



POWER PERSPECTIVES



State overview: Rajasthan

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An Initiative by Prayas (Energy Group), Pune

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Prayas (Energy Group)

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About Power Perspectives

Power Perspectives is an initiative by Prayas (Energy Group) to provide brief commentaries and analyses on important developments in the Indian power sector in various states and at the national level. The portal hosts articles on a wide-ranging set of issues to inform policy makers, regulators, researchers, journalists and civil society organisations about sector developments from a public interest perspective. The initiative focuses on critical developments that are not adequately reported.

As part of the initiative, developments in focus states are tracked. In addition to articles, each focus state has a “State Overview” document which provides a brief background of the state and infographics with key statistics. The portal can be accessed here: <https://prayaspune.org/peg/resources/power-perspective-portal.html>. Comments and suggestions are welcome at powerperspectives@prayaspune.org.

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State Overview: Rajasthan

1. Background and context

With the electrification of all households, successful transition away from sustained power shortages and as a significant contributor to India's renewable energy generation, the Rajasthan power sector has seen significant changes in the past two decades. However, the state electricity sector is currently facing multiple challenges which affect its operations and finances. The driver of the sector's financial crisis in the past decade has been the fact that revenues from various sources have not risen at par with the rapid increase in cost incurred by the state's electricity distribution companies (DISCOMs).

Much of the cost increase can be attributed to power procurement which accounts for 70% of total expenses. Rajasthan DISCOMs have seen substantial capacity addition in the recent past and much of the power procured has been high cost. The consequence of this high cost, extensive capacity addition is that Rajasthan has contracted power far in excess of its current demand. As a result, significant amount of thermal capacity is backed down or remains unutilised every year, for which consumers continue to incur fixed cost payments.

Issues with power procurement planning and rising distribution costs have resulted in the average cost of supply rising to Rs. 7.88/kWh by FY18. If tariffs for all consumers were to be approved at the average cost of supply (ACoS), small consumers, especially newly electrified homes would, in all likelihood, find the power to be unaffordable without state government subsidy. Thus, they are cross-subsidised by industrial and commercial consumers. Large industrial consumers, who have access to alternate supply options, find their tariffs (which are higher than the ACoS) to be uncompetitive. As these consumers are charged more than the cost of supply while they can procure power using open access and captive options for less than Rs. 4/kWh.¹ With rising costs, there has been substantial erosion of such sales which has worsened the financial predicament of Rajasthan DISCOMs.

The state government subsidises about 20-25% of the expenses approved by the regulator for the DISCOMs. As the costs are already high and the losses have been mounting, even steady increases in tariffs (as well as subsidies) have not been enough to meet expenses. Between FY12 and FY18, even an average tariff increase of 11% per annum has not helped meet costs rising at 5% per annum.²

With strained finances, there is limited attention to quality of service especially to poor consumers. Since FY12, about 7.2 million poor homes have been electrified in the state. Further, about 40% of the sales in Rajasthan are to agricultural consumers. DISCOMs rely on unsustainably high government subsidy (about Rs.10, 800 crore in FY18) and limited cross-subsidy revenue to meet the cost incurred for these consumers.

Since FY12, Rajasthan has seen significant addition of wind and solar capacity. With the relative price advantage in renewable energy (RE) technologies and various measures to address issues with variability, such investments could be an opportunity to ensure cost-competitive supply in the future.

¹ If power is available at Rs. 3.5/kWh in the market, large industrial consumers make savings of about 30% to 40% (as compared to the applicable regulated energy charge) if power is availed via open access along with applicable charges such as cross-subsidy surcharge, additional surcharge, wheeling charge, transmission charge as well as wheeling as transmission loss. The savings increase to 50% in case of captive consumption.

² Based on commission approved true-up expenditure, revenue from retail sales and sales for the years FY12 and FY18. The average cost of supply increased from Rs. 6.03/kWh in FY12 to Rs. 7.88/kWh in FY18 while the average billing rate increased from Rs. 3.72/kWh in FY12 to Rs. 7.10/kWh in FY18. The estimates for average billing rate includes revenue from state government subsidies.

This note explores these multiple challenges and opportunities, while giving a brief overview of the key institutions, practices and realities in the state. A brief institutional overview is provided in Box 1. Given their scale of operations and coverage of consumers, the focus of this note will be on the trends and challenges before the Rajasthan DISCOMs.

Box 1: Institutional overview of Rajasthan Power Sector

The Rajasthan State Electricity Board was unbundled in 2000 with the creation of the companies, detailed in Table 1

Table 1: State-owned companies formed after unbundling

Type of Company	Name
Generation company	Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUNL)
Transmission company	Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPNL)
DISCOMs	Jaipur Vidyut Vitaran Nigam Limited (JVVNL), Jodhpur Vidyut Vitaran Nigam Limited (JdVVNL), Ajmer Vidyut Vitaran Nigam Limited (AVVNL).

As per the Rajasthan Power Sector Reforms Transfer Scheme (2000), the assets, liabilities, obligations and personnel of the erstwhile electricity board were to be vested in these successor companies.

The Rajasthan Electricity Regulatory Commission (RERC) has been regulating the state sector since 2000, focussing on the performance of its licensees, tariff determination, power procurement, facilitating open access and performing various functions as per the Electricity Act, 2003. In addition to the utilities mentioned above, RERC also regulates eight private transmission licensees.

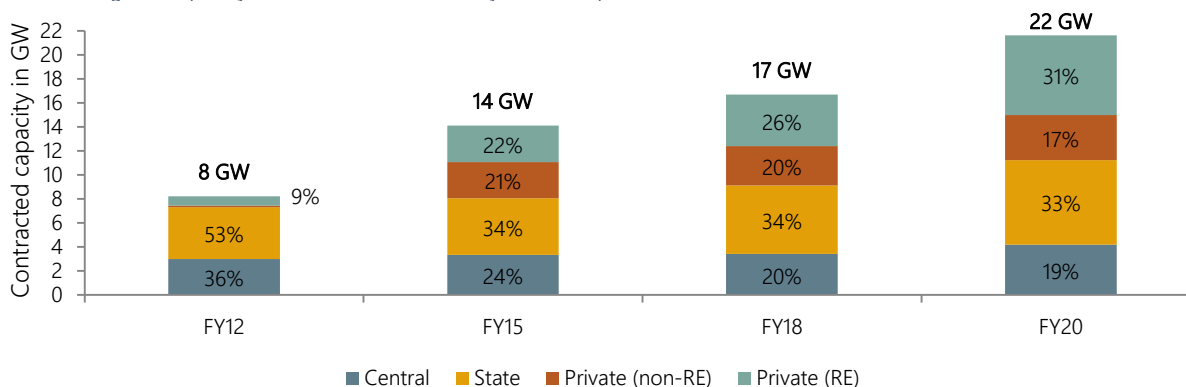
The Rajasthan Government has also set up the Rajasthan Renewable Energy Corporation Limited (RRECL) which acts as the state nodal agency for RE promotion and the State Designated Agency for energy conservation efforts. RRECL has an intra-state trading licence and a subsidiary called Rajasthan Solarpark Development Company Limited

2. Power procurement planning and capacity addition

As per the power procurement guidelines for DISCOMs issued by RERC, the decision to procure power is made by the Energy Assessment Committee based on future demand and supply estimates provided by the DISCOMs and the SLDC (State Load Despatch Centre). The Committee consists of the Chairmen and Managing Directors of RVPN, RVUN, the three DISCOMs and the SLDC in-charge. This section details trends in capacity addition in the past decade and its implications on the cost of supply of the DISCOMs.

