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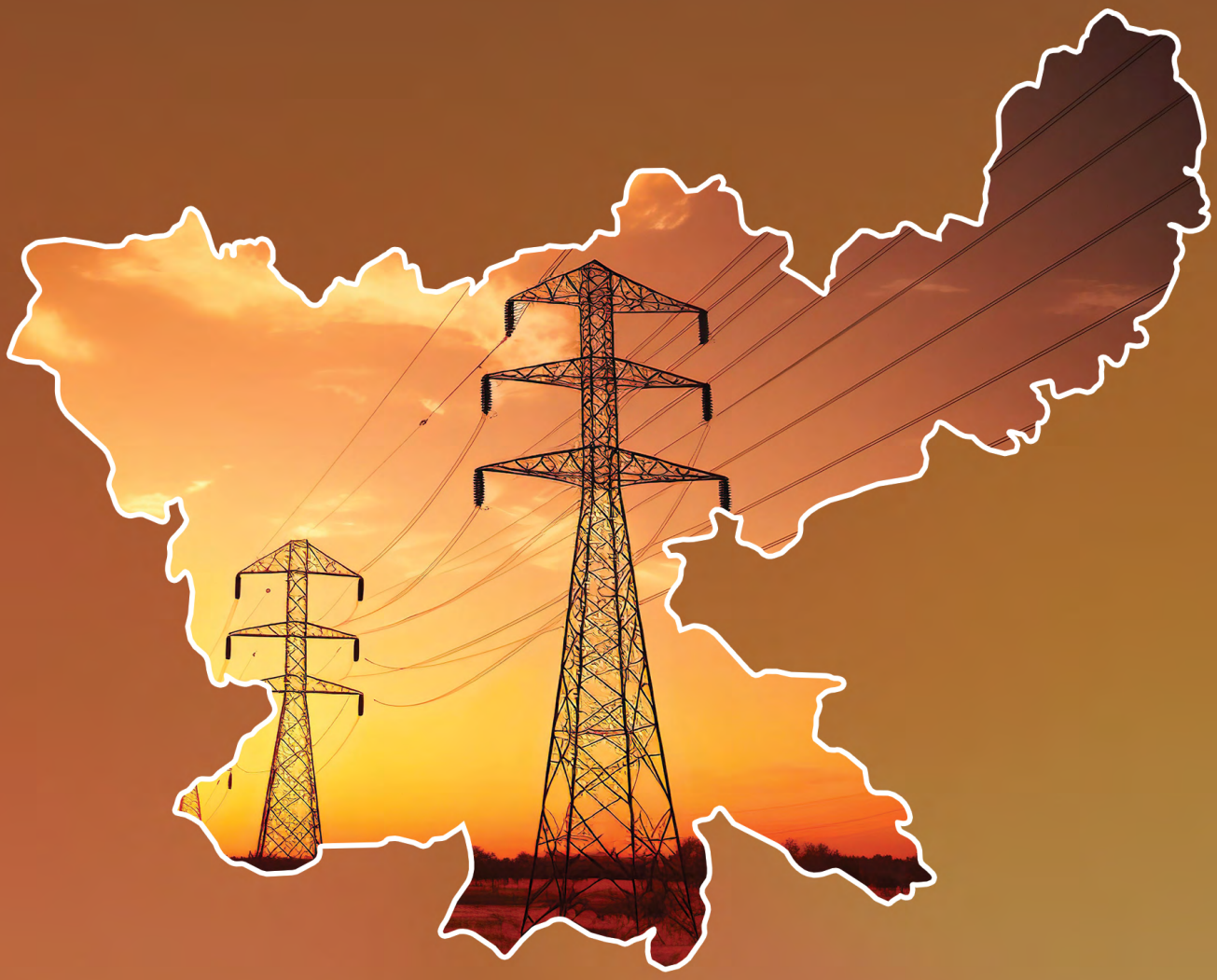
VIABILITY OF JHARKHAND'S ELECTRICITY DISTRIBUTION:

DISTORTED BY LEGACY AND CONSUMER PROFILES



NIKHIL TYAGI AND RAHUL TONGIA

Centre for Social and Economic Progress (CSEP)
CSEP Research Foundation
6, Dr Jose P. Rizal Marg, Chanakyapuri,
New Delhi - 110021, India

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DISTORTED BY LEGACY AND CONSUMER PROFILES

Nikhil Tyagi
Research Associate
Centre for Social and Economic Progress
New Delhi, India

Rahul Tongia
Senior Fellow
Centre for Social and Economic Progress
New Delhi, India

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Abbreviations and Acronyms

ABR	Average Billing Rate
ACoS	Average Cost of Supply
APPC	Average Power Purchase Cost
AT&C	Aggregate Technical and Commercial (losses)
C&I	Commercial and Industrial
CEA	Central Electricity Authority
DISCOMs	Distribution Companies
DVC	Damodar Valley Corporation
EHT	Extra High Tension (Extra High Voltage = bulk consumer)
FY	Financial Year
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
HH	Household
HT	High Tension
HTSS	High Tension Special Supply
JBVNL	Jharkhand Bijli Vitran Nigam Ltd
JSEB	Jharkhand State Electricity Board
JSERC	Jharkhand State Electricity Regulatory Commission
JUSCO	Jamshedpur Utilities & Services
IISD	International Institute of Sustainable Development
ISEP	Initiative for Sustainable Energy Policy
kWh	Kilowatt hour
LGBR	Load Generation Balance Report
LT	Low Tension (Low Voltage = regular consumer)
LTIS	Low Tension Industry supply
MERC	Maharashtra Electricity Regulatory Commission
MES	Military Engineering Supply
MU	Million units (million kWh)
PFC	Power Finance Corporation
RTS	Railway Traction Supply
SAIDI	System Average Interruption Duration Index
SAIL	Steel Authority of India Ltd
SGDP	State Gross Domestic Product
TSL	Tata Steel Ltd
TSUIS	Tata Steel Utilities and Infrastructure Services Ltd
UPERC	Uttar Pradesh Electricity Regulatory Commission

Abstract

The state of Jharkhand is rich in mineral reserves, including coal, but lags in development compared to most of India. This paper attempts to examine the structure and legacy of electricity distribution in the state with a lens to examine how that impacts the future viability of the distribution companies (DisComs).

After unbundling of the erstwhile Jharkhand State Electricity Board (JSEB), Jharkhand Bijli Vitran Nigam Ltd (JBVNL) took over virtually all of the distribution segment in 2014. It inherited High AT&C losses,[1] poor electricity access, and a list of legacy issues. While there are five distribution companies (DisComs), their size and performance are very skewed. Four have very low operational and financial losses, but still Jharkhand state's overall performance parameters (e.g., AT&C losses) are significantly worse than the all-India average.

The analysis shows that two public sector utilities, JBVNL and Damodar Valley Corporation (DVC), serve more than 90% of consumers. The latter is a hub for major industrial activities that have cumulatively and historically had a high energy demand. DVC also happens to be an integrated utility under Central Govt. control, with extensive generation capability, also selling power in parts of West Bengal.[2] This leaves smaller and less remunerative consumers for JBVNL to serve, with DVC keeping large industrial consumers. This leads to DVC having lower AT&C losses and high revenues, and JBVNL lacking a diverse consumer mix with enough consumers capable paying cross-subsidies for offsetting under-paying consumers. The asymmetric consumer profile becomes a key challenge for the viability of the majority provider of electricity (JBVNL) considering the traditional Indian utility equilibrium has relied not just on subsidies (which are extensive in Jharkhand) but also cross-subsidies from so-termed "paying customers", the commercial and industrial (C&I) consumers, which are overwhelmingly missing from JBVNL. This paper attempts to examine DisCom viability in light of not only consumer profile distortions but also trendlines of energy sales. We find that a model based on gradual improvements (efficiency) is unlikely to be sufficient in the near term and we may require new policies or instruments, and perhaps new modes for social welfare redistribution outside traditional cross-subsidy models in India. With this, either the burden upon the state exchequer will be high or quality of service may suffer.

[1] Aggregate Technical and Commercial Losses (AT&C Losses) are a measure of efficiency (rather, inefficiency) of distribution, comparing incoming energy versus the money received. This spans technical losses, theft, non-billing, and non-collection of dues. The formula is AT&C = {1 - (Billing Efficiency x Collection Efficiency)} x 100. More details are at https://npp.gov.in/glossary

[2] DVC was modelled on the US Tennessee Valley Authority system, which provided power but also other multi-state benefits notably in irrigation and flood control. It had stakeholders from the Central government and the states of West Bengal and Bihar; Amendments to the DVC Act gave Board Membership to a representative from Jharkhand.

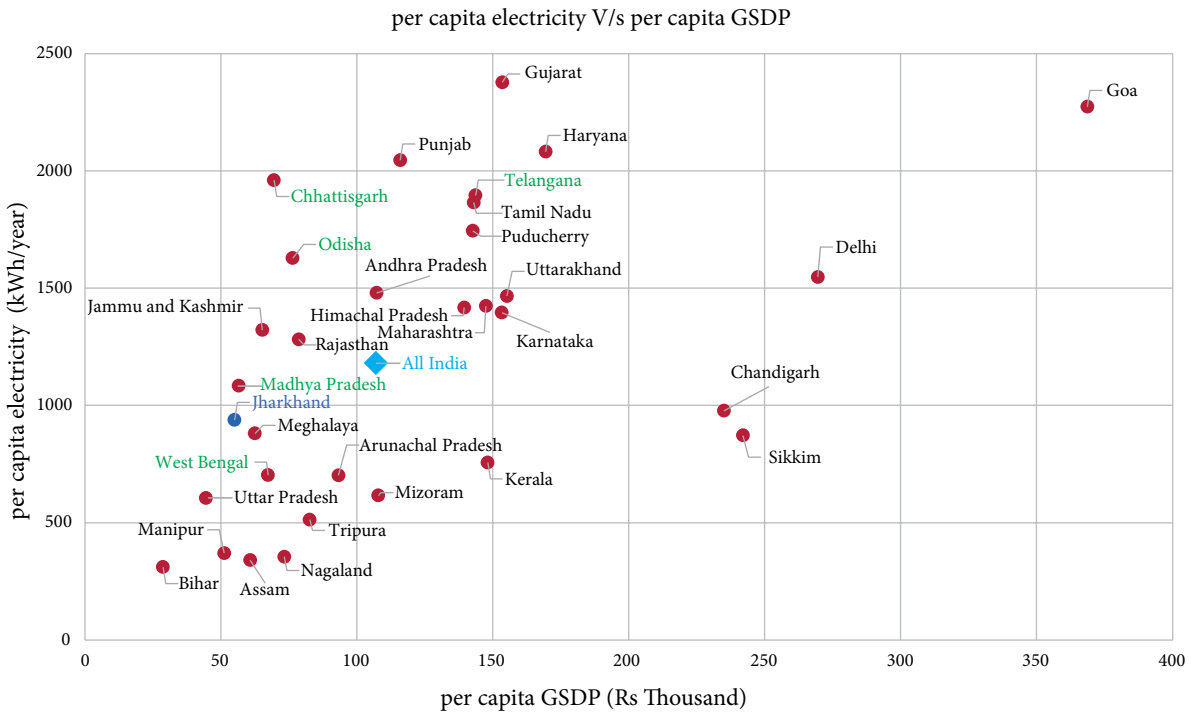
1. Background on the State of Jharkhand

Jharkhand is mid-sized state in India, both in terms of population and size, and was carved out of the state of Bihar in 2000. Despite being resource rich, with an estimated 40% of India's mineral reserves (Government of Jharkhand, 2023), Jharkhand lags in development, with almost 40% of the population being below the poverty line (World Bank Group, 2023).

The population living in urban areas rose slightly from 22% in 2001, to 24.1% in 2011, considerably below the national average of 31.2% in 2011. On the other hand, even urban areas of Jharkhand have a substantially high proportion of the population living below the poverty line (25%), compared with the national average of about 14% (MoP, 2019).[3]

Jharkhand's natural resources include India's largest coal reserves, important for power production. Combined with waterways and land availability has led it to have several major industrial entities like the Tata Steel Ltd (TSL; plant at Jamshedpur), Steel Authority of India Ltd (SAIL; plant at Bokaro), and Damodar Valley Corporation (DVC; power generation facilities). Despite this, both gross state domestic product (GSDP), and electricity consumption per capita are on the lower end of all-India values (Figure 1, which includes all consumption segments). Household electricity data (Figure 2) follows a mostly similar pattern when it comes to inter-state comparison, but within the state high household consumption is disproportionally an urban phenomenon, instead of being linked only to GSDP per household. Residential sector consumption in Jharkhand appears measurably higher than the all-India average, something we revisit subsequently.

