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Electricity Distribution Concessions in Odisha

An Initiative of the MIT-Comillas Universal Energy Access Lab

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This case study was prepared by Ignacio Pérez-Arriaga (Visiting Professor at MIT, Professor at Comillas Pontifical University. Director of Energy Training at the Florence School of Regulation) and Paolo Mastropietro (Researcher at Comillas Pontifical University); all the data used in this case study are real and have been collected from public sources or provided by Tata Power.

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Initial reports from Odisha, India, were slowly coming into the Tata Power headquarters in Mumbai, where CEO Praveer Sinha was waiting for them in a state of expectation and apprehension. The Eastern Indian state, where Tata Power had recently been awarded four electricity distribution concessions, had been hit by cyclone Yaas, a very severe storm that had left a trail of devastation, damaging houses, destroying farmlands, and disrupting the electrical network. Following meteorological alerts, the company had carried out predictive maintenance at strategic sites and had already mobilized nearly 15,000 workers for the restoration of service. A single point of contact, active 24x7, was established for all affected customers so they could notify Tata Power of any emergencies.

Reports were dramatic, but they showed that, with support from the state government, the company was managing the crisis efficiently. Power supply was never lost in the two main cities, Bhubaneswar and Cuttack, and it had been reestablished in 70% of the service area within 8 hours. The restoration work was complicated by the new wave of COVID-19 in the country, which had reached its peak just a few weeks earlier; however, the company had implemented a thorough testing protocol to limit the spread of the virus. The CEO started experiencing an initial feeling of relief. The new corporate culture, based on technological innovation, customer engagement, and staff motivation, that he was trying to bring to Odisha electricity distribution was showing results.

Dr. Praveer Sinha had been appointed CEO and Managing Director of Tata Power Company Limited in May 2018. An electrical engineer, Sinha had over three decades of experience in the power sector, deploying power plants in India and abroad. Since

2012, he has served as managing director of Tata Power Delhi Distribution Limited (TPDDL), the power distribution company that supplies electricity to North Delhi. In Delhi, he had decisively contributed to the success of the concession by introducing the same corporate culture that he was now trying to transfer to Odisha.

Delhi was not the only experience of Tata Power in the electricity distribution sector. The company had also been awarded distribution licenses in Mumbai and Ajmer, which along with a handful of other distribution concessions in comparatively affluent Indian cities, were clear success stories.

Praveer Sinha was now at the helm of India's largest integrated power company. When he took office, Tata Power was embarking in a new tender for distribution licenses, this time in Odisha, a mainly rural setting. The state, and its Regulatory Commission, had pioneered distribution licenses in India back in 1999, with the award of four distribution concessions to private companies. All of them had failed, ending with the resignation of the concessionaire or termination for poor performance. Now, the regulatory authority, taking advantage of the lessons learned in the previous experience, was offering new licenses and launching tenders to attract private capital. Guided by Sinha, Tata Power was awarded the four distribution concessions in close succession and, by April 2021, had gained control of electricity distribution throughout Odisha, right at the cusp of the COVID-19 pandemic in India.

With these concessions, Tata Power was breaking new ground, and not only in the Indian context: with 40 million new customers, many of them living in poor rural villages spread across the state, the Odisha project was unique in the entire developing world. It could have strategic value beyond short-term monetary considerations, but faced considerable implementation difficulties.

At the inauguration ceremony of the first of the four companies, TPCODL (Tata Power Central Odisha Distribution Limited), Sinha said: "Recently, our focus has been on increasing the company's existing footprint in distribution of electricity through Public-Private-Partnerships (PPP) with discoms. This tie up with CESU is the latest such partnership in the distribution business". Tata Power President for Transmission and Distribution, Sanjay Banga, added: "We hope to transform Odisha distribution system with 24x7 reliable power and unmatched customer services with extensive social engagement using our existing experience in distribution of electricity in Delhi, Mumbai, and Ajmer".