2.1 Power procurement mix

Figure 1: Change in capacity contracted since FY12 by ownership

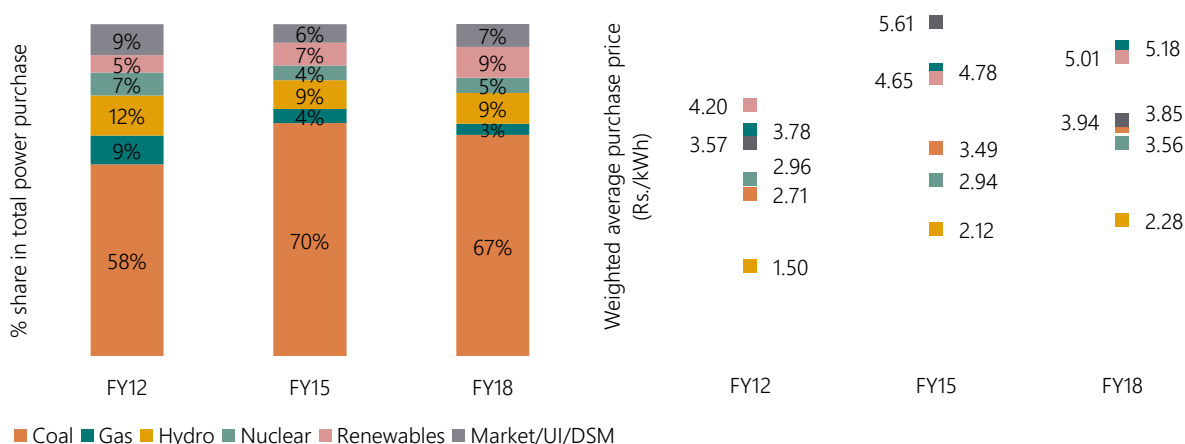


Source: Prayas (Energy Group) analysis based on tariff, true-up orders by RERC and true-up petitions filed by the DISCOMs

Between FY12 and FY18, the capacity contracted has doubled as shown in Figure 1. By FY18, Rajasthan DISCOMs had contracted about 16,679 MW of power using long-term contracts, 56% of which is from coal based sources and about 26% is from renewable energy sources, predominantly wind. It is also worthwhile to note that between FY18 and FY20, the contracted capacity increased by about 4,946 MW. 44% of the addition was from RUVNL, 52% due to privately owned, renewable energy capacity and 4% from central sector plants.

The recent capacity addition resulted in procurement increasing from 50 BU in FY12 to 75 BU in FY18 which has had significant impacts on the cost and nature of power procurement in the state. Figure 2 shows the fuel/technology-wise share and average price of the power procured in this period.

Figure 2: Fuel/technology wise breakup of power procured and its price

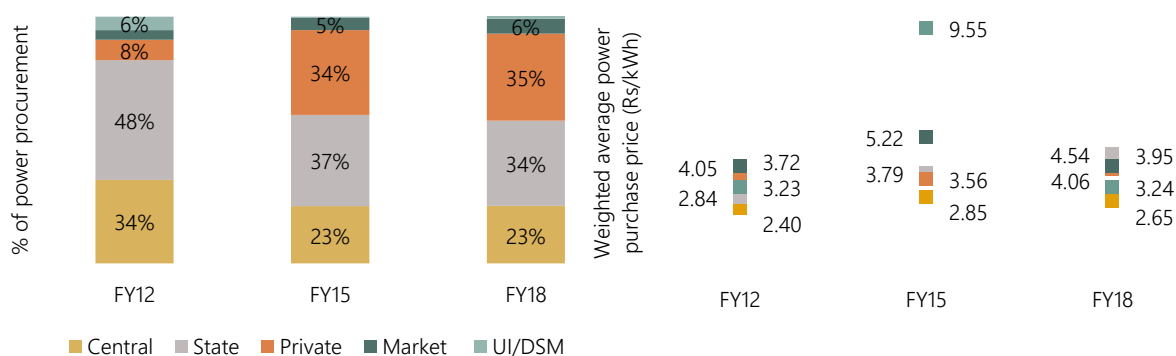


Note: "Market" refers to short-term procurement from power exchanges and bilateral traders. UI refers to the erstwhile unscheduled interchange balancing mechanism and DSM refers to the prevalent deviation and settlement mechanism. Renewables refers to procurement from wind, solar and biomass. Share of biomass, however, is negligible (< 0.5%).

Source: Prayas (Energy Group) analysis based on tariff, true-up orders by RERC and true-up petitions filed by the DISCOMs

Reflective of capacity addition, coal-based capacity dominated at 60% of power procured. The reduction in gas based procurement is due to fuel availability. The marginal fall in coal-based purchase in the recent past could be due to 'surplus' power which has necessitated reduced utilisation of high cost thermal capacity. This is detailed in Section 2.4. Figure 3 shows the break-up and rate of power procured by ownership.

Figure 3: Ownership-wise breakup of power procured



Source: Prayas (Energy Group) analysis based on tariff, true-up orders by RERC and true-up petitions filed by the DISCOMs

It is clear that almost all of the power was procured from central and state owned generators in FY12. Due to significant increase in privately owned, coal-based capacity addition; there has been a reduction in the

relative contribution of state-owned generators. In FY12, renewable energy generation accounted for more than 60% of the purchase from private sources and this fell to 29% by FY18. This is primarily due to addition of coal-based private capacity in this period. Short-term market purchase has been consistent around 4-6%.

2.2 Private capacity addition in the recent past

Details of the major coal-based private capacities contracted recently are listed in Table 2.

Table 2: Details of private capacity addition

Name of Plant	Raj West Power Limited (RWPL)	Coastal Gujarat Power Limited (CGPL)	Sasan Power Limited	Adani Power Rajasthan Limited (APRL)	Power Trading Corporation (PTC)
Ownership	Joint Venture (JV) of Rajasthan State Mines and Minerals Limited (RSMML) & JSW Energy	Tata Power Company Limited	Reliance Power Limited	Adani Power Limited	Power from Maruti Clean Coal & Power Limited (MCCBL), Dainik Bhaskar Power Limited (DBPL)
Location	Barmer, Rajasthan	Mundra, Gujarat	Singrauli, Madhya Pradesh	Kawai, Rajasthan	Bandakhar (MCCBL), Baradarha (DBPL) in Chhattisgarh
Fuel source	Mines of Barmer Lignite Mining Company Ltd, JV of RSMML and RWPL	Imported Coal	Chitrangi Power Pvt. Ltd mines (Reliance Power Ltd.)	Imported Coal, Coal India Limited	DBPL's Dharamjaigarh coal block, SECL coal for MCCBL.
Tariff Setting	Cost plus (Section 62)	Competitive Bidding Ultra Mega Power Project (UMPP) (Case 2)	Competitive Bidding UMPP (Case 2)	Competitive Bidding (Case 1)	Competitive Bidding (Case 1)
Date of PPA ³	26.10.2006.Units operational by FY11, FY12	22.04.2007.Units operational by FY11, FY12	07.08.2007.Units operational by March 2013	28.01.2010 Operational by January 2014	01.11.2013 Units operational by FY14
Contracted Capacity	1080 MW (8x135)	380 MW	396 MW	1200 MW	250 MW (MCCBL), 250 MW (DBPL)
Energy sold (FY19)	6698 MU	2361 MU	2681 MU	5289 MU	3669 MU
Per unit cost (FY19)	Rs. 4.18/kWh	Rs. 2.49/kWh	Rs. 1.51/kWh	Rs.3.56/kWh	Rs.3.16/kWh(MC CBL) Rs. 4.83/kWh (DBPL)
% of total procurement	9%	3%	4%	7%	6%

Source: Prayas (Energy Group) analysis based on information from various regulatory orders

³ PPA refers to power purchase agreement between the generator and the DISCOMs.