Figure 1: Per Capita Electricity versus Per Capita GSDP FY19

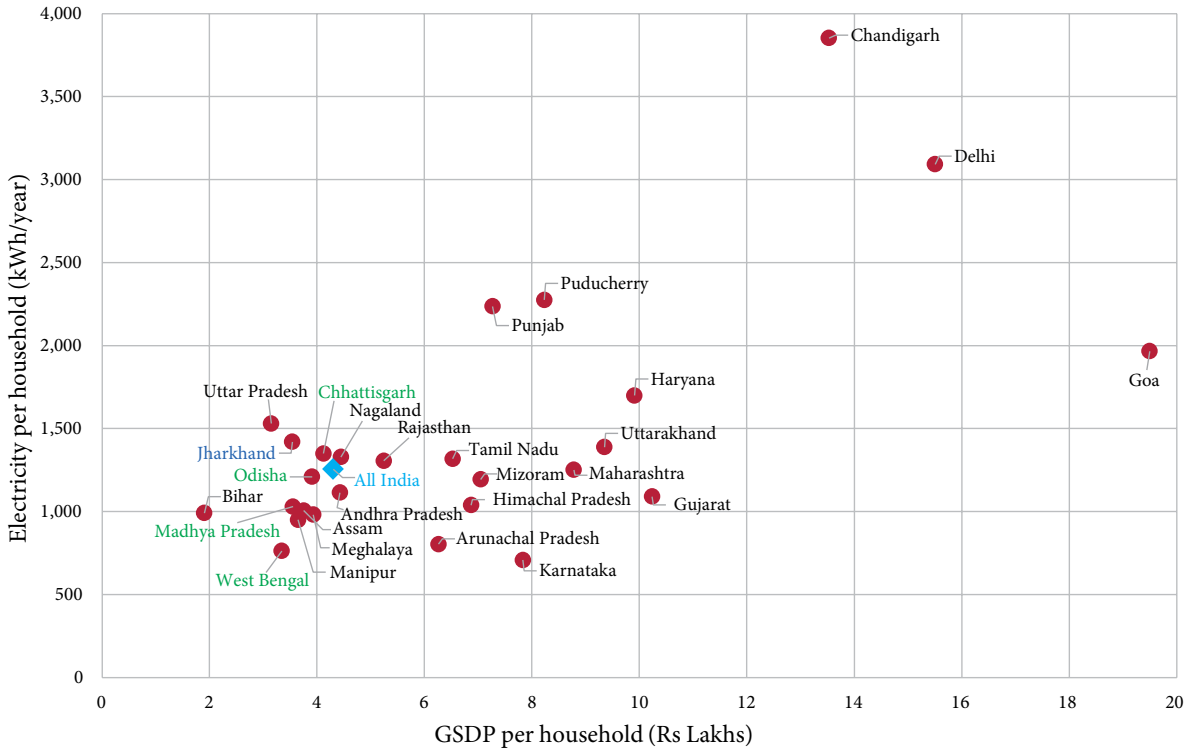


Source: Calculated from PBI's & Directorate of Economics & Statistics of respective State Governments' data.

Notes: States labelled in green are high coal-bearing states similar to Jharkhand. Subsequent sections compare their electricity and development in more detail.

[3] Deloitte, Ministry of Power. "Power for All", 2019. Accessed on: 13 October 2020. https://powermin.nic.in/sites/default/files/uploads/joint_initiative_of_govt_of_india_and_jharkhand.pdf

Figure 2: Household Electricity (kWh) versus GSDP Per Household (in Lakhs) for FY19



Source: Compiled from Tariff Orders of 61 DisComs, using latest approved numbers for FY19 and Power Finance Corporation (PFC) report FY19, Statistical Handbook (Reserve Bank of India), and Periodic Labour Force Survey FY18.

Notes: Electricity is for residential consumers, while GDP is converted to per household by dividing the GSDP by the number of households. The latter is higher than the average household income, since not all the GDP is household income. States labelled in green are high coal-bearing states similar to Jharkhand.

2. Jharkhand Electricity Distribution Landscape

Aided by a push from the Central government, Jharkhand is among the many states in India to have *officially* achieved 100% electrification at a household level.[4] Like the rest of India, Jharkhand has seen improvements not just in access but also in supply availability and overall growth in consumption, as well as other operational improvements. However, following the unbundling of the state power sector, the state still suffers from numerous legacy problems such as lower per capita electricity usage, high AT&C losses, non-cost reflective tariffs, insufficient workforce, restricted electrification and electricity infrastructure in need of upgrades.

Jharkhand is divided into 24 districts, where electricity supplied by five Discoms: SAIL-BSL, TSL, DVC, Jharkhand Bijli Vitran Nigam Ltd (JBVNL), and Jamshedpur Utilities & Services Company Ltd (JUSCO).[5] While JUSCO, SAIL-BSL and TSL operate in Saraikhela Kharsawan, Bokaro Steel City and the city of Jamshedpur, respectively, with geographic independence, JBVNL and DVC are public sector utilities with geographic overlap. The private DisComs—SAIL-BSL, TSL and JUSCO—have a very limited coverage areas; JBVNL operates throughout the state, while DVC operates in 7 districts (Dhanbad, Koderma, Bokaro, Giridih, Hazaribagh, Ramghar, and Chatra). Thus, unlike virtually all of India—where different DisComs within a state are segregated by geography—there is

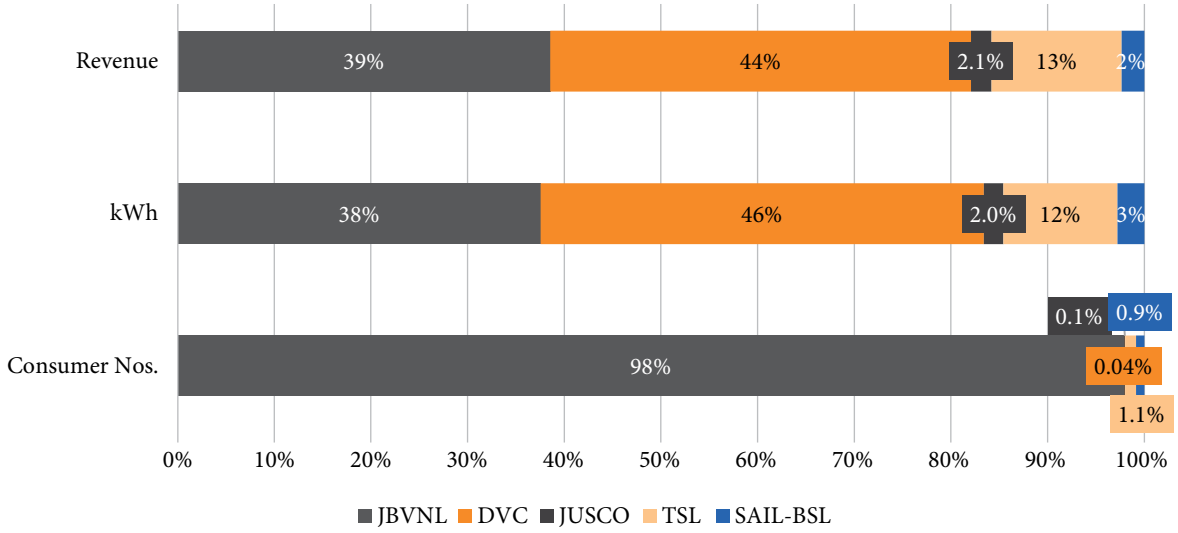
[4] As per Ministry of Power Saubhagya portal (http://saubhagya.gov.in/).

[5] As of December 20, 2019 the name of Jamshedpur Utilities & Services Company Ltd (JUSCO), was changed to Tata Steel Utilities and Infrastructure Services Ltd; https://www.tatasteeluisl.com/pdf/certificate-of-incorporation-post-change-of-name.pdf

a physical overlap for some districts in Jharkhand, but with a separation of consumers served based on type – this is in the case of DVC versus JBVNL.[6]

While DVC is an integrated utility that also owns generation assets, and has coverage in Jharkhand and West Bengal, JUSCO, SAIL-BSL and TSL conduct their operations over a smaller area in the state for a smaller pool of consumers, that too urban consumers (predominantly their townships). Of the state's total consumer base of 42.5 lakhs, JUSCO, SAIL-BSL and TSL have only a 2% overall share. Damodar Valley Corporation's share of electricity becomes significant, despite being lowest in terms of number of consumers, because it has large or very large consumers with very high average consumption (Figure 3).

Figure 3: DISCOMs Share in Total State Consumers, Unit Sales and Revenues



Source: Data from Jharkhand State Electricity Regulatory Commission (JSERC) Tariff Order (FY19). For JUSCO, FY18 data are used as these are the latest available.

Notes: Category-wise revenue from consumers on an approved tariff basis is not available in the JSERC Tariff order, thus category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, the State subsidy data is only available for JBVNL domestic category (the same is used in revenue calculations).

As per the figures approved by JSERC in the Tariff Order for FY19, the state had a total electricity consumption of 24,945 million units (MUs, or million kilowatt hours [kWh]), i.e., 2.5% of India's consumption. Of this, 20,807 MUs of electricity (83%) is consumed by JBVNL and DVC consumers. Not only does DVC have very few customers who disproportionately consume bulk electricity, this advantage extends into earnings where the revenues are even more skewed, with JBVNL bearing the brunt on both counts (lower energy sales and even lower revenues).

This paper analyses how the disproportionality in the consumer mix has hampered JBVNL's revenues. The paper is structured as follows: Section 3 shows the historical trends of consumer mix and DisComs financial parameters across the consumer categories. In Section 4, we analyse JBVNL's financial performance, which shows a consistent loss trend. Section 5 compares Jharkhand to its peer states and shows that Jharkhand's power sector is unique primarily because of its consumer mix. In Section 6, we discuss and recommend the possible solutions to overcome the legacy issue being faced by JBVNL due to presence of DVC.

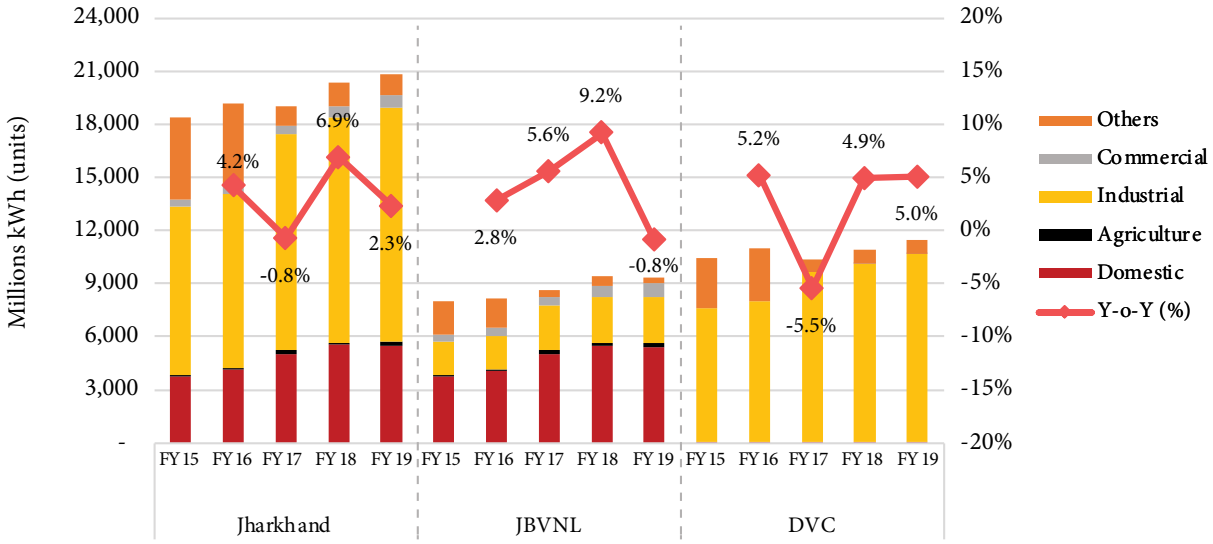
[6] Mumbai now has overlap in a competitive model where the DisComs can compete for all classes of consumers, which is unique in India.

3. JBVNL and DVC: Major Historical Trends

Although the State government officially proclaims to have every house electrified, recent Jharkhand survey data indicate that 13% of rural households still lack access to electricity.[7] Per the survey, almost half of those with access are not metered and do not receive monthly bills, while more than a third of households say they are unhappy with the supply of the grid.[8]

Energy sales in Jharkhand have evolved over the last decade. After the unbundling of the vertically integrated JSEB, the JBVNL was incorporated and began operations in 2014. It saw a 69% rise in consumers served, in a short period of six years, driven heavily by household electrification programmes. Damodar Valley Corporation, which mainly serves a smaller pool of bulk commercial and industrial consumers saw similar growth, but on a smaller base of consumers since 2011. The extreme asymmetry in number of consumers overlays with asymmetries in energy sold.

Figure 4: Category-wise Energy Sales Trend (year-on-year change)



Source: Compiled from different financial year JSERC Tariff Orders.

Notes: Jharkhand as shown here is simply the sum of JBVNL and DVC, and technically not the entire state due to the small three private DisComs Year-on-year or Y-o-Y growth is the total sales growth. MU = million units (kWh).

[7] Brian, Blankenship. 2020. 'Rural electrification in Jharkhand: Progress and gaps' 08 April 2020. Accessed on 22 Oct 2020. https://energy.economictimes.indiatimes.com/energy-speak/rural-electrification-in-jharkhand-progress-and-gaps/4146

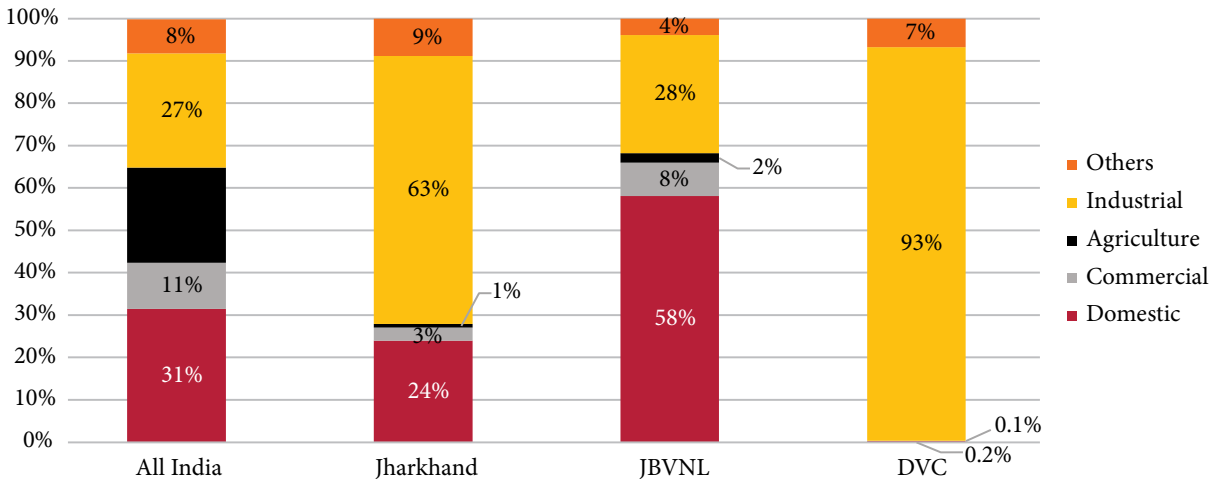
[8] Beyond missing some homes, it's possible that in some cases the house has a connection but the line may not be activated.

