	206	175
	Deoghar	10	10	194	192
	Jamtara	6	6	118	71
Hazaribagh	Bokaro	9	9	251	136
	Dhanbad	9	8	256	226
	Giridih	13	13	358	127
	Koderma	6	6	109	98
	Chatra	12	11	154	-
	Hazaribagh	16	15	257	20
	Ramgarh	6	6	143	50
Kolhan	West Singhbhum	18	18	216	117
	East Singhbhum	11	11	231	85
	Saraikela Kharsawan	9	7	136	100
Ranchi	Simdega	10	10	94	-
	Ranchi	18	18	303	129
	Khunti	6	2	86	21
	Lohardaga	7	7	66	50
	Gumla	12	12	159	-
Palamu	Palamu	20	20	283	109
	Latehar	9	9	115	91
	Garhwa	19	19	193	94
Total		**260**	**251**	**4,423**	**2,310**