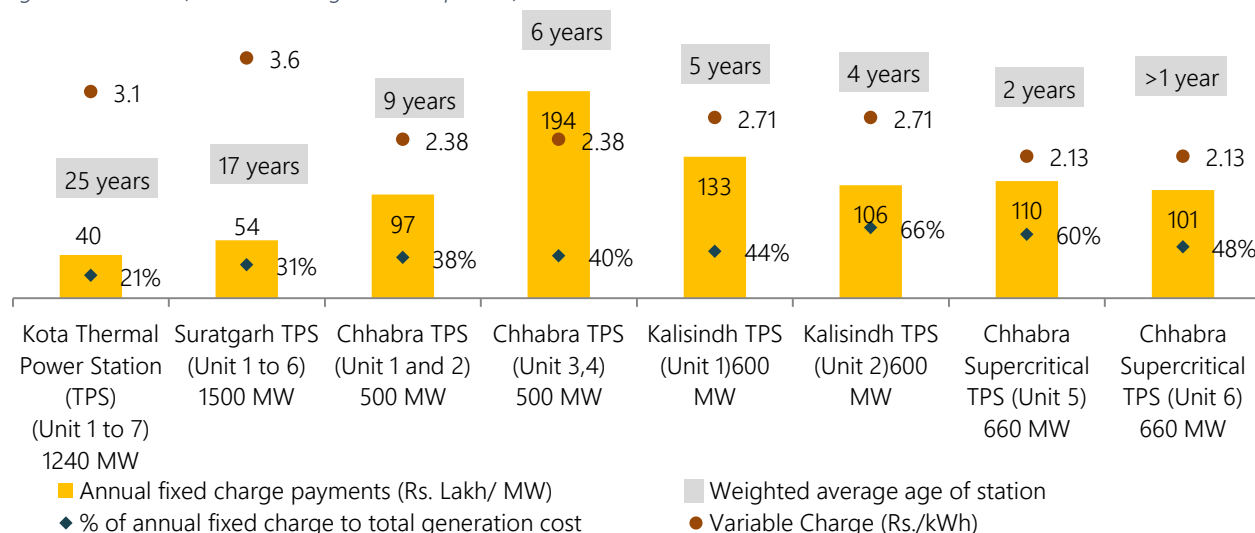
The DISCOMs have also contracted power from JSW's, 'cost-plus' Karcham Wangtoo Project. The cost of this hydro-power project was as high as Rs. 4.63/kWh in FY19 primarily due to delays in construction and project execution. Other than RWPL, most of the private capacity has been contracted via the competitive bidding process and two of the projects are UMPPs.

RWPL, APRL and the capacity contracted via PTC account for the most expensive among the capacity listed. Together, they form 22% of the total power procured by the DISCOMs. RWPL is a cost plus project where the ERC determines the tariffs based on the plant's cost and performance estimates and the transfer price of lignite from the captive mines of its subsidiary company. Even though APRL is a competitively bid project where many of the cost components have been fixed over the PPA duration, it has been awarded compensatory tariff of about Rs. 2,700 crores (comparable to 50% of the payments to APRL in FY18 for power procurement) due to issues with availability of coal and adherence to contract terms.

2.3 State –owned capacity addition

The contribution of RVUNL to power procurement is significant, even with the recent fall in its power procurement share. The actual, average cost of RUVNL's coal based capacity was Rs. 4.5/ kWh in FY18 and has been increasing at 9% per annum. In fact, 90% of RVUNL capacity is coal-based. Figure 4 shows the weighted average age as well as RERC approved fixed and variable cost for coal-based capacity in FY20.

Figure 4: Details of state-owned generation plants for FY19



Notes: The average age of the station weighted with the capacity of its units is reported.

Source: Prayas (Energy Group) analysis based on information from various regulatory orders

The build-up of variable cost, as shown in Figure 4 could be due to issues with fuel availability and quality as well as operational inefficiencies of the generating plants. The annual fixed cost payment for recently added capacity accounts for 40 to 60% of the total procurement costs of these plants. This is because recently contracted capacities have had high capital costs. Further, significant delays and cost-overruns have further increased the fixed costs. For example, Units 3 and 4 of Chhabra Supercritical TPS (CSTPS) were delayed by 28 and 38 months respectively. The capital cost for the units saw a 30% increase from the original estimates. Cost overruns are also likely for Units 5 and 6 of CSTPS, delayed by 18 and 27 months respectively.⁴

⁴ This is discussed in greater detail here: <https://prayaspune.org/peg/resources/power-perspective-portal/177>

2.4 Extent and impact of surplus power

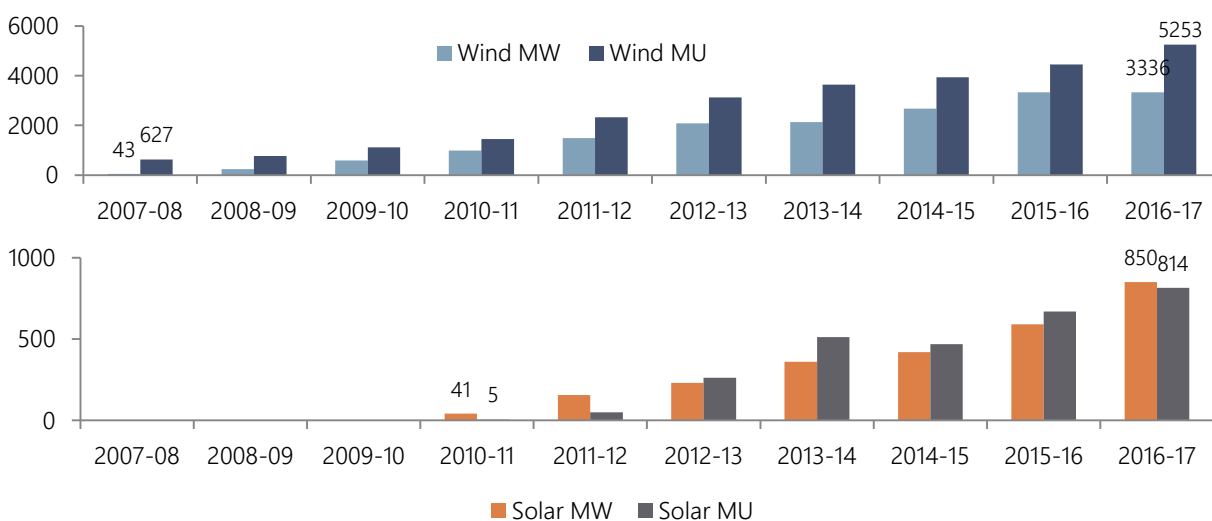
Thermal plants are scheduled less than their availability when demand is lower than available supply and Rajasthan has seen sustained backing down of base-load capacity due to lower than anticipated demand growth. This is due to increased migration of consumers to open access and captive options as well as poor procurement planning (for example, contracting base-load power to meet anticipated peak shortages and procurement based on highly optimistic demand projections).⁵

In 2015-16, about 12.6 BUs of the contracted energy available from plants with relatively higher variable costs were not scheduled by the DISCOMs based on the merit order stack.⁶ 54% of this unscheduled energy was from RVUNL plants. In fact, Suratgarh Thermal Power Station (TPS) was lying idle for 43% of the time that it was available in the year. Privately owned RWPL and APRL together contributed to 12% of the backed down power. With increased high cost capacity addition and tepid demand growth, the extent of backing down could potentially have increased in the recent years but data is not available to assess its magnitude.

2.5 Renewable energy capacity addition and power procurement plans

Rajasthan DISCOMs have been adding significant renewable energy capacity (predominantly solar and wind) in the recent years. The increase in contracted capacity and energy generation is shown in Figure 5.

Figure 5: Renewable energy capacity addition and generation over the years



Source: Prayas (Energy Group) analysis based on information from various regulatory orders

79% of the renewable energy procured is from wind and solar accounts for 16%. However, there has been substantial addition of solar capacity in the past five years with the annual average growth in addition being at the rate of 36%. With its relative cost competitiveness and the Union Government's commitment to 175 GW by 2022, the procurement of RE (especially solar) will increase massively in the medium-term. To meet its share in the national target, the state would have to ensure procurement of 5,672 MW of solar and 8,600 MW of wind by December 2022 with bulk of this procurement by the DISCOMs. RERC has increased the

⁵ For a more detailed analysis of power procurement planning processes in Rajasthan, please read: <http://www.prayasgroup.org/peg/publications/item/335>. Instances of procurement more than assessed demand due to a variety of reasons including slippages of capacity in the pipeline, non-availability of bidders for peak capacity is also available in RERC orders in Case Nos. 217 of 2010, 205 of 2009.

⁶ The principle which ranks thermal generation capacity for scheduling in the ascending order of variable costs to ensure that plants with lower marginal costs are utilised first.

Renewable Purchase Obligation (RPO) for the DISCOMs to 21% of consumption by 2023-24. The RPO target is 10.5% for solar and 9.4% for wind.⁷ The Rajasthan Government notified its revised solar policy in 2019 which announced a target of 30 GW of solar by FY25.⁸ Rajasthan is also committed to provide day-time solar power to farmers via the centrally sponsored KUSUM scheme.⁹ Thus, Rajasthan will see a substantial increase in renewable energy purchase which will impact thermal power operations, costs and network investments.