3.1 Consumer Mix

The state's consumer base is bifurcated into five distinct categories: domestic, industrial, agriculture, commercial, and other (this last category, is a combined category which includes various public and miscellaneous utilities such as public lighting, railways, etc.). In Jharkhand the "other" category is dominated by the railways, but they are switching from DisComs to captive generation facilities or other supply options (as can be seen between FY16 and FY17 in Figure 4). Surprisingly, Jharkhand's electricity consumption is dominated by industrial consumers (63%), followed by domestic (24%) (Figure 5). At first glance this may suggest a high level of development and industrialisation but, in reality, it reflects very low consumption by the agricultural sector and even commercial sales, especially when compared to the all-India averages.

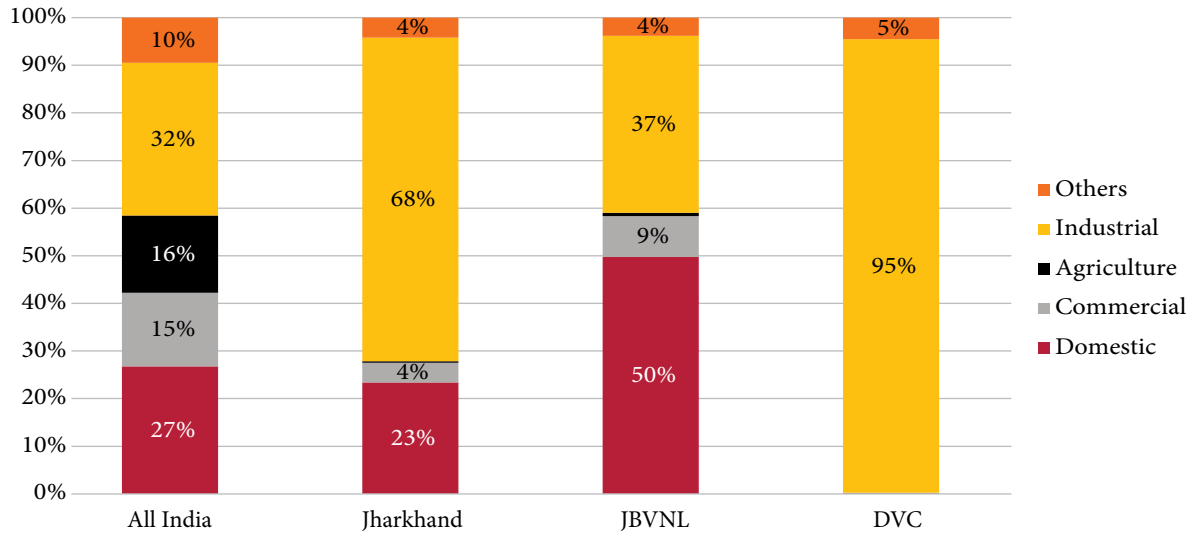
Though JBVNL covers 98% of the electricity consumers in Jharkhand, it constitutes only 38% of total state electricity sales and 39% of total distribution sector revenues (Figure 3). In contrast to the overall state consumption, JBVNL's sales are dominated by domestic (household) consumers (~58% of total electricity consumption) followed by industrial consumers (~28%), leaving about 14% for the remaining categories within JBVNL (Figure 5 & Figure 6). On the other hand, DVC has ~93% of electricity consumption from the industrial category; categories like domestic, agriculture and commercial are negligible. These asymmetries are heavily due to the legacy of bulk consumers being served by DVC, but this does not explain the aggregate state discrepancy in terms of low agriculture or commercial usage compared to the rest of India.

Figure 5: Electricity Consumption Share by Category Comparison (FY19)



Source: All India is based on aggregate Tariff Order data from 61 discoms and rest is based on data from JSERC Tariff Order (FY19).

Figure 6: Revenue Comparison by Consumer Category (FY19)

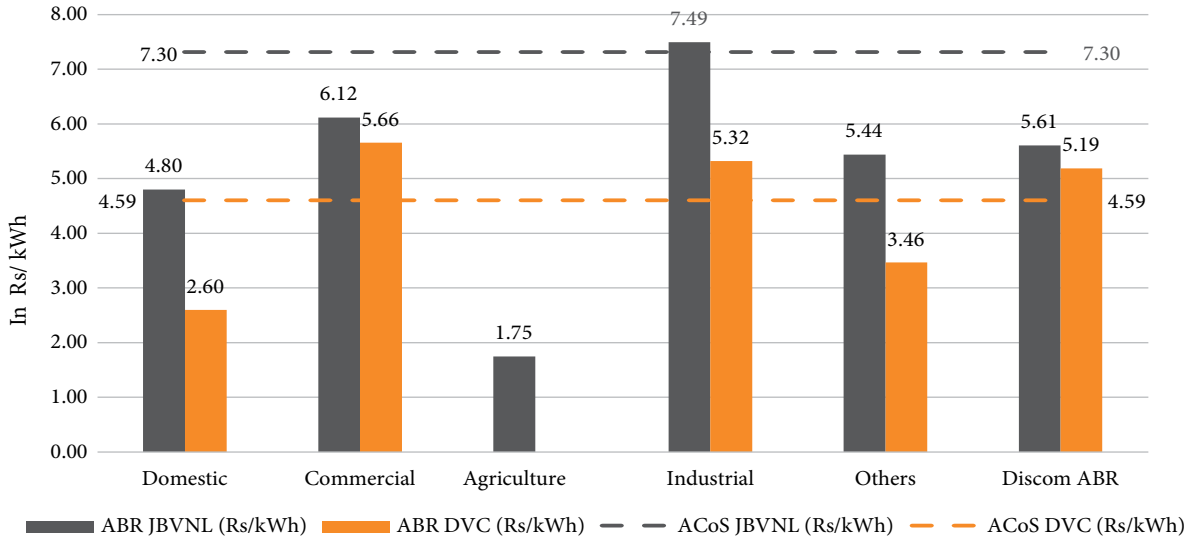


Source: The 'All India' category is based on aggregate Tariff Order data from 61 DisComs and the other categories are based on data from JSERC Tariff Order (FY19).

Notes: All-India agriculture revenues are high, as these are revenues after accounting for subsidies paid by the State government. These are based on authors' calculations using respective DisCom Tariff Orders. The PFC's annual summary report on DisComs (PFC, 2020) doesn't show subsidy by category, instead it separates subsidies as a standalone revenue head. Hence, it only shows revenues as paid by consumers per category, and not tariffs by categories (or even earnings by category post-subsidy). Tyagi and Tongia (2023) have manually undertaken that exercise. Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus category-wise revenues from consumers, calculated for FY19 energy sales on FY18 tariff basis, have been considered for analysis. Also, as the State subsidy data is only available for JBVNL domestic category the same is incorporated in revenues.

The consumer mix asymmetry is clearly reflected in the electricity prices (Figure 7). Like most of India, commercial and industrial consumers (in both JBVNL and DVC) overpay compared to the utility's average cost of supply (ACoS). However, DVC's underpaying consumers (domestic and other) are charged lower than JBVNL underpayers, and DVC's overpaying consumers still pay less than JBNVL overpaying consumers on a per kWh basis. This is due to the total sales volume asymmetry between JBVNL and DVC. Put together, the average billing rates (ABRs) of the two DisComs are similar, but end up being profitable for DVC and loss-making for JBVNL because of the enormous difference in ACoS.

Figure 7: JBVNL and DVC Category-wise Average Billing Rate (Rs/kWh)



Source: JSERC Tariff Order (FY19 and FY21) and PFC report FY19.

Notes: ABR = Average Bill Rate (revenues); ACoS = Average Cost of Supply. DVC ACoS of 4.59 Rs/kWh is per JSERC Tariff Order September 2020 True-up ACoS for FY19. Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, as the State subsidy data is only available for JBVNL's domestic category the same is incorporated in revenues.

3.2 Consumers and Consumption Distribution

The asymmetry between DVC and JBVNL becomes clearer if we dig into the details of the consumer mix. Damodar Valley Corporation has only 145 industrial connections but its total consumption amounts to almost four times that of JBVNL's, and it (DVC) generates more than double the revenue (Table 1). In aggregate, DVC has less than 0.05% of JBVNL's number of consumers, yet has higher sales of energy and higher revenues.

Table 1: JBVNL and DVC Electricity Sales and Revenue FY19

	JBVNL					DVC				
Consumer category	Nos. of consumers	Sales (MUs)	Revenue (Rs crore)	Avg. Consumption (units/ consumer per month)	Avg. Revenue (Rs/ consumer per month)	No. of consumers	Sales (MUs)	Revenue (Rs crore)	Avg. Consumption (Units/ consumer per month)	Avg. Revenue (Rs/ consumer per month)
Domestic	3,850,029	5442	2,612	118	565	1,282	27	7	1,752	4,599
Commercial	237,536	737	451	259	1581	461	12	7	2,236	13,445
Agriculture	63,420	212	37	279	481	–	–	–	–	–
Industrial	17,309	2,606	1,953	12,548	94,038	145	10,617	5,647	6,101,529	32,453,038
Others	538	368	200	56,958	309,046	13	777	269	4,977,564	17,248,607
TOTAL	4,168,832	9,365	5,252	187	1,050	1,901	11,433	5,930	501,161	2,599,693

Source: JSERC Tariff Order (FY19) and PFC Unities performance report.

Notes: Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, as the State subsidy data is only available for JBVNL domestic category the same is incorporated in revenues.

Table 2 shows more details in the industrial consumer category, which occurs due to a mix of various types of industrial consumers. Jharkhand Bijli Vitran Nigam Ltd has an industrial low-tension (LT, or low-voltage) average monthly consumption of 1,143 kWh/consumer per month. The high-tension (HT) industrial consumer for JBVNL has an average monthly consumption of 1.22 lakh kWh/consumer per month. DVC displays a sharp contrast in monthly average for each distinct sub-type of consumer. It enjoys sales to bulk consumers, who operate at high voltage levels and also consume more for a given type of connection. Not only does this raise revenue per connection, but such consumers cost less to serve as well. The DVC's per consumer consumption for HT 33 kV (kilovolt), 132 kV and 220 kV consumers is almost 42, 155 and 122 times of JBNVL HT industrial consumers, respectively.

Table 2: JBVNL and DVC Industrial Category Break-up (FY19)

DISCOM	LT/HT	Category of consumer	No. of consumers	Sales (MU)	Revenue (Rs crore)	Average monthly consumption (kWh)
JBVNL	LT	Industrial LT/ LTIS	15,684	215	222	1,143
	HT	Industrial HT/ HTSS/EHT	1,625	2,391	1,731	122,623
DVC	HT	33 kV	134	8,206	4,123	5,103,507
	HT	132 kV	9	2,051	1,332	18,994,630
	HT	220 kV	2	359	192	14,950,000
	HT	ALL HT	145	10,617	5,647	6,101,529

Source: JSERC Tariff Order (FY19).

Notes: LTIS = Low tension industry supply; HTSS = High tension special supply; EHT = Extra hight tension. Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, as the State subsidy data is only available for JBVNL domestic category the same is incorporated in revenues.

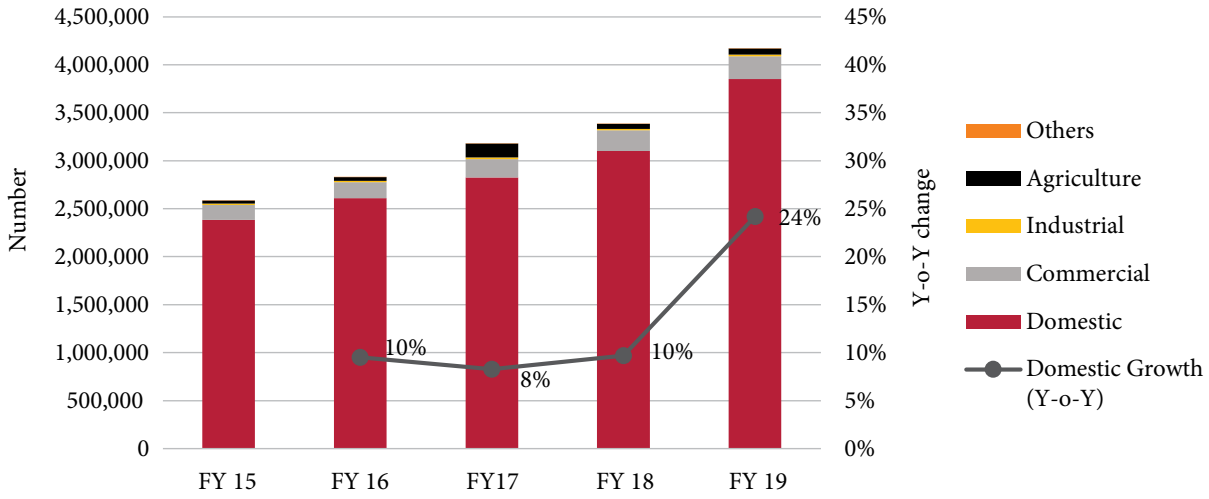
3.3 Saubhagya (electrification) Scheme's Impact

Energy sales in Jharkhand have seen a measurable increase since the implementation of the Central government's household electrification scheme, Saubhagya, in 2017, which reports 100% household electrification in two years or less. Jharkhand, which previously saw just 39% electrification of rural households, faced a massive challenge of improving its distribution sector at a rapid pace (Chandra, 2018). However, discussions with on-ground experts indicate official data overstate the extent of electrification (Vallecha & Aklin, 2020). This is separate from the issue of quality of supply (hours of supply), which also is below targeted levels.

Domestic connections have grown rapidly in the last few years, and as per the Saubhagaya portal, more than 15 lakh households have been electrified within the state, raising the total number of electrified households to almost 70 lakh. It's worth observing that the JSERC FY19 Tariff Order only shows about 40 lakh domestic connections. This is likely because Saubhagya is a recent programme, outside the regulator's purview, and tariff orders are issued in advance based on assumptions.

However, the implications of this discrepancy can be strong because tariffs are set assuming a particular consumer mix. The newly electrified households are likely to consume less electricity than the average and thus the per unit costs to serve them will be higher than the average because of the disproportional impact of fixed costs of power delivery including last-mile infrastructure, maintenance, metering, and billing (non-energy costs). Figure 8 shows the growth of consumers, including the annual growth rate for domestic consumers. In contrast, Figure 11 subsequently shows the plateau or decline in average per-household consumption as consumers were added.