2.6 Conventional capacity addition in the pipeline

The DISCOMs also have 2,300 MW of upcoming conventional capacity, detailed in Table 3.¹⁰

Table 3: Details of conventional capacity addition in the pipeline as on November 2019

Station	Ownership	Location	Fuel	Tariff determination	Expected CoD	Contracted capacity
Rajasthan Atomic Power Plant (Unit 7 and 8)	Nuclear Power Corporation of India Limited	Rawatbhata, Rajasthan	Nuclear	Cost plus	Dec-21	280 MW
Suratgarh (Supercritical TPS)Unit 7,8	RVUNL	Ganganagar, Rajasthan	Coal	Cost plus	Dec-19 (U-7) Feb-20 (U-8)	1320 (660*2) MW
North Karanpura	NTPC Ltd.	Chatra, Jharkhand	Coal	Cost plus	Sep-20	195 MW
Tanda		Ambedkar Nagar, Uttar Pradesh (UP)	Coal	Cost plus	Jun-20	88 MW
Meja	JV- NTPC, UP Rajya Vidyut Utpadan Nigam Ltd.	Allahabad, UP	Coal	Cost plus	Jun-20	88 MW
Teesta Power	Contracted via PTC	North Sikkim	Hydro	Cost plus, Tariff > Rs.5/kWh, time/cost overruns.	Feb-17, (delay due to litigation, transmission issues,)	100 MW
Kameng Hydroelectric Project (HEP)	North Eastern Electric Power Corporation Ltd	West Kameng, Arunachal Pradesh	Hydro	Cost plus	Nov-19	93 MW
Tapovan Vishnugad HEP	NTPC	Chamoli, Uttarakhand	Hydro	Cost plus	Dec-20	56 MW
Parbati II HEP	NHPC Ltd.	Kullu, Himachal Pradesh	Hydro	Cost plus	Dec-21	86 MW

Source: Prayas (Energy Group) analysis based on information from various regulatory orders and reports of the Central Electricity Authority.

⁷As per RERC (Renewable Energy Obligation) (Fifth Amendment) Regulations, 2019 notified on 11th January 2019

⁸<https://energy.rajasthan.gov.in/content/dam/raj/energy/rrecl/pdf/Home%20Page/Rajasthan%20Solar%20Energy%20Policy2019.pdf>

⁹ The details of the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) Scheme is available here: <http://upneda.org.in/MediaGallery/KUSUMGuidelines.pdf>

¹⁰ DISCOMs have planned to contract 47 MW from Lower Subansri Hydroelectric project and 400 MW of coal based power from Lanco Babandh Power Limited. However, given the uncertainty in project execution and tariff adoption, these have not been included in Table 3.

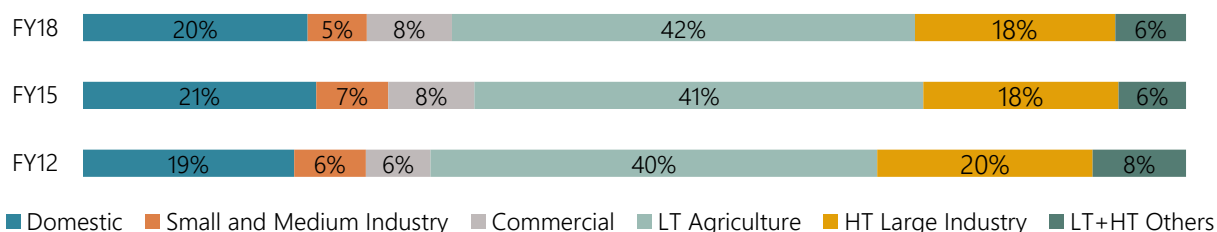
About 45% of the long-term conventional capacity contracted in FY18 costs more than Rs. 4/kWh and almost a third of this capacity had variable costs greater than Rs. 3/kWh. While these costs are bound to increase for the rest of the contract duration, renewable energy will become more and more competitive, especially with increased innovation and investments to address variability. Going forward, thermal capacity addition needs to be seen in the light of these developments. 85% of the upcoming conventional capacity is base-load and long-term. Such procurement will be challenging for to manage especially with uncertain demand.

3. Demand and sources of revenue

3.1 Sales and tariff design

40% of DISCOM sales are to agriculture and 20% to domestic as shown in Figure 6. Due to electrification, the small domestic consumer sales have been increasing.¹¹ This is not reflected in the figure as the relative proportion of the sales is not significant.

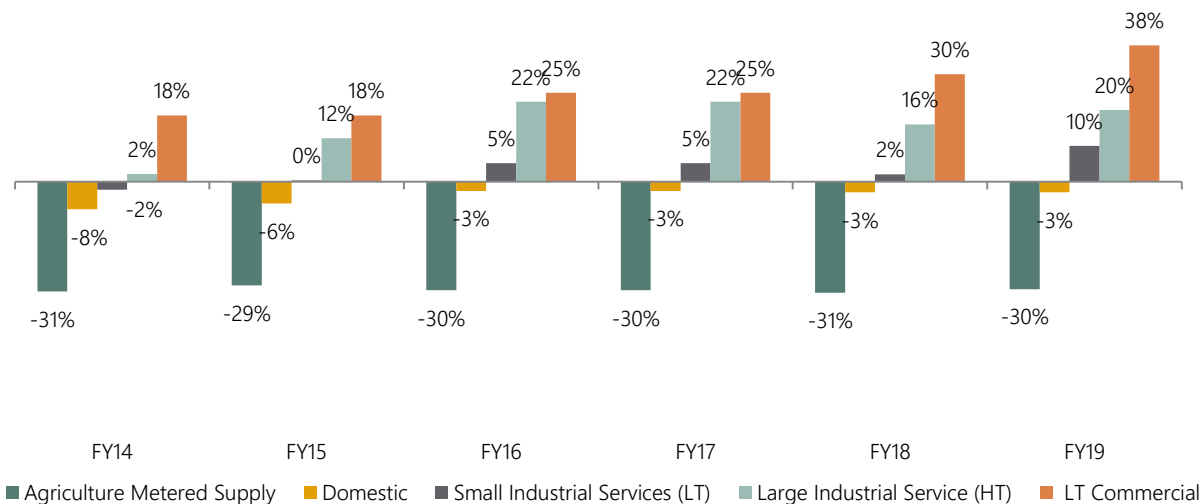
Figure 6: Sales mix of the DISCOM



Source: Prayas (Energy Group) analysis based on information from various regulatory orders

Typically domestic and agricultural consumers pay less than cost of supply and in addition to state government subsidy, receive cross-subsidy from industrial consumers. Figure 7 shows the extent of cross subsidy¹² for major consumer categories.

Figure 7: Extent of cross subsidy approved by RERC



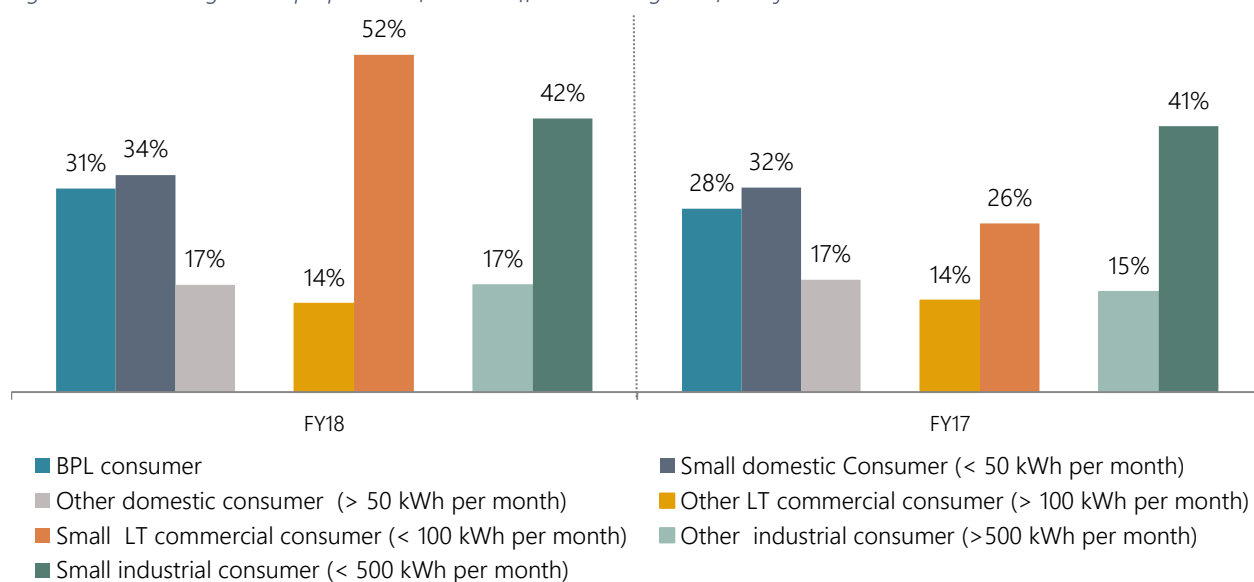
Source: Prayas (Energy Group) analysis based on information from various regulatory orders

¹¹ Between FY17 and FY18, sales to those using < 50 kWh and sales to below poverty line consumers increased by 47%.
¹² Estimated as the percentage by which the average tariff (inclusive of revenue from subsidy) is in excess of the average cost of supply. Along with subsidy, the support required for metered agricultural consumers would be 75% rather than the 30% reported only for cross subsidy.

Given the sales mix, majority should be paying less than cost of supply. However, that is increasingly not the case in Rajasthan. With sales migration and rising cost of supply, reliance on cross subsidy from major categories has reduced. The extent of cross subsidy for domestic consumers has been reducing between FY14 and FY16. Domestic consumers currently pay almost at cost of supply. The cross-subsidy for agriculture has more or less remained the same. Perhaps to cope with the rising costs, the percentage cross-subsidy from commercial consumers, mostly small and low-tension (LT) consumers as well as large industrial consumers has increased.

Of late, a large proportion of the tariffs paid by consumers in various categories are recovered via fixed charges, as shown in Figure 8. While such a measure would be more reflective of costs incurred by the DISCOMs and is implemented to cope with the shrinking cross-subsidies in the state, it could also pose challenges linked to accountability, affordability and competitiveness. This is detailed subsequently.

Figure 8: Fixed charges as a proportion of total tariff across categories for Rajasthan DISCOMs



Note: Other commercial, industrial and general domestic consumer refers to other than small consumers in the category.
Source: Prayas (Energy Group) analysis based on information from various regulatory orders and tariff petitions

For below poverty line (BPL) and small domestic consumers, who use less than 50 units per month, about a third of their regulated tariff is paid in fixed charges.¹³ Such a tariff design could result in significant revenue recovery even when power supply is limited and poor, which would reduce accountability for supply quality. Additionally, as per the existing tariff structure, fixed charges vary with each consumption slab, which could incentivise metering splitting to avoid sharp increase in tariff after the marginal unit of consumption between slabs.

Small industrial and commercial consumers have almost 40% to 50% of their revenue recovery through fixed charges whereas the proportion of fixed charge revenue from large industrial and commercial consumers is much lower. Even so, such a tariff design for large industrial consumers could have adverse impacts. In FY20, RERC increased the fixed charges for large industrial consumers by 46% to Rs. 32.4 lakhs/MW/year. This

¹³ These consumers have also been receiving subsidy on the energy charges in the range of 50% (BPL) and 30% (small domestic) of the regulated energy charge which amounted to Rs. 176 crores in FY18. The estimation in Figure 8 is inclusive of revenue from subsidy. However, if the energy charge paid by consumers after subsidy is accounted for, the contribution of fixed charges in FY18 would increase to 48% for BPL consumers and 40% for small domestic consumers.

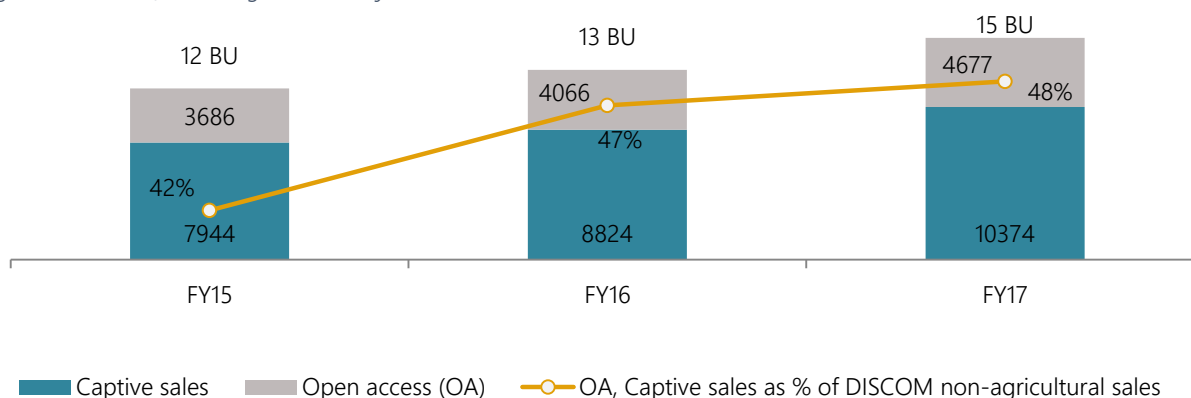
translates to about 8% of the per MW investment required to set up a captive solar plant. Thus, increasing fixed charges could further incentivise consumers to reduce their contracted demand and migrate to captive options.

3.2 Migration of cross-subsidising consumers

In the recent past, Rajasthan has seen a substantial reduction in HT sales due to open access and captive options. As shown in Figure 9, sales migration due to open access and captive consumption increased from 11 to 15 BU between FY15 and FY17.¹⁴ This is comparable to almost half of the total non-agricultural sales by the three DISCOMs in these years.

With the imposition of additional surcharge, open access consumption has reduced in 2017-18 to 3199 MUs. However, it is likely that captive consumption (on which cross-subsidy surcharge and additional surcharge is not levied) has increased in the same year, especially using the group captive mechanism. This is difficult to establish, as data for captive consumption for the year is currently unavailable. With increasing cost of supply and tariffs, the trend of increasing sales migration is likely to continue, making recovery of revenue challenging.

Figure 9: Extent of sales migration in Rajasthan



Source: Prayas (Energy Group) analysis from tariff filings and CEA general review reports from various years

3.3 Estimation of agricultural demand

Like most states, Rajasthan's DISCOMs have both metered and unmetered agricultural consumers. Typically, the demand for unmetered consumers is determined based on the number of consumers, the connected load of the agricultural pump-sets and norms assumed by the Commission for the hours of use of the pump-set. This norm is also called the specific consumption norm. DISCOMs across the country have a tendency to over-estimate the unmetered sales which in turn lead to under-reporting of distribution losses for a given energy input.¹⁵ Thus, significant regulatory scrutiny and oversight is needed for the estimation of agricultural demand. In Rajasthan, only 11% of agricultural consumers are reported as unmetered. The estimation of demand for these consumers is based on a specific consumption norm approved by the Rajasthan ERC. Despite changes in rainfall and cropping patterns, farming practices and actual hours of supply, the norm of 1945 kWh/kW/consumer has not been revised since FY06.

¹⁴ The extent of sales migration reported is for consumers with contracted demand greater than 1 MW. However, the captive consumption could be higher as there are as many consumers have installed captive units, especially renewable energy systems having capacity even less than 1 MW.