Figure 8: Number of JBVNL Consumers



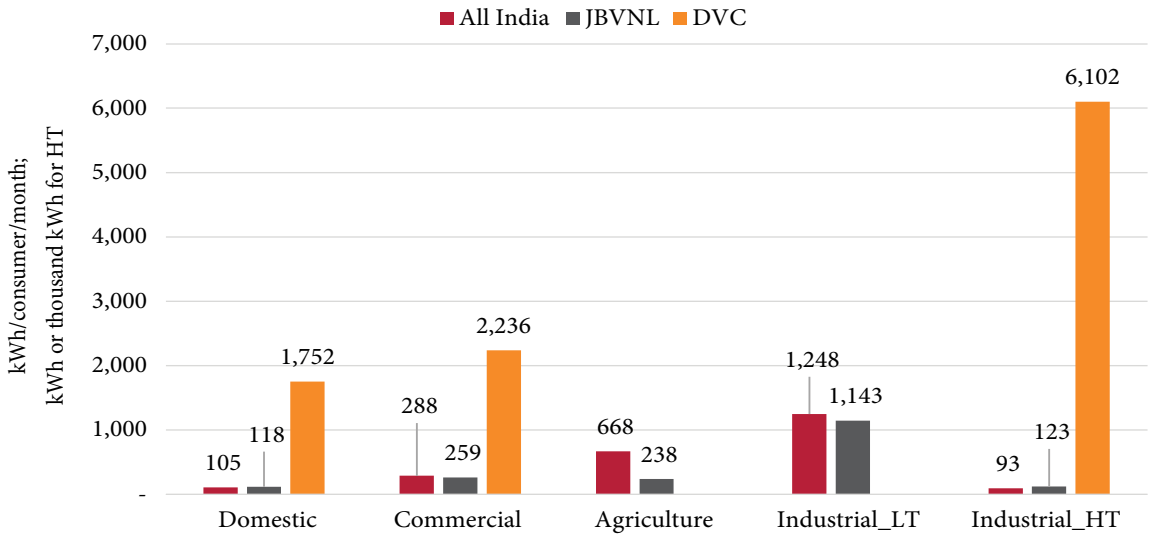
Source: Compiled from different financial year JSERC Tariff Orders.

3.4 Understanding User Skews within Jharkhand and across States

Previous sections show the dominance of domestic and industrial category consumers over Jharkhand's power distribution portfolio. The JBVNL's domestic consumer has a monthly average consumption of 118 kWh, which turns out to be 13 kWh more than the all-India monthly average of 105 kWh, or 12% higher (Figure 9).

For the HT level industrial category consumer, the monthly average of both the public sector DisComs is exceptionally higher than the all India average. This is perhaps because the state has fewer total industrial consumers but many of those are larger scale entities driven by the high mineral resources within the state.

Figure 9: Monthly Average Consumption Category-wise (FY19)



Source: Compiled from Tariff Orders of 61 DisComs using latest approved numbers for FY19.

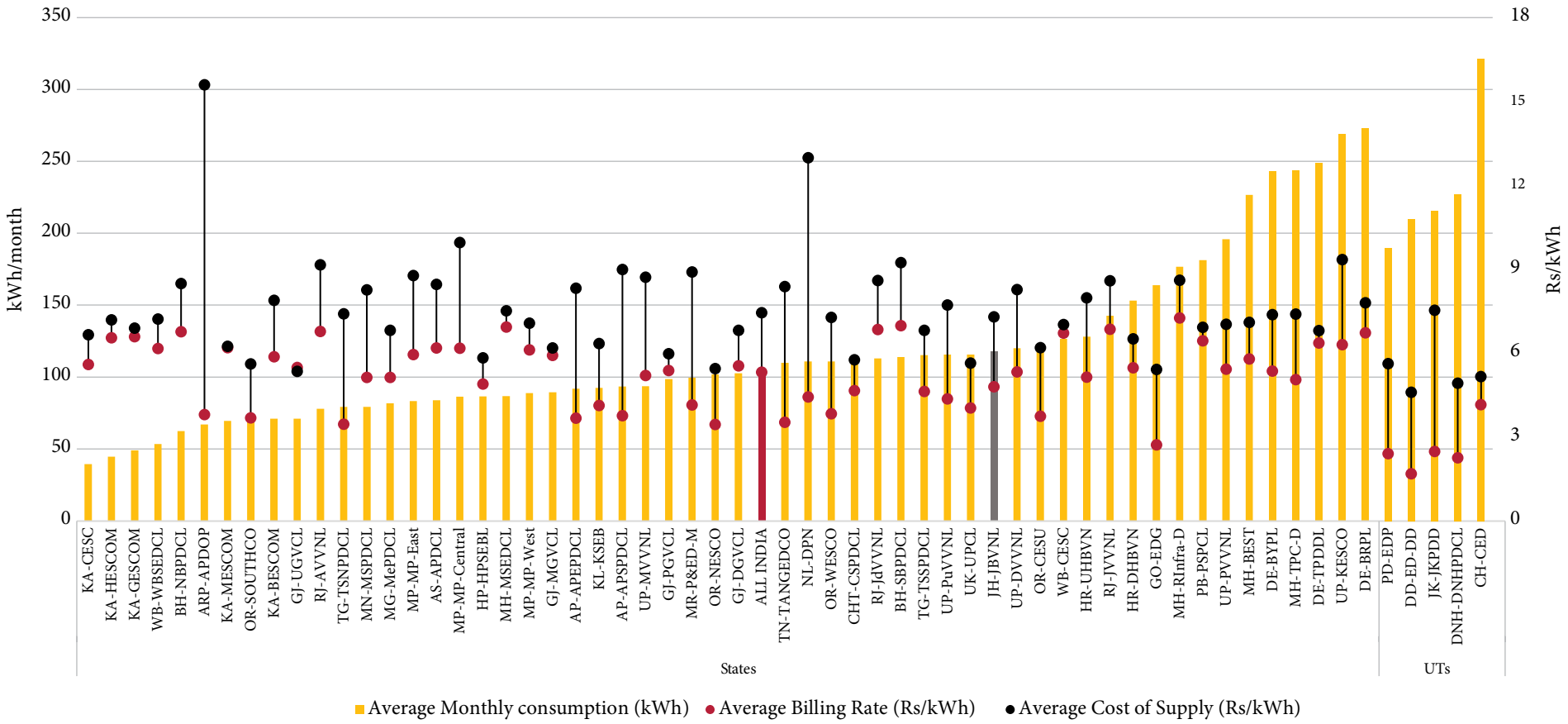
Notes: Industrial HT is on a different scale (thousand kWh/consumer/month).

3.5 Residential Consumers

Residential consumers not only represent a high segment of growth, starting with new connections, but they also are a good indicator of human development. It is beyond the scope of the paper to fully explain the unexpected higher than all India consumption per household, but we examine a few of the issues below.

Figure 10 shows the household consumption across states and how Jharkhand has higher than the average monthly consumption of states such as Karnataka, Gujarat, Uttar Pradesh, Rajasthan, Madhya Pradesh, and Andhra Pradesh. Looking at the DisCom-wise ACoS, or ABR (revenues), there is no clear trend that suggests cheaper power explains the higher average consumption in Jharkhand.

Figure 10: All-India DisCom Domestic Consumer Monthly Average Consumption and Pricing (FY19)



Source: Compiled from Tariff Orders of 61 DisComs using latest approved numbers for FY19 and PFC report released in FY19.

Notes: The dots show the segment ABR and the overall Discom ACoS. Appendix 2 lists the DisComs and Appendix 1, the states. Dark gray represents JBVNL, while maroon (mostly near the centre of the yellow bar that depict states) shows the All-India average. For most states, this shows the domestic consumer for LT only (i.e., individual households); the number of HT residential consumers (e.g., townships or complexes) is very low. Union Territories are separated to the right, and consume far more, because of their urban preponderance. For the small number of DisComs where no bifurcation is available in the Tariff Order, we show the total domestic (predominantly in Jharkhand or Delhi). Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers on existing tariff basis, and revenue from PFC report, are considered for analysis for DVC and JBVNL respectively. Also, as State subsidy data is only available for JBVNL domestic category the same is incorporated in revenues.

Table 3 shows the subsidy for residential consumers by slab (though this is for a different year than our base year, FY19). Residential tariffs shown in Table 4, show how energy charges are no longer progressive by tier (but still rural consumers pay a bit less). The subsidy is directly paid by the State government to JBVNL.

A recent survey conducted under the Global Subsidy Initiative by the International Institute of Sustainable Development (IISD) and Initiative for Sustainable Energy Policy (ISEP) found 11% of surveyed households have 200 kWh or higher monthly consumption. 79% of surveyed households were metered but not all of them were getting bills, suggesting lacunae in billing or in meter reading efficiency (Sharma, Moerenhout, & Aklin, 2020).

Assuming all the almost 90% of consumers below 200 kWh usage block are metered, they will get a State government subsidy of 3.90 Rs/kWh if rural and 2.75 Rs/kWh if urban against an ACoS of 7.30 Rs/kWh. The domestic ABR is lower, and thus about half the residential charges are covered by the State government. The FY19 total subsidy received (Rs 1,250 crore) was lower than what appears to be the expected ask from the State in FY20, based on the subsidy structure and expected units. This represents a large State burden that would only grow as consumption grows per household (all else being equal).

Table 3: Subsidy for JBVNL Domestic Consumers for FY20

Category	Subsidy slab (units)	Subsidy by State govt (Rs)
Kutir Jyoti metered	All units	4.25/kWh
Kutir Jyoti unmetered	–	125/connection
Rural metered	All units	3.90/kWh
Rural unmetered	–	25/connection
Urban metered	0-200 units	2.75/kWh
	201-500 units	2.05 /kWh
	501-800 units	1.85 kWh
	>800 units	1.00 /kWh

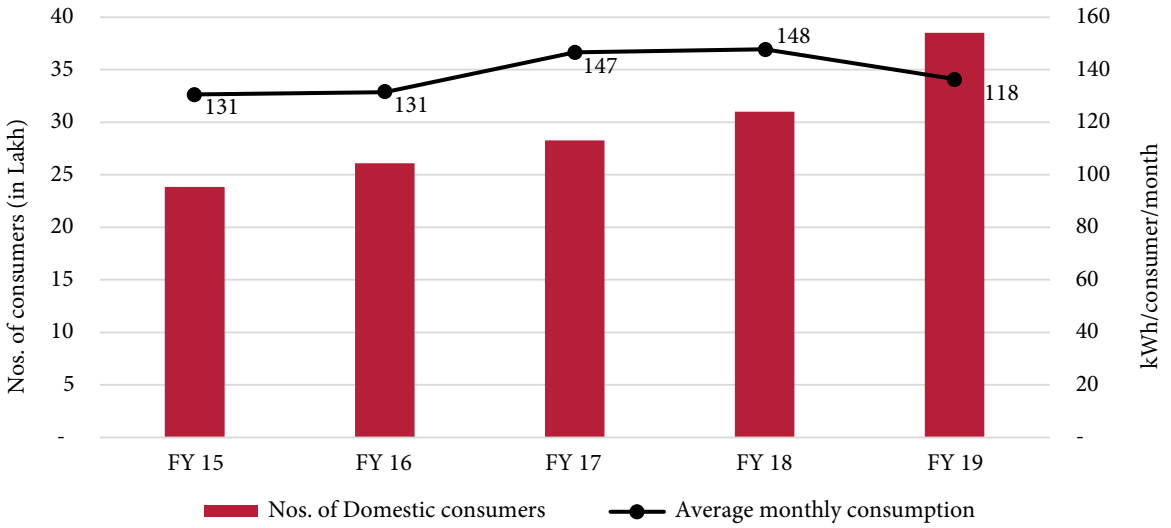
Source: (Sharma, Moerenhout, & Aklin, 2020).

Table 4: Approved Tariff for Domestic Category for FY19

Domestic Consumer Category	Fixed Charges		Energy Charges Rate (Rs/kWh)
	Unit	Rate	
Kutir Jyoti	Rs/Conn/Month	20	4.40
Rural (metered)	Rs/Conn/Month	35	4.75
Rural (unmetered)	Rs/Conn/Month	250	–
Urban	Rs/Conn/Month	75	5.50
HT	Rs/KVA/month	200	5.25

Source: JSERC Tariff Order for FY19.

Figure 11: JBVNL Domestic Consumer Trends



Source: Calculated from JSERC Tariff Orders for various financial years.

4. JBVNL Financials

The consumer mix turns out to be a key issue for DisCom financials. Power prices aren't equal across consumers, with enormous cross-subsidies keeping the system in balance, distinct from State government subsidies. The financial health of DisComs is a major concern across the Indian power sector. As Rajasekhar and Tongia (2020) showed, the picture was stark even before COVID-19, with not just a gap in projected earnings versus costs (book basis), but also enormous failures to achieve book values due to delayed payments, both by consumers and promised subsidies (D. Rajasekhar & Tongia, 2020). This, in turn, is a key factor in DisComs not paying generators for their power purchases. As of March 2019, JBVNL owed Rs 6,968 crore to GenCos; per calculations based on PFC (2020), this translates to 453 days of payables.

We focus only on JBVNL for several reasons in this analysis. The PFC data is used for parts of the analysis and it only has JBVNL revenue and expenses. Additionally, DVC being an integrated utility, profit and loss data for its distribution segment is not readily available.