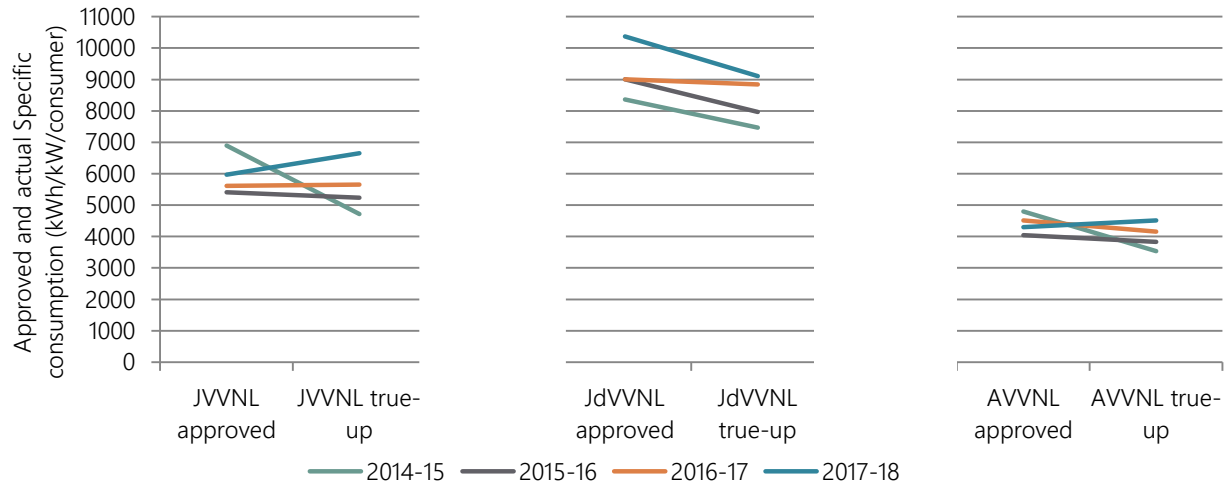
¹⁵ Detailed analysis here:

http://prayaspune.org/peg/publications/item/download/929_c7ad475a5d2e9f08ee471f40721c3fd1.html

Unlike demand estimation for other categories, which is based on past consumption trends, demand for metered agricultural consumers is also estimated based on specific consumption norms derived from past data. Even though Rajasthan DISCOMs report that majority of the consumers are metered, it is likely that in many locations, the meter is on the distribution transformer (DT) supplying to the consumer¹⁶ and it is unclear if the DT level metered data is recorded on a systematic basis and used for the estimation process.

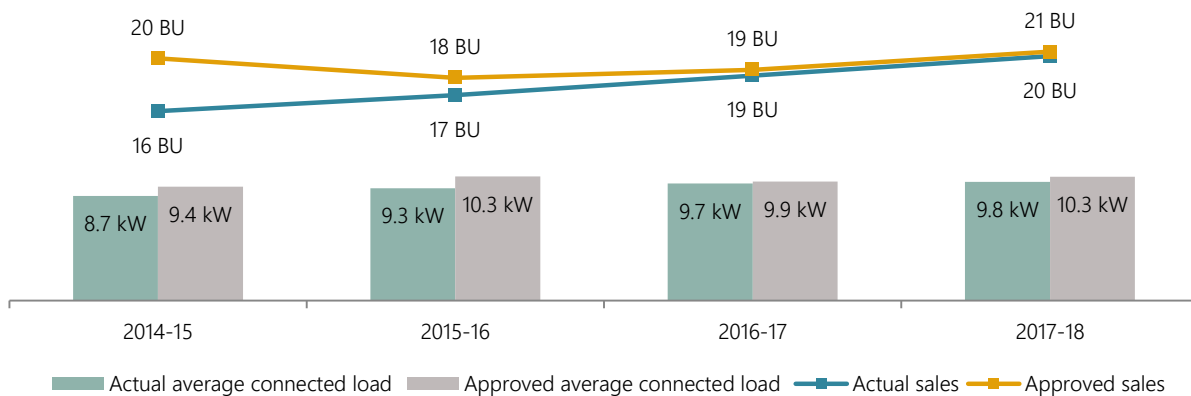
There is variation in the approved and trued-up specific consumption norm across years. The true-up estimates are derived from the RERC approved numbers for connected load, consumer numbers and sales. This is shown in Figure 10. Figure 11 shows a similar trend with agricultural sales and average connected load.

Figure 10: Approved consumption norm versus calculated norm with trued-up sales, connected load



Source: Prayas (Energy Group) analysis data from tariff filings by DISCOMs and regulatory orders

Figure 11: Approved and actual sales, average connected load for agricultural consumers in Rajasthan



Source: Prayas (Energy Group) analysis based on information from various regulatory orders and tariff petitions

¹⁶ Figure 11 shows that the average connected load is high in the state and JdVVNL true-up filings show that the average agricultural load is equivalent to about 24 HP for the DISCOM. Therefore it is likely that each farm connection is provided with its own transformer in some locations. JdVVNL accounts for 45% of the agricultural sales in Rajasthan.

It is pertinent to note that there is limited scrutiny of the agricultural demand information submitted by the DISCOMs during the true-up process. The numbers submitted by the DISCOMs for both metered and unmetered consumption is approved as is, without an investigation into the claims of the DISCOMs.

The subsidy committed by the state government to DISCOMs for agricultural consumption was about Rs. 3.85/kWh for metered consumers and Rs. 550/HP/month for unmetered consumers in FY18. This amounted to about Rs. 10,069 crores for all DISCOMs accounting for 21% of their combined revenue requirement. With the implementation of component A of the KUSUM scheme (which relates to the installation of MW scale solar plants at the sub-station level to provide low-cost, day time power to farmers) there is a potential for reduction in the subsidy burden over time.¹⁷

Given the implications of agricultural demand estimation on distribution losses, subsidies and the revenue requirement of the DISCOMs, the veracity of the DISCOMs claims should be investigated thoroughly by the Commission based on a scientific study using details on metered input energy data at the feeder/ DT level, verification of consumer numbers and connected load, etc.

4. Distribution business and Quality of supply and service

Transmission and Distribution (T&D) losses (especially distribution losses) are often used as an important performance metric of the DISCOM as it impacts power procurement costs and DISCOM finances. Distribution losses are also closely linked to the frequently cited aggregate technical and commercial (AT&C) losses. The Rajasthan DISCOMs reported distribution losses of 20% and AT&C loss of 24% in FY18.¹⁸

As mentioned earlier, the estimation of distribution losses is closely linked to the estimation of agricultural demand. However, it is also tied to the extent of investment and maintenance on the DISCOM wires.

Between FY15 and FY19, an estimated Rs.21,400 crores have been invested in various capital works in the state distribution network. The annual investment has been growing at an average annual rate of 9% since FY15. While a majority of these investments are financed by loans, an average of 30-50% is financed by state and central government grants as well as state government equity. This is because half the capital investments are under centrally sponsored programmes such as DDUGJY, IPDS and about 45% of remaining investments are for state government supported rural electrification programmes and projects to strengthen the transmission and sub-transmission network.¹⁹

A major capital investment project undertaken by the state was to ensure separate feeders for agriculture in rural areas. As of FY18, about 49% of the predominantly agricultural feeders are reported to have been separated. This has the potential to enable provision of reliable power supply to homes and enterprises in rural areas and also facilitate investment in Component A of the KUSUM scheme.

As per DISCOMs' audited accounts, their annual capital expenditure was Rs. 3,477 crores in FY18, and has been growing at an average annual rate of 17% since FY15. It primarily consists of interest on long-term loans and depreciation. This is because the DISCOMs have been forgoing their regulated return on equity for almost a decade citing the unsustainably high revenue gaps as the reason.

¹⁷ For more details on the progress of implementation of Component A KUSUM scheme, read: <https://prayaspune.org/peg/resources/power-perspective-portal/221>

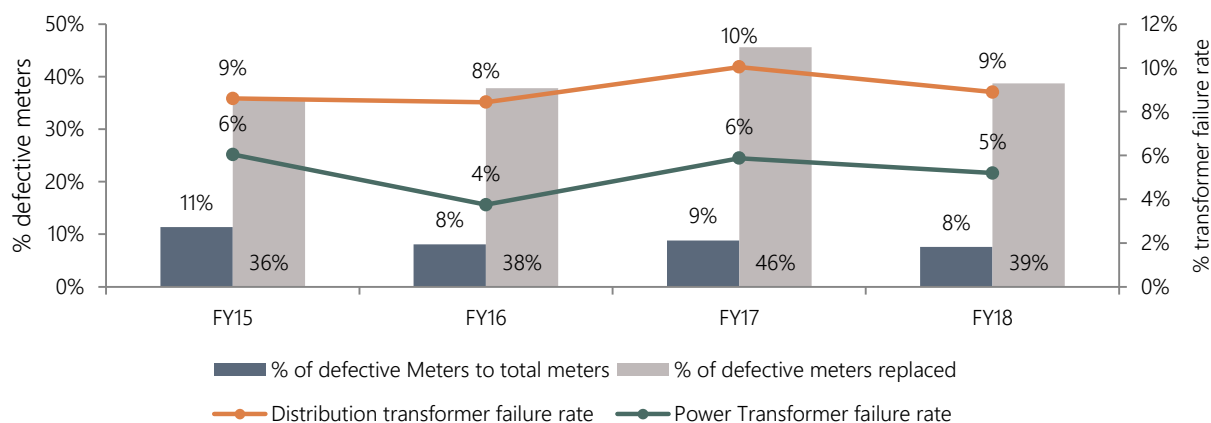
¹⁸ Based on report by Power Finance Corporation: https://www.pfcindia.com/DocumentRepository/ckfinder/files/Operations/Performance_Reports_of_State_Power_Utilities/Report_on_Performance_of_State_Power_Utilities_%202017_18.pdf

¹⁹ The extent of equity and grant support from the central and state sector sponsored schemes vary widely.