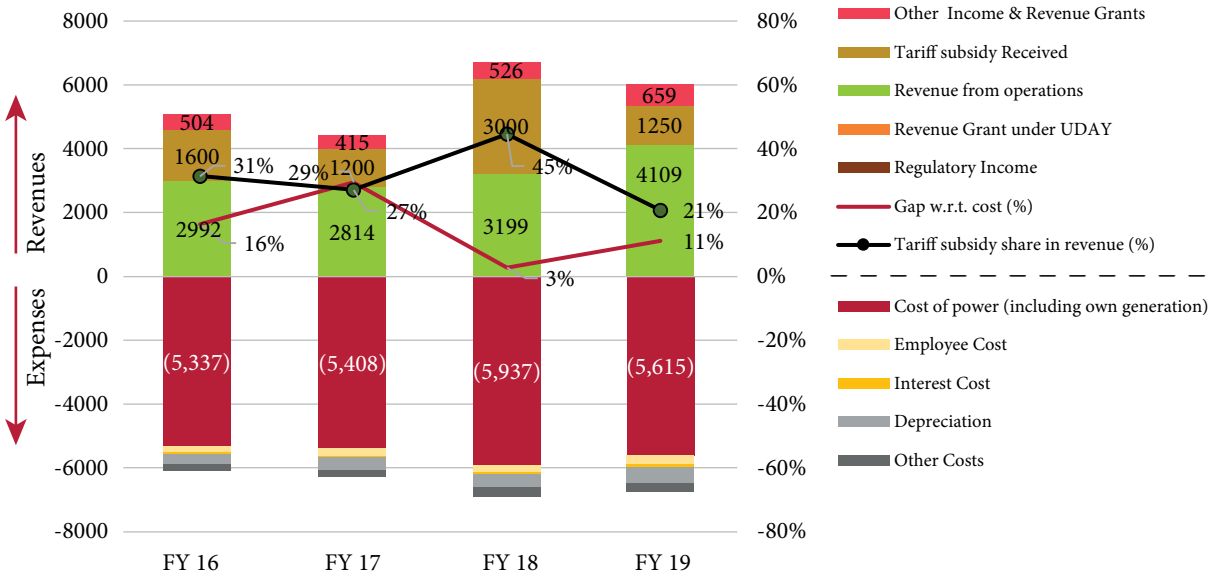
As shown in Figure 12, from FY16 to FY19, JBVNL has been a continuously loss-making entity. On average, about 30% of its revenues are from government subsidies. This is high in percentage share as well as in absolute numbers for an underdeveloped state like Jharkhand to bear. Revenue from operations is not even able to cover the cost of power procurement from generators. However, with a short period of analysis in the figure, the total gap between Total Revenue (revenue from operations tariff subsidy received + regulatory income + revenue grant under Uday + other income & revenue grants) and Total expenses (cost of power + employee cost + interest cost+ depreciation + other costs), appears to be improving.[9]

The real need is to improve DisCom viability. While raising tariffs or reducing AT&C losses are the default answers for many analysts, these have limits in part due to political compulsions upon the former. Tyagi and Tongia (2023) have shown that improving AT&C will only reduce one-third of the expense-revenue gap (cash-basis), excluding other income and grant support, that too including subsidy payments by the State (rather, non-payments) as part of AT&C. Using the same methodology for JBVNL, we found that AT&C improvements will fix only half the expense-revenue gap (cash-basis) (see Appendix 8.3: Cost-Revenue Gap Analysis).

[9] The FY18 sharp reduction in gap to Rs 190 crore may have been due to relatively high government subsidy, as compared to other financial years.

The trendlines of consumer profiles and corresponding revenues prompt the question what happens if the underpaying consumers grow faster than the over-paying? Most of the recent growth in JBVNL's consumer portfolio has been in the domestic category, which only covers 55% per unit cost of supply.

Figure 12: JBVNL Revenues and Expenses (Rs crore)



Source: Compiled from FY19 and FY20 PFC reports on performance of power utilities.

4.1 Subsidies

In theory, regulators are meant to set tariffs at levels that cover all the costs of a DisCom, allowing for a statutory rate of return. State governments are then free to offer subsidies to consumers as they see fit. In most cases this simply reduces the amount due on a consumer's bill, but in a few states the regulators have taken cognisance of the subsidies and set lower tariffs. For multiple reasons, it is better to segregate subsidies and regulator-set tariffs.

One challenge is whether the states actually pay promised subsidies on time. In a recent analysis based on PFC data, a cumulative unpaid subsidy as Rs 89,509 crore is estimated for all Discoms as of FY21 (Devaguptapu & Tongia, 2023), without factoring in carrying costs due to delays in states paying out promised subsidies. Jharkhand is not suffering any such unpaid subsidy dues and JBVNL has realised 100% subsidy. Examining the State budget, the State Energy Department allocated Rs 2,000 crore in FY19 as "Tariff subsidy through JBVNL for consumers" which was 36% of the total Energy Department budget (Financial and Planning Department Jharkhand, 2018). The actual received amounts were Rs 594 crore as "Tariff subsidy through JBVNL for consumers", plus Rs 500 crore as "Regulatory disallowance support to JBVNL as Grant" (Finance and Plainning Department, Jharkhand, 2020).

There was thus a substantial difference. PFC reports show the tariff subsidy booked and received was Rs 1,250 crore, the same amount is accounted as "State government grants" in JBVNL's FY19 financial statements. The difference might have been received under other financial heads of the State budget, and not necessarily as tariff-plus-consumption linked subsidies. Deeper analysis is difficult without more granular and properly allocated budgetary data. It is suggested there should be separate and detailed accounts of subsidies in State and DisCom financials.

While Rs 984 crore, of the Rs 1,250 crore subsidies, was expected to be allocated for domestic consumers, almost every sub-category of households was subsidised (Sharma, Moerenhout, & Aklin, 2020).

While D. Rajasekhar & Tongia (2020) focused on all-India figures of the gap on an operating basis (income being far less than expenses), totalling a shortfall of Rs 61,255 crore in FY2019, the situation is even more precarious when we examine balance sheet issues that bring in dues to lenders and to suppliers (like power generators). Table 5 attempts to capture the same aspects for JBVNL, showing a gap of Rs 750 crore on an operating basis but short-term *net* dues of Rs 11,570 crore owed by JBVNL (which assume receivables are taken in). One difference from many states, is that trade receivables are relatively low in Jharkhand, suggesting the challenge isn't as much one of cash management alone but a fundamental challenge including of tariffs and operating inefficiency.

Table 5: JBVNL DisCom Financials FY19 (operating income statement plus short-term Payables minus Receivables)

Revenue (Rs crore)		Expenses (Rs crore)	
Revenue from operations	4,109	Cost of power (including own generation)	5,615
Tariff subsidy received	1,250	Employee cost	294
Regulatory income	–	Interest cost	68
Revenue grant under UDAY	–	Depreciation	520
Other income & revenue grants	659	Other costs	271
Total Revenue	6,018	Total Expenses	6,768
REVENUES minus EXPENSES	**(750) (losses)**		
Receivables (Rs crore)		**Short-term payables (Rs crore)**	
Regulatory assets	–	Short-term borrowings	10
Trade receivables	3,196	Maturities and interest due on long-term borrowings	428
		Payables for purchase of power and fuel	6,968
		Other Current Liabilities	7,360
	3,196		14,766
Book-basis balance sheet "Deficit" = Short-term payables – Receivables			11,570

Source: Calculated from PFC report on utilities FY19, based on the framework in Rajasekhar and Tongia (2020).

4.2 The More Subtle Problem: Cross-Subsidies

Leaving aside State government subsidies, regulators invariably differentiate tariffs amongst consumers in a manner that is meant to be progressive or keep electricity affordable. There are two sets of such cross-subsidies. First, some segments of consumers overpay—typically the commercial and industrial consumers—to allow for others underpaying. Second, consumption, especially in the residential sector, follows telescopic tiers or slabs that keep prices low for smaller consumers (who are ostensibly poorer consumers). The real challenge becomes when you don't have sufficient "paying customers" to offset under-pricing for others, something that is exceptionally acute for JBVNL.

National policies (Electricity Act 2003, and the National Tariff Policy) dictate that tariffs set by regulators should be "cost-reflective". Specifically, the Tariff Policy set an objective to attain cost reflective tariff with a maximum of ± 20% of cross-subsidy by FY11, achieved in a progressive manner (within three years).

The present cross-subsidy model in Jharkhand does not comply with the rules (Table 6); to be fair, most states also don't comply, as Tyagi and Tongia (2023) show. As discussed, JBVNL has more than 60% electricity kWh sales to domestic consumers who are in the "underpaying category". If Jharkhand's regulators (JSERC) were to simply raise the tariff to the minimum normative level (80% of the ACoS), this would increase JBVNL's revenues by Rs 644 crore (Table 6). However, such a tariff hike would have political implications, one reason much of India doesn't comply with the rule.[10] It's important to note that even bringing the subsidy values within 20%, leaves a net gap post cross-subsidy since we have far few subsidising customers compared to those that need to receive a subsidy. Table 6 shows how tariffs per category fall outside the ±20% limit for cross subsidies.

[10] We focus on aggregate sector-level 20% variations from ACoS, and ignore intra-category cross-subsidies through slabs or tiers.

Table 6: JBVNL Cross-Subsidy Analysis on Basis of Revenue from Energy Sales (FY19)

	As -Is					With hypothetical 20% capping on cross-subsidies			
Category of consumer	ABR (Rs/ kWh)	Post domestic subsidy ABR (Rs/ kWh)	Pre-domestic subisdy ACoS coverage	Post-domestic subsidy ACoS coverage	Tariff under-/ overpricing implication (post tariff-linked subsidy	ABR (Rs/ kWh)	ACoS coverage	Net cross-subsidy value (20% capping) (Rs crore)	Change in revenue (Rs crore)
Domestic*	2.99	4.80	41%	66%	(1,361)	5.84	80%	(795)	566
Commercial/ Non-domestic	6.11	6.11	84%	84%	(88)	6.11	84%	(88)	0
Irrigation & Agricultural/ IAS*	1.73	1.73	24%	24%	(118)	5.84	80%	(26)	91
Industrial LT/ LTIS	10.31	10.31	141%	141%	65	8.76	120%	31	(33)
Industrial HT/ HTSS/ EHT	7.24	7.24	99%	99%	(14)	7.24	99%	(14)	0
IS-I: Public Lighting/ SS	4.86	4.86	67%	67%	(61)	5.84	80%	(36)	24
IS-II: RTS, MES	6.61	6.61	91%	91%	(8)	6.61	91%	(8)	0
JBVNL ABR	4.11	5.60	56%	69%					
				Shortfall: (Rs crore)	(1,584)			(936)	
Adding other-than-domestic subsidy: JBVNL ABR (including Tariff Subsidy for category other than Domestic) (Rs 266 crore)		5.89			(1,318)				
Adding non-tariff "revenue support": JBVNL ABR (including other Revenue support) (Rs 659 crore)		6.60			(659)				
						Net Revenue Change (In Rs crore)			644

Source: Calculated based on JSERC Tariff Order FY19 and PFC report FY20; the latter is ex-post.

Notes: LTIS = Low tension industry supply; HTSS = High tension special service; EHT = Extra high tension, SS = Streetlight service; RTS = Railway traction services; MES = Military Engineer Services. Only categories outside 20% limits would see a change (rise or fall in tariffs). We see overpayment by industrial consumers would be modest in aggregate since the volume is low. For reference, the ACoS is 7.30 Rs/kWh. Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, as the State subsidy data is only available for JBVNL Domestic category the same is incorporated in revenues.

**Energy sales and revenue numbers are from PFC data released in FY20.*

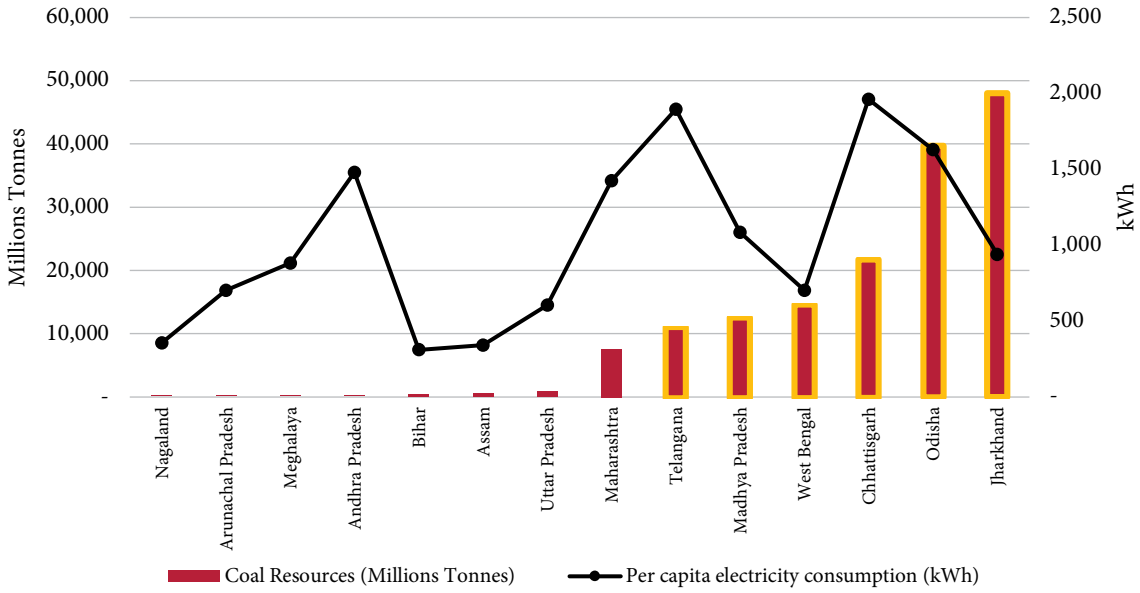
5. Understanding JBVNL in Context

While Jharkhand is an underdeveloped state, it isn't the only such state in India. We examine states that may be considered peers to see if the consumer mix and financial impact on the DisCom is unique for JBVNL. An underlying question for this section is whether Jharkhand is unique within India. For electricity, is any skew because of it being an outlier in development (if at all) or because of other reasons?

5.1 Jharkhand vis-à-vis Similar States

While GDP offers one lens against which to compare states, we also use coal reserves to determine peers for comparing with Jharkhand. The yellow states are coal rich, with 10,000 million tonnes or more proven coal resources (Figure 13). Jharkhand holds the highest coal reserves in India. We observe that the per-capita electricity consumption is not well correlated with coal reserves.

Figure 13: State-Wise Coal Resources (March 2019)



Source: Coal Controller's Organisation (2020) and Central Electricity Authority (FY19).

Notes: The figures are based on only proven coal resources and exclude lignite.

5.1.1 Quality of Power Supply

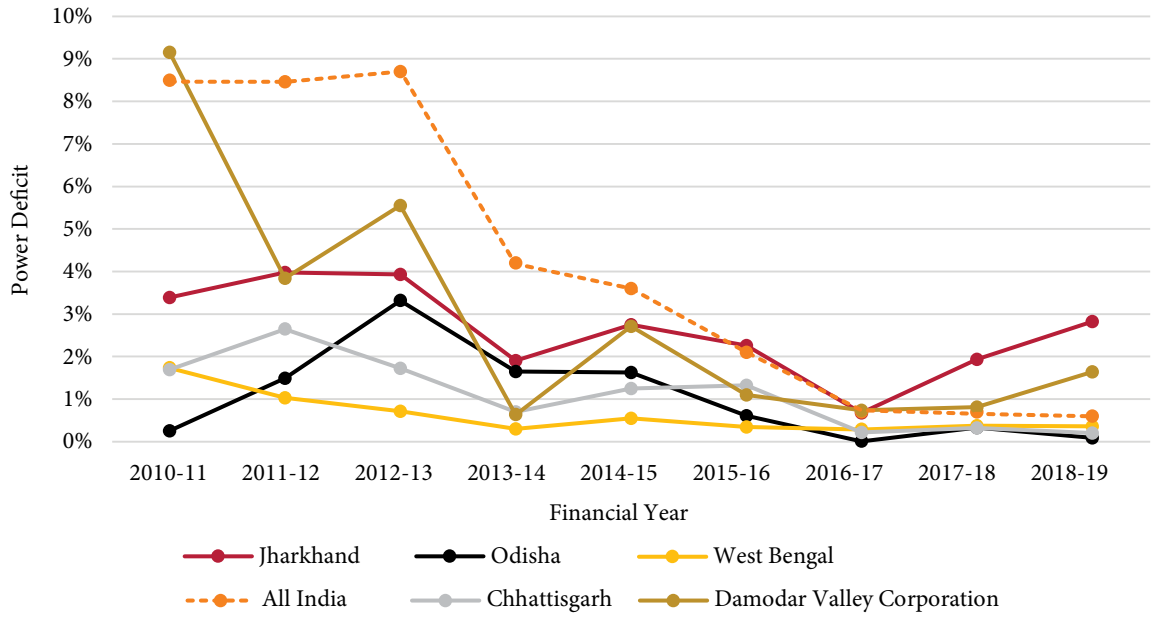
Given household "electrification" is officially complete, quality of power supply is a key focus area. In addition to being important for consumers, it is a good proxy for financial health and (mis) management of the DisCom. It also costs money for the DisCom to bridge the supply gap.

While all states are mandated to focus on key performance indicators (KPIs) like outages, one challenge is that traditional measures like SAIDI—the System Average Interruption Duration Index—exclude load-shedding, because these are technically not a fault. Thus, we have limited accurate data on the true power supply position in states. This is before considering latent demand.

The official measures for shortfall of power are captured in the government's Load Generation Balance Report (LGBR) by Central Electricity Authority (CEA). However, these are based on voluntary reporting by states, and are based on "as reported" instead of measured or instrumented data, with a range of other assumptions that likely understate the shortfall (Tongia, 2014).

While the eastern region of India, which includes populous states like Bihar and West Bengal, is one of the poor performing parts of India in terms of shortfall, timeseries data from LGBR reports show that even within this pool Jharkhand has performed worse than others. All other states had a shortage under 1%, but for JBVNL the shortfall in FY19 was reported as 2.83%. At the start of the decade, JBVNL was better than the all-India average (albeit with poor household level electrification). However, all other states improved, but Jharkhand didn't improve as much. In fact, there was only one intermediate year (FY17) where the supply shortfall as reported was under 1%.

Figure 14: Power Deficit Trend (selected states) – Actual Performance



Source: Load Generation Balance Report, CEA.

Notes: Jharkhand only represents the JBVNL region, while DVC represents whole command area (West Bengal + Jharkhand).

Surveys suggest the true picture is far worse than official data, with obvious negative human impacts. As per one study, most households experienced power outages for almost nine hours a day, and 13% of the state's population to remain outside formal power supply at all (Vallecha & Aklin, 2020). Fixing this problem would have direct financial implications. Not only would supply procurement costs go up as purchasing peak electricity is higher cost than average, but the state would also likely require measurable investment in infrastructure to improve delivery of power.

5.1.2 Consumer Mix and Implications Compared

Table 7 shows that Industrial consumers per millions population is lower in Jharkhand than other coal-rich or eastern region states, more so when we look at LT industry (a key indicator for job creation). Looking from another aspect— state-level monthly average consumption per consumer— Jharkhand seems to have consumers both at LT and HT level, but this is only because most of this comes from DVC. JBVNL is dramatically low in this regard (see Table 2).

Table 7: Industries and Consumers in Similar State for FY19

	Industrial consumers per million population		Monthly average consumption (kWh)	
State/ voltage level	LT level	HT level	LT level	HT level
Bihar	512	23	965	83,314
Chhattisgarh	1,195	97	1,360	2,34,421
Jharkhand	419	47	1,143	6,12,420
Odisha	509	68	1,044	1,50,501
Telangana	1,667	182	1,427	1,16,291
West Bengal	1,766	37	1,088	1,98,405

Source: Calculated using data compiled from respective state DisComs Tariff Orders for FY19.

Notes: The state data for Jharkhand are misleading given most industrial consumption is with DVC. Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, as the State subsidy data is only available for JBVNL domestic category the same is incorporated in revenues.

In addition to consumer mix, costs of coverage in JBVNL are the lowest amongst this group at a DisCom level. This indicates the regulator will have to raise electricity tariffs not merely because of the requirement to be within 20% limit for cross-subsidies.

Table 8: State ABR and ACoS Coverages

States	DISCOMs	Average Billing Rate (Rs/kWh)						ACoS (Rs/kWh)	Average Cost of Supply coverage (%)					
		Domestic	Commercial	Others	Agriculture	Industrial	DisCom ABR		Domestic	Commercial	Others	Agriculture	Industrial	DisCom ABR
Bihar	BH-SBPDCL	6.98	8.71	8.14	6.86	7.64	7.37	9.23	76%	94%	88%	74%	83%	80%
	BH-NBPDCL	6.76	8.57	6.34	7.01	8.39	7.03	8.49	80%	101%	75%	83%	99%	83%
Chhattisgarh	CHT-CSPDCL	4.66	8.55	6.14	5.10	7.52	6.20	5.76	81%	148%	107%	89%	131%	108%
Jharkhand	JH-JBVNL	4.80*	6.11	5.43	1.73*	7.49	5.07	7.30	66%	84%	74%	24%	103%	77%
	JH-DVC	2.62	6.01	3.47	–	5.32	5.19	4.59	58%	131%	76%	–	113%	113%
Odisha	OR-NESCO	3.46	6.41	6.10	1.74	5.83	4.82	5.45	63%	118%	112%	32%	107%	89%
	OR-SOUTHCO	3.69	7.40	6.62	1.77	6.05	4.64	5.61	66%	132%	118%	31%	108%	83%
	OR-WESCO	3.84	6.74	6.17	1.70	6.37	5.23	7.28	53%	93%	85%	23%	87%	72%
	OR-CESU	3.76	6.52	6.11	2.45	6.38	4.95	6.19	61%	105%	99%	40%	103%	80%
West Bengal	WB-WBSEDCL	6.17	8.44	7.99	4.62	7.68	7.05	7.22	85%	117%	111%	64%	106%	98%
	WB-CESC	6.73	8.30	7.46	–	7.38	7.27	7.02	96%	118%	106%	–	105%	104%
Telangana	TG-TSSPDCL	4.67	10.01	8.80	2.42	7.85	5.72	6.81	69%	147%	129%	35%	115%	84%
	TG-TSNPDCL	3.60	9.76	7.19	6.02	7.78	5.99	7.40	49%	132%	97%	81%	105%	81%

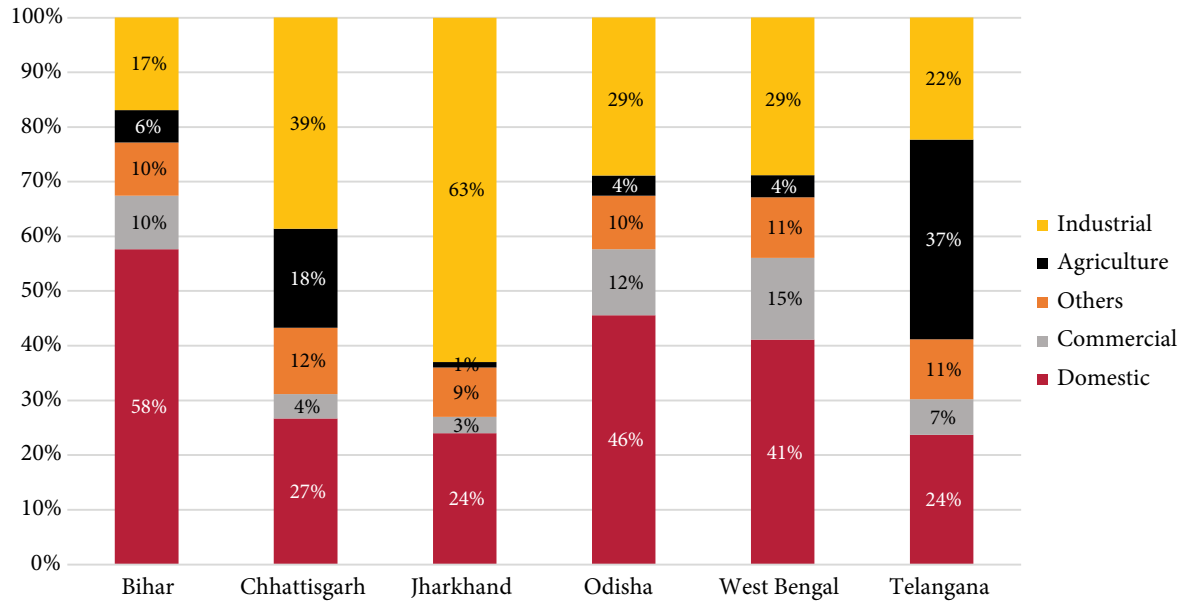
Source: Calculated using data Compiled from respective state DisComs Tariff Orders for FY19.

Notes: The colour codes indicate (non)compliance with the ±20% limit for cross-subsidies. (Green = compliance, Red = Non-compliance). DVC has no agricultural consumers. Category-wise revenue from consumers on approved tariff basis is not available in JSERC Tariff Order for FY19. Thus, category-wise revenues from consumers calculated for FY19 energy sales on FY18 tariff basis are considered for analysis. Also, as the State subsidy data is only available for JBVNL domestic category the same is incorporated in revenues.

** Energy sales and revenue numbers are from PFC data.*

While changing the consumer mix is ostensibly not in the hands of the utility, the differences across states (Figure 15) hint at some changes that may occur over time. With greater development, the commercial load should increase, which would help revenues, but agriculture could also increase dramatically. The increase in overpayments from commercial would be dwarfed by the potential need for cross-subsidies or subsidies for agriculture, which has a pre-subsidy tariff shortfall of 5.57 Rs/kWh (or almost 76% of ACoS for JBVNL; see Table 6).

Figure 15: State Share of Category-Wise Energy Sales



Source: Compiled from respective state DisComs' Tariff Orders for FY19.

Notes: JBVNL data for domestic and agriculture categories are taken from PFC Report FY20.

Before we can make any estimates of how much agriculture might grow, we need to understand the current status. Unfortunately, scarcity of reliable data is a problem for consumers in the Agriculture category. Official data available from CEA doesn't match PFC data, and tariff orders are also different. The CEA data on pumpsets energised may not be accurate but it is the best available. What we can definitively say, even if the numbers are inaccurate or outdated, is that the agricultural consumption in Jharkhand might grow by multiple times based on the relatively low share of pumpsets per capita. This remains true even if we normalize for water table depths, e.g, based on Central Groundwater Board (2020) data. West Bengal and Bihar offer a more comparable data point, instead of Telangana, a much drier region.

Table 9: Pumpsets Energised (in thousands)

States/UTs	2013	2014	2015	2016	2017	2017 Pumpsets per 100 population
Bihar	278	283	283	286	286	0.24
Jharkhand	9	9	9	9	9	0.03
Chhattisgarh	282	282	282	350	376	1.31
Odisha	77	77	77	77	78	0.18
Telangana	–	–	–	1,671	1,784	5.10
West Bengal	116	116	116	243	285	0.29
All India	18,859	19,107	19,107	20,434	20,776	1.56

Source: The number of pumpsets is compiled from CEA's Annual Pumpset Energising Report. Pumpset per 100 population is calculated using data from the Directorate of Economics & Statistics of respective State governments.

6. Discussion and Recommendations

6.1 The Present Equilibrium Leaves a Huge Financial Gap

While our analysis focused on FY19, a pre-COVID era, it is unlikely the fundamentals would have shifted much in the last few years. The key issue remains the legacy consumer and pricing mix.

Though JBVNL covers the overwhelming majority of households in the state, its finances are precarious at best, relying on measurable formal subsidies as well as delays in payments to suppliers. These factors are visible in the books but punt the problem temporarily to manage cash flows. *Critically, it is unclear whether the growth in so-termed paying customers (especially commercial) would grow faster than growth of consumption in the underpaying sectors of agriculture and households*. This is one reason JBVNL is unlikely to be able to rely on the typical equilibrium of overpaying versus underpaying consumers (cross-subsidies) as other states do.

While the regulator has a key role to play in setting tariffs, with a need to increase tariffs to cover costs, the DisCom also must reduce AT&C losses from FY19's 28.6% (PFC, 2020).[11] However, there is a significant chance that neither of these can be achieved realistically or fast enough to offset the burden of the consumer mix. This is before considering the need to raise tariffs for some segments simply to comply with national policy on capping cross-subsidies and if that is politically difficult or even socially challenging, any increase in tariffs for lower-end consumers could simply result in an increased offset through direct subsidies.