As per DISCOM filings, operation and maintenance expenses (O&M) including employee expenses, expenditure on repair and maintenance as well as administration has been increasing at the rate of 4% per annum since FY15. In FY18, RERC approved O&M expenses of Rs. 3,233 crores of which 77% of the expenses were on employees. In stark contrast, the expenses on repair and maintenance have been about Rs. 300 to 500 crores per annum. The modest increase in crucial operation and maintenance expenses could be indicative of cash-strapped utility forgoing expenses to reduce its working capital requirement.

Reduced O&M expenses could also be a sign of increased efficiency unless it comes at the cost of poor supply and service quality. Figure 12 details indicators related to service quality which, despite investments have not shown a marked improvement.

Figure 12: Select service quality indicators for which information was available



Source: Prayas (Energy Group) compilation from true-up submissions of DISCOMs

It must be noted that there is some variation in the reported indicators across DISCOMs. For example, DT failure rate for AVVNL is three percentage points higher on an average than the other DISCOMs and power transformer failure rate is two percentage points higher in JdVVNL than the others.

Along with service quality, safety is another grave issue which could be improved with adequate attention, investment and adoption of better operational practices by the DISCOMs. About 9% of the deaths due to electrocution in India in 2018 took place in Rajasthan.²⁰ The number of deaths in the state is the highest in the country after Madhya Pradesh, Maharashtra and Uttar Pradesh.

²⁰ For more details, please refer the 2018 report on Accidental Deaths and Suicides in India by the National Crime Records Bureau, Ministry of Home Affairs, Government of India. It is available here: <https://ncrb.gov.in/sites/default/files/ADSI-2018-FULL-REPORT-2018.pdf>

In a bid to reduce distribution and AT&C loss, DISCOMs have also appointed franchisees for high loss areas to manage billing and revenue collection, O&M and investments. The details for these franchisees are listed in Table 4.

Table 4: Details of franchisees awarded in Rajasthan

Franchised area	Kota	Bharatpur	Bikaner	Ajmer
DISCOM	JVVNL	JVVNL	JdVVNL	AVVNL
Awarded to	CESC Limited	CESC Limited	CESC Limited	Tata Power
% of DISCOM sales in FY18	4.29%	1.06%	3%	2%
Operational from	Sep-16	Dec-16	May-17	Jul-17
Period of contract	20 years	20 years	20 years	20 years

Source: Prayas (Energy Group) compilation from Request for Proposals, tariff orders and franchisee websites

As there has been no performance evaluation or separate monitoring of the quality of supply and service, capital investment and AT&C losses in the franchisee area, it is difficult to ascertain if these franchisees are beneficial.

5. The financial position of the distribution utilities

5.1 Nature and extent of financial crisis

The accumulated liabilities of state utilities are an indicator of the sector's financial distress. The liabilities of the Rajasthan DISCOMs increased ten-fold in the decade after the reforms. They were about Rs.3, 789 crores in 1999²¹ and increased to Rs. 39,710 crore by 2011-12.²² By the time the central government scheme, UDAY (Ujjwal DISCOM Assurance Yojana) was launched the liabilities had ballooned to Rs. 80,530 crores.²³ In effect, the liabilities grew by 20% per annum in real terms between FY12 and FY16.

About Rs.62, 400 crores of liabilities are supposed to be taken over by the state government under UDAY.²⁴ These liabilities consist of mostly short-term loans undertaken to:

- meet gaps due to costs disallowed by the regulator,
- meet expenses when faced with delay in revenue recovery and subsidy payment.

Under UDAY, the DISCOMs had committed to limiting their short-term borrowing. However, by FY18, two years after UDAY was launched, the outstanding working capital loans were already at a whopping Rs. 14,826 crores.²⁵

Delay in subsidy payments will have significant impact on short-term borrowing given that more than 1/5 of the revenue requirement is met by subsidies. The delay in annual subsidy payments is indicated in Figure 13.

²¹ Rajasthan Power Sector Transfer Scheme :

http://energy.rajasthan.gov.in/content/dam/raj/energy/dept_of_energy/pdf/misc/TRANSFER_SCHEME_2000_Amended.pdf

²² Financial Restructuring Plan 2012:

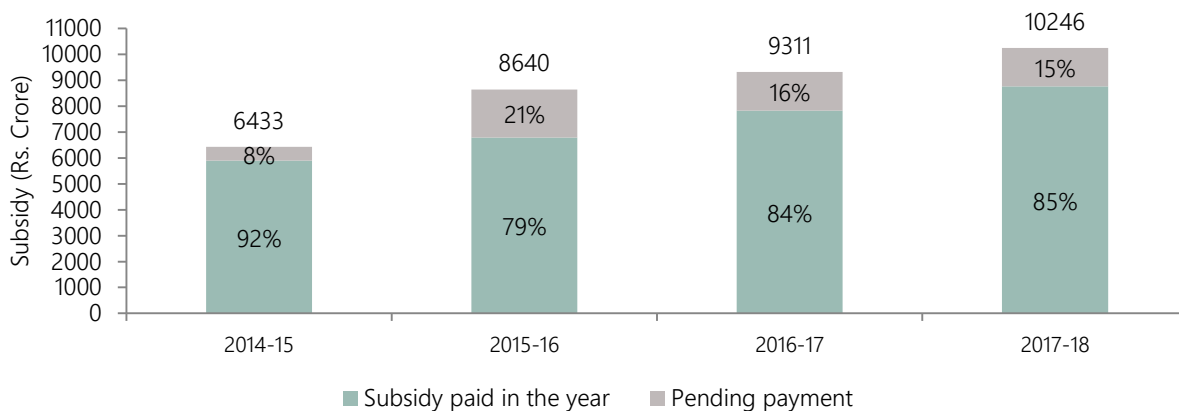
https://powermin.nic.in/sites/default/files/uploads/Financial_restructuring_of_State_Distribution_Companies_discoms_Oct_2012.pdf

²³ UDAY MoU for Ajmer, Jaipur and Jodhpur DISCOMs: https://www.uday.gov.in/MOU/Rajasthan/MoU_Jodhpur.pdf, https://www.uday.gov.in/MOU/Rajasthan/MoU_Jaipur.pdf, https://www.uday.gov.in/MOU/Rajasthan/MoU_Ajmer.pdf.

²⁴ Of this, 71% was taken over as state government bonds and the rest was financed by state government loans, equity.

²⁵ For a more detailed analysis of these working capital loans, please read: <https://prayaspune.org/peg/resources/power-perspective-portal/227>

Figure 13: Extent of subsidy paid and delays in payment over the years



Source: Prayas (Energy Group) compilation from true-up submissions of DISCOMs

Poor revenue recovery due to issues with payment of bills by customers is also a contributor though there is no recent disaggregated evidence in regulatory documents to ascertain its contribution.

In order to ensure timely recovery of additional, fuel and power procurement expenses that are fait accompli (such as costs to change in fuel prices, legal dispensation etc.), the DISCOMs levy a fuel surcharge on consumers. Provision for such timely recovery for expenses incurred reduces the strain on DISCOMs' working capital requirement. However, as discussed earlier, it seems like such measures are not sufficient to arrest the growth in working capital borrowings. In FY18, the surcharge accounted for only 1% of the total revenue from retail tariffs.

5.2 Regulatory treatment of debt take-over under UDAY

In a bid to rationalise tariff impact in the face of rising costs, RERC has been deferring revenue recovery to meet the total costs approved by it to subsequent years. This accumulates over the years along with allowed interest expenses (called carrying cost) and forms the cumulative revenue gap or regulatory asset. By FY16, the cumulative revenue gap approved by the RERC stood at around Rs. 47,846 crores.