It is premature to speculate on consumption by households, but at a qualitative trend level there are indications that not only will the average consumption be modest for newly electrified homes, but they will also be the most challenging consumers for the DisCom, expensive to collect monthly billing from as well as expensive to serve at a technical level (due to the high fixed costs and relatively low consumption). This is before making any predictions over regularity of paying their bills. As a harbinger of challenges, the Uttar Pradesh Electricity Regulatory Commission (UPERC) Chairman issued a series of tweets highlighting how more than 38% of consumers have never paid their bills, mostly correlated with rural consumers (Shah & Chauhan, 2020).

[11] As per the latest PFC report on utility performance, the AT&C trend for JBVNL has worsened. In FY22, JBVNL's reported AT&C loss was 33.79%, which was 5.19% higher than in FY19.

Is it possible that the average monthly household consumption figure is inflated? There is certainly a pressure to keep AT&C losses low, and one traditional mechanism has been to inflate consumption in selected categories. In most states that has been under the guise of agriculture which is disproportionately unmetered and therefore assumption based (MERC, 2020) but in Jharkhand agricultural consumption is very low. High consumption (on paper) by a category doesn't always translate into high burdens upon such consumers, since the state can also have high subsidies to offset. A number of homes may also be operating small-scale commercial or industrial operations. The only mechanism to improve this discrepancy in data is enforcement of greater transparency including across detailed underlying assumptions, including, e.g., how many consumers are billed on actual versus estimated meter readings.

6.2 Options Towards a Viable JBVNL

The legacy structure of consumer mix between JBVNL and DVC is a fundamental structural challenge facing JBVNL. There can be multiple ways to overcome this challenge, either structural or regulatory, but these rely on changing the underlying fundamental consumer + financials mix.

The main options include:

1. Merging JBVNL's and DVC's Jharkhand distribution business (physical transfers)
2. Creating a state pooling mechanism for financial transfers into JBVNL (financial transfers)

6.2.1 JBVNL Can Take Over DVC's Distribution Business within Jharkhand?

A merger or restructuring is the most long-term sustainable solution for the issue of consumer-mix disproportionality between JBVNL and DVC. Such a merger needs a consensus between the Centre and relevant State (Jharkhand and West Bengal) governments.

Most states in India have unbundled the three core functions, viz., generation, transmission, and distribution, so there is a rationale for DVC relinquishing distribution. However, at best this will be a drawn-out process considering the time taken to resolve the past disputes between JBVNL (erstwhile JSEB) and DVC, just for power purchase payments. In many cases it took years to resolve, and that too after the intervention of Appellate Tribunal for Electricity (APTEL).[12] While tariffs are one issue, JBVNL's performance is another. The billing inefficiency, a subset of AT&C losses that measures technical losses, is expected to remain higher than the targets set by regulator because of the wide gap (starting point), which will lead to consistent business losses for some time.

Another issue is that any such restructuring requires JBVNL to buy the distribution assets of DVC. This is unlikely without fiscal support from the Centre or the State, given JBVNL's consistent cash shortfall from FY16 to FY19 (Figure 12) and its Rs 11,570 crore balance sheet deficit as on FY19 (Table 5).

The State could perhaps provide financial support to JBVNL to take over DVC's Jharkhand electricity distribution business if it felt this would lead to long-term improvements. As the State is already a shareholder in both the entities, financial support can be provided in the form of an equity infusion or a mix of equity plus debt. The latter might increase the long-term debt for JBVNL but would likely be manageable given the rich consumer portfolio they'd acquire.

[12] The Appellate Tribunal for Electricity is a quasi-judicial body. It hears appeals against the orders of CERC and SERCs under the provisions of the Electricity Act, 2003.

Another option is the separation of carriage, and content for DVC. Content refers to DVC's retail business: the procurement of power; and revenue recovery from the end-consumers. With the retail business being handed over to JBVNL, DVC will continue to run the distribution network infrastructure by levying a regulated wheeling charge to JBVNL on a usage basis. This would meet JBVNL's financial requirements to a large extent, thus slashing its need for outside fiscal support to a great degree.

6.2.2 Fixing The Legacy Impact: Blending Coverage of Consumers?

We've seen how revenues of DVC and JBVNL are substantially different. Their expenses are measurably different too. While the power procurement costs are relatively similar for both at the level of average power procurement cost (APPC), the per-unit-sold cost that is paid for generation is vastly different because JBVNL has enormous AT&C losses, necessitating the purchase of additional units from generators to meet a given demand.

As a thought exercise, what if we blended DVC with JBVNL in terms of consumer mix? This would give JBVNL sustainable revenue support and lower the dependency on State subsidies. Is this fair? The JBVNL's 28.60% AT&C losses are not just because of the HT-deficient consumer mix but also due to JBVNL's performance issues. This suggests a two-stage solution where first JBVNL must improve its performance and then we add-in some portion of socialisation (cross-subsidies) via DVC, perhaps through a cross-subsidy surcharge or pooling mechanism. This is justifiable as the technical (benchmark) losses for bulk consumers (DVC) will always be lower than for retail (that too rural) consumers (JBVNL).

An important question is whether 15% AT&C losses is an appropriate target?

The first reality is simply one of practicality—DisComs that are worse off would need more time to reach a 15% target (which may further tighten over time). But given legacy disadvantages from high domestic (predominately LT) share in energy sales, with low HT or industrial consumption, is 15% appropriate even as a medium-term target?

Aggregate technical and commercial (AT&C) losses are composite, capturing both leakage (non-billing—which itself encompasses both theft and technical losses; and non-collection after billing—which encompasses non-payment by consumers and also any non-payment of promised subsidies by the State).

Table 10 sheds some light on AT&C losses for JBVNL, comparing the present versus JBVNL hypothetically matching: the all-India FY19 average performance, and targets under UDAY. It's important to recognise that a particular AT&C target, say, 22%, can be met through multiple combinations—we assume a particular billing and collection efficiency as shown. If one improves billing efficiency only, one saves on the quantum of power needed to be procured. This lowers expenses. In contrast, collection efficiency improves incoming cash flows.

Table 10: Performance Calculation for Improving JBVNL Efficiency (FY19)

	JBVNL present	Efficient JBVNL (~matching all-India FY19)	UDAY JBVNL (matching targets)
Net energy sale (MU)	9,187	9,187	9,187
AT&C	28.60%	22.03%	15.00%
Collection efficiency	92.59%	93.47%	100.00%
Billing efficiency	77%	83%	85%
Input energy (net power purchased)	11,914	11,013	10,808
Gross input energy (transmission losses @ 7.36%)	12,861	11,888	11,667
APPC (Rs/kWh)	4.37	4.37	4.37
Cost of power (Rs crore)	5,620	5,195	5,098
Savings per unit sold (Rs/kWh) from reduced power procurement	–	0.46	0.57

Source: Authors' analysis based on PFC data for FY19.

Notes: AT&C is a combination of two parameters: billing efficiency and collection efficiency. We use estimates for present collection efficiency as per PFC data, but do not know the assumed collection efficiency under UDAY; we assume it to be 100%. "Efficient JBVNL" roughly matches all-India parameters. The savings shown in the last row are on the cost side, and thus agnostic of collection improvements.

Further, an efficient JBVNL can be used to calibrate surcharges for DVC consumers on paper. As per Tariff Orders, the two DisComs have a similar ABR, just that one makes money, and the other loses money! For FY19, the ABR for JBVNL was only Rs 5.60/kWh, per PFC reporting, which are *ex-post* numbers.[13] Tariff Order (*ex-ante*) based calculations show similarity between JBVNL and DVC, though *ex-post* data through PFC are not available for DVC's distribution business.

Given the paucity of "paying customers" today under JBVNL, what if the State had a pooled structure for cross-subsidies, including DVC (limited to DVC's distribution operations in Jharkhand)? Table 11 shows calculations for combining the two. Here, we make a few assumptions about DVC since it is an integrated utility (and is able to directly ship power to its bulk consumers, with its own "transmission lines"). Specifically, we assume AT&C losses are only at the medium or low voltage level like with most DisComs, and higher voltage losses are classified as transmission losses.

[13] The ABR value in Figure 7 is slightly different as it is calculated based on the FY19 Tariff Order.

Table 11: Performance Calculations for Combining JBVNL and DVC in Jharkhand (FY19)

	Efficient JBVNL (achieving all-India present performance)	DVC	Blended (JBVNL and DVC)
Energy sale (MU)	9,187	11,432	20,619
AT&C	22.03%	0%	10.1%
Collection efficiency	93.47%	100%	97%
Billing efficiency	83.42%	100.00%	93%
Input energy (net power purchased)	11,013	11,432	22,445
Transmission losses	7.36%	3.00%	5.2%
Gross power purchased (MUs)	11,887	11,786	23,673
Cost of power (Rs crore)	5,195	5,236	10,431
Cost of power (Rs/kWh) on sales basis	5.65	4.58	5.06
Avg. power procurement cost (APPC) (Rs/kWh)	4.37	4.44	4.41
All other costs (Rs/kWh)	1.24	0.01	0.56
ACoS (Rs/kWh)	6.89	4.59	5.62

Source: Calculated using PFC's FY19 report on performance of utilities and JSERC Tariff Orders for the two DisComs.

Notes: We assume billing and collection efficiency for DVC is 100%, and all losses are at a transmission level, instead of AT&C level (assumptions shown in red, and yellow boxes are figures as calculated by authors). Other costs are also back-calculated (estimated) for consumer-facing activities and are very low. Even the average power procurement cost (APPC) is closer than the arithmetic suggests given DVC's costs are for an integrated entity, likely with lower costs than JVBNL pays to the state transmission company (JUSNL). The numbers here match official data within the limits of rounding errors.

As a benchmark, the study by Tyagi and Tongia (2023) on cross-subsidies across India showed that selected category consumers (most of industrial, and almost all of commercial) overpay. In aggregate, such overpaying consumers overpay 7% of total revenues, despite consuming only 32% of units, because their overpayment is more than 18% on a per unit basis. Table 12 shows that the blended calculations fall very closely in sync with the all-India average figures.

Table 12: Cross-Subsidy Case for Jharkhand (FY19)

	Total subsidising units (MUs)	Total overpayment (Rs crore)	Overpayment per subsidising unit (Rs/ kWh)	Overpayment per subsidising unit (as % of ACoS)	Subsidising units share in total units sold	Overpayment share in total revenue
All India	281,899	37,597	1.33	17.9%	32.5%	7.0%
JBVNL	215	65	3.02	41.4%	2.3%	1.2%
DVC	10,629	776	0.73	15.9%	93.0%	13.1%
Combined JBVNL and DVC	5,526	716	1.30	23.1%	26.56%	6.4%

Source: All-India and JBVNL volumes and Costs are based on the PFC Report on Utilities released in FY20, DVC is calculated from respective Tariff Orders (FY19, except DVC ACoS 4.59 Rs/ kWh, which was FY19 True-up section from Tariff order FY21).

Notes: Overpayment is relative to respective ACoS, or combined ACoS for the last row. Combined JBVNL and DVC is a synthetic calculation. While the volume of overpaying customers in the combined JBVNL and DVC is high compared to All-India, the rate at which they overpay is modest, thus leaving a lower aggregate overpayment in rupee terms.

Combined cross-subsidy planning could be achieved via state-level financial pooling instruments. What this shows is that if we allowed for combined cross-subsidies, the net under-recovery for JBVNL would decrease measurably, despite the aggregate JBVNL + DVC's overpayment fraction of 6.4% in rupee terms being similar to the all-India average of 7% (Table 12).

What would blending on paper do, even if mandated by the regulator? All we're doing is blending some numbers that are a mix of over and under—why would the total change? The reason is that for a blended entity, the tariffs and cost allocations would also need to shift. Some of the profitability of DVC would compensate the inherent losses of JBVNL, and one may also require a revision in tariffs. To manage the blended AT&C figures, DVC tariffs would need to rise slightly, all else being equal. In contrast, JBVNL tariffs wouldn't fall pro-rata, since this would simply reduce the gap, instead of being a one-is-to-one offset.

The disparity is heightened on the cost side as well. The DVC has a lower ACoS, partly due to superior performance (lower AT&C losses). The cost paid to generators doesn't appear to be very different (estimated via back-calculation) but there are two measurable differences between JBVNL and DVC. First, operating costs and infrastructure costs are vastly different—the number of consumers served is more than 2,000 times different! The AT&C losses also differ. While JBVNL had about 7.4% as collection losses, of the remaining portion of its 28.6% AT&C losses, a measurable fraction would be technical losses. In contrast, calculations based on DVC's annual reports and tariff orders indicate about 3% losses, which we partition in Table 11 as transmission losses instead of distribution losses. In comparison, their operating expenses are negligible, which are the benefits of a favourable bulk-supply consumer mix leading to low AT&C losses. If we blended the two together, the aggregate AT&C losses would have been about 10.1% (see Table 10), a figure much lower than the all-India figure, which is over 20%, thanks to the disproportionally high share of very large industrial users (Figure 15).

This gets to the heart of the larger policy issue—what level of blending is fair or appropriate? National data show expected heterogeneity across states in financial health and consumer mix. But Jharkhand (JBVNL) is exceptionally extreme, more so when we exclude "outliers" of urban states and UTs which are both small in coverage and also "better off" in their deviation from the average in terms of national averages.

A good analogy to think through would be the recommendation in some quarters to combine "bad banks" with "good banks". At first blush, this looks like the equivalent of a simple cross-subsidy, or blending of costs and margins. But the more subtle question becomes what makes a bank (or other entity) "good" versus "bad." Just because we have (say) 1% returns for one and 20% returns for another, doesn't mean that the former is a bad operator, with bad management. They may simply have a bad consumer mix (highest costs to serve, highest risk, etc.). Given we don't have the metric in force to apply risk-adjusted returns for a DisCom, cost-structure adjusted pricing is a close alternative. And when we examine cohorts (peers), the data indicate that JBVNL is poor more for legacy reasons outside its control, even after factoring in high AT&C losses that only explain part of its losses.

How would we achieve blending, whether at a corporate level or simply at a tariff-setting level? This requires deep discussion amongst stakeholders. The latter can also be addressed by incorporating an amendment in the JSERC (Operation of Parallel Licensees) Regulations, 2019. A provision of a special surcharge for such consumer-mix imbalance can help to transfer social-welfare support from DVC consumers to JBVNL consumers. The first step for a regulator is to take cognisance of distortions before soliciting remedies for the same. The DisComs can only ask for limited changes via tariff petitions, but the frameworks under which they propose an Aggregate Revenue Requirement (ARR) is determined by the regulator, who in turn operates within policy guidelines set by the government. Regulators can also take note of some factors *suo moto*, even if not petitioned by the utilities.

The State would have to investigate the right instruments to make any such pooling occur. The DVC is multi-stakeholder Central PSU, where West Bengal is also a shareholder as an owner. This suggests a dramatic restructuring is difficult in the short run. What might be more feasible is a State-centric cross-subsidy levy that could be imposed upon DVC to pay for JBVNL (the same may even be considered for the three urban DisComs, but the impact on JBVNL will be minimal due to their low volumes).

6.2.3 Compensatory Shifts in Electricity Duty?

If a pooling mechanism is deemed infeasible, the State can also consider a revision in electricity duty structure to raise funds from the relevant consumer categories. Electricity duties are outside regulator purview and vary enormously across India; electricity is not within the ambit of GST. The duty structure today already differentiates between categories of consumers (and the tariffs distinguish between rural and urban) so it's not unreasonable to examine the impact of further changes. They are simply instruments for social welfare transfer, just like we have subsidies by the State.

A differential electricity duty (ED) mechanism is already followed by the Government of Jharkhand. Considering each consumer category's median ED rate across India as a benchmark, ED rates applicable for Jharkhand industrial consumers are generously low (Table 13). The domestic consumer's ED rate is at par with to All India whereas for Industrial users it is only 1% for all sub-category (different voltage levels) users compared to the all-India median rate of 5%-8% (varying at different voltage levels) as per our compilation from CEA Electricity Duty data (CEA, 2018).

A simple calculation of GoJ revenue from a hypothetical Jharkhand ED rate revision to the Median of all-India ED rates is shown in Table 13. As estimated from the ED rates and ABR, the existing revenue from Electricity Duty is Rs. 203 Cr. With such a revision, this would increase to Rs. 708 Cr., a rise of Rs. 505 Cr.

Any increase in ED, by definition, could impact consumer bills, but the impact would predominantly be on industrial and larger users, more so DVC's large industrial consumers, who would naturally resist such a hike. But such an increase, merely to match India's median rate, is modest and could be viewed simply as an alternative to changes in tariffs (and are similarly a social-welfare redistribution instrument).

Table 13 Revenue Calculation from Electricity Duty (FY19)

		As-Is					Aligning with all India				
DISCOM	Category of consumer	ABR (Rs / kWh)	ACoS (Rs./ kWh)	ED Rate	ED/ unit	Revenue from ED (in Rs crore)	Median of All-India ED Rates	New Electricity Duty (ED) / unit	Revenue from revised ED (in Rs crore)	Median of all-India ED per unit	Average impact on consumer monthly bill (Rs)
JBVNL	**Domestic***	4.80	7.30	4.00%	0.19	104.47	4.00%	0.19	104.47	0.21	–
	Commercial/ Non-domestic	6.11	7.30	5.00%	0.31	22.53	5.00%	0.31	22.53	0.47	–
	Irrigation & Agricultural*	1.73	7.30	0.00%	0.00	0.00	0.00%	0.00	0.00	0.00	–
	Industrial LT /LTIS	10.31	7.30	1.00%	0.10	2.22	5.00%	0.52	11.09	0.34	472
	Industrial HT/ HTSS/ EHT	7.24	7.30	1.00%	0.07	17.31	7.00%	0.51	121.20	0.46	53,273
	IS-I: Public Lighting/SS	4.86	7.30	0.00%	0.00	0.00	0.00%	0.00	0.00	0.00	–
	IS-II: RTS, MES	6.61	7.30	2.00%	0.13	1.57	0.00%	0.00	0.00	0.00	-1,63,938
DVC	LT (Domestic)	2.62	4.59	4.00%	0.10	0.28	4.00%	0.10	0.28	0.21	–
	LT (Commercial)	6.01	4.59	5.00%	0.30	0.37	5.00%	0.30	0.37	0.47	–
	33 kV	5.02	4.59	1.00%	0.05	41.23	8.00%	0.40	329.83	0.46	17,94,761
	132 kV	6.49	4.59	1.00%	0.06	13.32	8.00%	0.52	106.56	0.43	86,33,007
	132 kV Traction	3.47	4.59	0.00%	0.00	0.00	0.00%	0.00	0.00	0.00	–
	220 kV	5.35	4.59	0.00%	0.00	0.00	6.00%	0.32	11.52	0.45	48,01,401
				Total Amount:		**203.00**			**708.00**		

Source: Calculated using data compiled from DisComs Tariff Orders for FY19 and Electricity Duty data from CEA Electricity Duty data 2017.

Notes: LTIS = Low tension industry supply; HTSS = High tension special service; EHT = Extra high tension, SS = Streetlight service; RTS = Railway traction services; MES = Military Engineer Services. The Jharkhand Electricity Duty (ED) rates are colour coded to show those which match the median all-India rates in green, with red showing ones which don't match. The last column shows the impact on consumer bills if ED rates were changed to match the all-India average ED rates.

**Energy sales and revenue numbers are from PFC data.*

The instruments discussed thus far focus on distribution, but it's not unreasonable to consider even wider mechanisms for ensuring funding for access and affordability for the poor. In case pooling of cross-subsidy fails, the Central Government may need to step up to keep the burden on the State manageable and in line with other peer states (we do not include north-eastern states in this cohort). If it is financial support that is needed, the State may also consider imposing a surcharge on coal as used for power outside the state. However, adding a general state-wise levy on coal would raise costs for in-state consumers as well, and such a mechanism might then be imposed by other states, perhaps for other commodities.

Regardless of the mechanism to bring JBVNL towards financial viability, the current system is unlikely to sustain, and as cash becomes scarce or costs rise post-COVID, one will have to purposely ensure the DisCom is kept whole while electricity remains affordable for the poorer segments of the population.

The JBVNL's financial viability isn't just its own challenge—as the owner, the ultimate responsibility lies with the State. If the State doesn't address the fundamentals of consumer mix and tariffs, either the utility will suffer in its social objective (quality supply) or the State will have a high subsidy burden, one that may be too high to manage.

7. Appendices

7.1 Appendix 1: List of States

AP	Andhra Pradesh
ARP	Arunachal Pradesh
AS	Assam
BH	Bihar
CH	Chandigarh
CHT	Chhattisgarh
DD	Daman and Diu
DE	Delhi
DNH	Dadar and Nagar Haveli
GJ	Gujarat
GO	Goa
HP	Himachal Pradesh
HR	Haryana
JH	Jharkhand
JK	Jammu and Kashmir
KA	Karnataka
KL	Kerala
MG	Meghalaya
MH	Maharashtra
MN	Manipur
MP	Madhya Pradesh
MR	Mizoram
NL	Nagaland
OR	Odisha
PB	Punjab
PD	Pondicherry
RJ	Rajasthan
TG	Telangana
TN	Tamil Nadu
UK	Uttarakhand
UP	Uttar Pradesh
WB	West Bengal

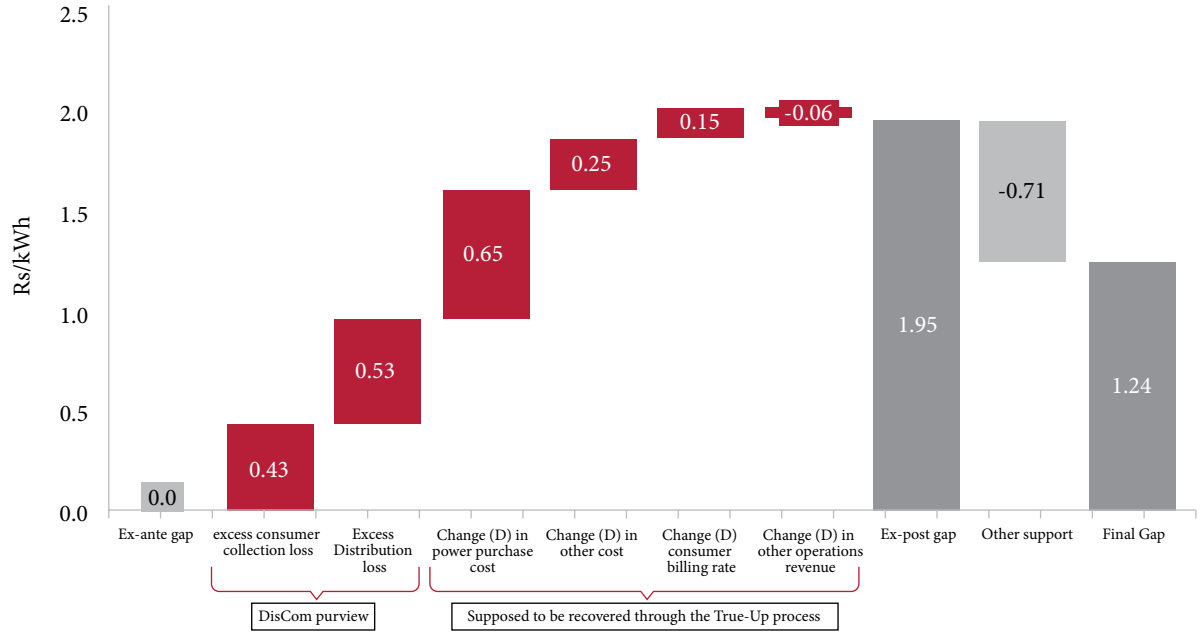
7.2 Appendix 2: List of DisComs

APDCL	Assam Power Distribution Company Ltd
APDOP	Arunachal Pradesh Department of Power
APEPDCL	Eastern Power Distribution Company of Andhra Pradesh Ltd
APSPDCL	Southern Power Distribution Company of Andhra Pradesh Ltd
AVVNL	Ajmer Vidyut Vitran Nigam Ltd
BESCOM	Bangalore Electricity Supply Company Ltd
BEST	Brihanmumbai Electric Supply and Transport Undertaking
BRPL	BSES Rajdhani Power Ltd
BYPL	BSES Yamuna Power Ltd
CED	Chandigarh Electricity Distribution
CESC	Calcutta Electric Supply Corporation Ltd
CESCOM	Chamundeshwari Electricity Supply Corporation Ltd
CESU	Central Electricity Supply Utility of Odisha
CSPDCL	Chhattisgarh State Power Distribution Company Ltd
DGVCL	Dakshin Gujarat Vij Company Ltd
DHBVN	Dakshin Haryana Bijli Vitran Nigam
DNHPDCL	DNH Power Distribution Corporation Ltd
DPN	Department of Power Nagaland
DVVNL	Dakshinanchal Vidyut Vitran Nigam Ltd
ED-DD	Department of Power Daman and Diu
EDG	Goa Electricity Department
EDP	Electricity Department Pondicherry
GESCOM	Gulbarga Electricity Supply Company Ltd
HESCOM	Hubli Electricity Supply Company Ltd
HPSEBL	Himachal Pradesh State Electricity Board Ltd
JBVNL	Jharkhand Bijli Vitran Nigam Ltd
JDVVNL	Jodhpur Vidyut Vitran Nigam Ltd
JKPDD	Power Development Department, Jammu and Kashmir
JVVNL	Jaipur Vidyut Vitran Nigam Ltd
KESCO	Kanpur Electricity Supply Company Ltd
KSEB	Kerala State Electricity Board Ltd
MEPDCL	Meghalaya Power Distribution Corporation Ltd
MESCOM	Mangalore Electricity Supply Company Ltd
MGVCL	Madhya Gujarat Vij Company Ltd
MP Central	Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Ltd

MP East	Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company Ltd
MP West	Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Ltd
MSEDCL	Maharashtra State Electricity Distribution Company Ltd
MSPDCL	Manipur State Power Distribution Company Ltd
MVVNL	Madhyanchal Vidyut Vitran Nigam Ltd
NBPDCL	North Bihar Power Distribution Company Ltd
NESCO	North Eastern Electricity Supply Company of Odisha Ltd
P&ED-M	Power & Electricity Department, Mizoram
PGVCL	Paschim Gujarat Vij Company Ltd
PSPCL	Punjab State Power Corporation Ltd
PuVVNL	Purvanchal Vidyut Vitaran Nigam Ltd
PVVNL	Pashchimanchal Vidyut Vitran Nigam Ltd
R Infra D	Reliance Infrastructure Ltd. (Distribution Business)
SBPDCL	South Bihar Power Distribution Company Ltd
SOUTHCO	SOUTHCO Utility, Odisha
TANGEDCO	Tamil Nadu Generation and Distribution Corporation
TPC-D	Tata Power Company Ltd. (Distribution)
TPDDL	Tata Power Delhi Distribution
TSNPDCL	The Northern Power Distribution Company of Telangana Ltd
TSSPDCL	Telangana State Southern Power Distribution Company Ltd
UGVCL	Uttar Gujarat Vij Company Ltd
UHBVN	Uttar Haryana Bijli Vitran Nigam
UPCL	Uttarakhand Power Corporation Ltd
WBSEDCL	West Bengal State Electricity Distribution Company Ltd
WESCO	Western Electricity Supply Company of Odisha

7.3 Appendix 3: Cost-Revenue Gap Analysis

Figure A-1: JBVNL ex-ante (planned in Tariff Order) to ex-post ACoS-ARR gap change per unit due to changes (deltas) in components in Rs/kWh (FY19)



Source: Authors analysis based on Tyagi and Tongia (2023).

Notes: The analysis shows the break-up of total gap shift from Ex-ante (planned) to Ex-post (Actual) gap into different components. The final gap is different from the revenue shortfall shown in Table 6 as it shows shortfall based on the cross-subsidy using Ex-ante tariff and Ex-post ACoS. Unlike in most other states, there was no subsidy shortfall for Jharkhand in FY19.

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