In the tariff order for FY17,²⁶ the RERC stated that the DISCOMs had accumulated Rs. 92,700 crores in accumulated losses by FY16. With the loans taken over under UDAY, these losses were effectively reduced to Rs. 37,600 crores. By FY16, the cumulative revenue gap approved for recovery from consumers stood at Rs. 47,800 crores. As the accumulated losses were reduced by the UDAY taken over, the Commission assumed that the revenue gap should also reduce. Thus, the cumulative revenue gap or the unfunded gap was restated to Rs. 37,600 crores, the same as the remaining losses of the DISCOM after UDAY take over.²⁷ This restatement resulted in a Rs. 15,000 crore reduction in the cumulative revenue gap approved by RERC. While this treatment results in lower tariffs for consumers in the future, it is effectively a write-off of prudent costs approved by the Commission to be recovered from consumers.

The take-over of debt under UDAY was restricted to loans taken by the DISCOM, to finance its losses. The losses of the DISCOMs include the cumulative revenue gap but are not limited to it as it also includes disallowed expenses. Additionally, a write-off of receivables from consumers (i.e- the revenue gap) in lieu of the take-over of short-term liabilities (i.e- debt taken over under UDAY) would in effect not improve the

²⁶ Page 59, Petition No. RERC 1077/17, 1078/17, 1076/17: <https://rerc.rajasthan.gov.in/rerc-user-files/tariff-orders>

²⁷ It must be kept in mind that losses and revenue gap are not the same as losses also includes disallowed and non-regulated costs.

financial position/ the balance sheet of the DISCOM. Such adjustments can be justified if the state government intended to transfer the take-over under UDAY in the form of grants as this effectively implies that the receivables are also being taken over as grants. However, 48% of the takeover has been transferred through loans which have to be paid by the DISCOMs. It is not clear if the interest for these loan payments are recovered through the ARR. Given these adjustments and lack of systematic tracking of accumulated liabilities and losses it is challenging to ascertain the current financial position of the DISCOMs. Between FY16 and FY18, the cumulative revenue gap rose by 9% indicative that the financial distress persists.

About 35% of the total debts taken over under UDAY were for term-loans undertaken for capital investments. It is unclear if the interest on long term loans for the projects have been rationalised to account for UDAY debt take-over, thus reducing the burden on consumers.

6. ERC functioning and effectiveness of accountability

The Rajasthan Electricity Regulatory Commission has a challenging and crucial duty to regulate the cash-strapped utilities, ensure market development via open access and captive generation and protect the interests of consumers, especially small consumers. Thus, regulatory effectiveness can have a major impact on the sector development.

To carry out its functions, RERC's website reports staff strength of 17 officers and a three member commission. The officers include three directors, seven deputy directors and seven assistant directors.²⁸ RERC has seen delays in filling vacancies for the posts of chairperson and members in the past. Since its inception, 50% of the vacancies were filled within three months. However, it took three months to a year to fill vacancies 36% of the time and more than a year 14% of the time.

Since its inception the Commission has had five chairpersons and eleven members. Three out of five chairpersons were previously bureaucrats working in senior positions with the Rajasthan government and one of them was an employee of a regulated utility. Similarly, six of the 11 members were bureaucrats working with the state government and the other 5 were with the regulated utilities in the state. While their experience gives them knowledge and expertise to better regulate the sector, it is also likely that their previous association reduces their independence.

In the recent years, RERC has taken several initiatives to ensure transparency, public participation and protect consumer interest. Since FY16, RERC has approved Rs. 50 lakhs for each DISCOM for activities related to consumer education. In FY20, unlike the past, the Commission conducted extensive public hearings in multiple locations in the state for the tariff determination process. Further, the Commission also conducts public hearings for approval for capital investment plans and other issues related to tariffs.

Additionally, the Commission also issued directions to the DISCOMs and the Electrical Inspector (EI) in the state to address issues related to safety.²⁹ The directives focus on timely provision of relevant information to the EI which the EI should use for periodic reporting to the state government, quarterly internal monitoring of safety training activities of the DISCOMs, efforts to increase safety awareness and creation of a safety manual. Compliance to these directions is not currently being reported in a systematic fashion in the public domain.

As an institution, the Commission could have taken certain initiatives over the years which would have ensured increased accountability of the utilities. Some instances are highlighted below:

²⁸ For more details, please see: <https://erc.rajasthan.gov.in/erc-support/officer-list>

²⁹ Directions provided in Order on Petition No. RERC 1365/18 dated 7th March 2019 in the matter of review of RERC tariff order 28.05.2018 passed in the Petition No. 1294/17, 1295/17 and 1296/17.

- *Power procurement planning:* Much of the high cost capacity addition in the recent past was undertaken after regulatory scrutiny. There are instances where base-load capacity addition was approved by RERC despite clear evidence that it was not necessary to meet demand. Such capacity addition has resulted in sustained, high cost surplus capacity with the DISCOMs. Tariff determination for the state-owned and private capacity was also approved by the regulator and a more thorough and prudent assessment of performance and costs could have benefitted consumers in the long-run.
- *Increased oversight of supply and service quality:* Several consumers and consumer groups have been repeatedly highlighting issues with respect to poor metering and billing practices and poor quality of networks. However, there have been limited regulatory measures to quantify and understand the extent of issues with supply and service quality in the state. The DISCOMs submit limited and incomplete information in compliance with Standards of Performance (SoP) regulations. What is submitted, is not verified or cross-checked by the Commission in a systematic manner. Beyond redressal of individual grievances, there is limited accountability for supply and service quality issues at the DISCOM level. For instance, despite several metering and billing related issues being highlighted in tariff processes, there is also no publicly available information of RERC initiating process for third party audits of the DISCOMs metering and billing systems in recent years.
- *Estimation of agricultural demand:* RERC should ensure that the annual agricultural demand estimation takes place based on a scientific assessment of the status of metering of agricultural consumers and that such assessment uses metered data from DTs and feeders to assess consumption. Further, a more detailed scrutiny of agricultural sales should be done during true-ups as well. This, along with a third party energy audit at the sub-division level would give necessary insights into the actual distribution and AT&C loss.
- *Ensuring timely tariff and true-up processes:* For many years, the Commission did not conduct tariff determination and true-up processes on a regular basis as shown in Table 5.

Table 5: Frequency of tariff determination and true-up processes

Utility	Observations on tariff determination and true-up process
All DISCOMs	No tariff order issued for FY02, FY03, FY08 and FY11. Typically, the tariff order is issued before commencement of the financial year. However, on an average, tariff orders were issued 7 months after April 1 st . True-ups have taken place for all years but with significant delays ³⁰ for 9 of the 18 true-up orders.
RUVNL	Since RERC's inception, tariff orders have been issued for all years till FY19 except from FY01 to FY04. As in the case of DISCOMs, the tariff orders were issued at least 6 months after the 1st of April. Since FY05 true-ups have been undertaken for all years except FY09 and FY10
RVPNL	Tariff orders have been issued till FY19 except for FY02, FY03. There is an average for 4 month delay in issue of the tariff order. True-ups have not been conducted for FY01 to FY04 as well as FY08 and FY09.

Source: Prayas (Energy Group) compilation from various tariff determination and true-up orders

³⁰ More than 3 years since issue of tariff order. In case of no tariff order has been issues for the year, delay for more than 3 years since April 1st of the trued-up year.

- *Implementation of Multi Year Tariff (MYT) Process:* It is extremely crucial that RERC ensures a medium-term approach to performance and cost assessments of the utilities. This is vital given the rising uncertainty in demand (due to open access, captive consumption and roof-top solar use, increased demand from newly electrified consumers) and challenges with power procurement planning (utilisation of contracted thermal capacity, increased penetration of variable renewable energy). Such an exercise would have been imminently possible if the Commission has ensured that all utilities had undertaken a multi-year tariff exercise. However, the tariff regulations notified by RERC provide utilities the option to file a petition for annual or multi-year tariff determination and no DISCOM has opted to file a MYT petition till date. As this approach would have ensured tariff certainty, periodic review of capacity addition plans, medium-term estimation of load/demand, increased performance accountability and reduced regulatory risk, the Commission's regulations and directions should have ensured its implementation.

Given the current trends, the financial crisis before the DISCOM will only worsen unless there is timely regulatory and policy action to address issues and respond to changes in the sector. It is hoped that the state government, RERC and the utilities are up for this challenge.

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