Several years of normal operation, which has so far been disturbed by the COVID-19 pandemic, will be necessary to gather enough information to evaluate the decision by Tata Power to take over distribution concessions in Odisha and the managerial approach of Praveer Sinha running this important part of the company. If successful, it will provide an example not only for other Indian states, but also for other emerging

countries that struggle to fix their distribution utilities and provide universal electricity access within their territories.

The following sections describe the evolution of the electricity distribution sector in Odisha, the main elements of the new licenses designed by the regulator, and the main challenges that Tata Power is facing in its new activity. The document also contains three boxes that provide some context on Tata Power and its activity in the distribution business, international experiences with distribution concessions, and electrification programmes in India.

Box 1: Tata Power and the experience with distribution in Delhi

Tata Power is India's largest integrated power company and, together with its subsidiaries, has an installed capacity of more than 13 GW. It has a presence across the entire power sector, including generation of renewable as well as conventional power (hydro and thermal energy), transmission, and distribution. Tata Power is a company belonging to the Tata Group, a global enterprise founded by [Jamsetji Tata](#) in 1868, headquartered in India, and comprised of 30 companies across ten verticals. [Tata Sons](#) is the principal investment holding company and promoter of Tata companies. 66% of the equity share capital of Tata Sons is held by philanthropic trusts, which support education, health, livelihood generation, and art and culture. Each Tata company or enterprise operates independently under the guidance and supervision of its own board of directors.

In 2002, Tata Power was awarded the concession for electricity distribution in North Delhi and, since then, has operated Tata Power Delhi Distribution Limited (TPDDL), holding 51% majority stake of the joint venture with the city government. During the first ten years of the concession, the company was able not only to comply with the loss reduction trajectory specified in its bid, but also to exceed those targets, bringing down losses from 48.1% in 2002 to 10.8% in 2013. In the same period, the company was able to dramatically improve the reliability of supply and to strongly enhance customer services, with a significant reduction of the time required for new connections or bill complaint resolutions.

Tata Power achieved these objectives through a tailored managerial structure that allowed it to define a corporate strategy and to progressively achieve all the goals that it set. The main initiatives carried out by the company can be divided among three broad categories (TERI, 2015):

- Technical innovation to reduce losses and improve reliability: The utility replaced more than 800,000 electromechanical meters, installed new

capacity transformers placed near load centres, introduced distribution automation in most grid substations, and decentralised operation and maintenance activities, ensuring fast response for fault restoration through a 24x7 mobile maintenance crew.

- Consumer-centric initiatives to promote the image of a consumer-friendly organisation close to its clients: Communication with customers was dramatically improved through new lines of interaction and the introduction of consumer satisfaction surveys. Specific activities were organised in slums to improve the job opportunities of their inhabitants and, therefore, their ability to pay bills. Meanwhile connection fees were reduced for certain categories of consumers. The utility also defined a specific strategy to fight power theft, but focusing it on the certainty of punishment rather than its severity.
- Staff motivation and enhanced employee experience: The new company inherited more than 5,000 employees and had to introduce a totally different work culture to achieve its objectives. It renovated most of its office buildings, improving hygiene and sanitation. It created a training centre to provide capacity building to all staff members, and it introduced a performance-based remuneration regime with voluntary enrolment.

The achievements of Tata Power in Delhi were commendable and showed the potential benefits of private involvement in the electricity distribution activity in India. However, it is important to note that the concession in Delhi was in a fully urban setting, which is different in the case of Odisha.

I. BACKGROUND ON ODISHA

Odisha (formerly known as Orissa) is an Indian state located on the east coast of the country. The economy of Odisha is predominantly based on agriculture, with 65% of the workforce deriving employment from this sector (GoO, 2016) and 83% of the population living in rural areas (Hoda et al., 2021). Although the state is registering a fast economic growth, a large part of its population still lives below the poverty line (Panda and Padhi, 2020). The Odisha territory is characterised by frequent cyclones and floods, which hamper economic development (Bahinipati and Venkatachalam, 2016).

The power sector of Odisha was historically under the control of the Odisha State Electricity Board (OSEB), a vertically integrated state-owned company established in 1961 and responsible for generation, transmission, and distribution. The performance of the monopolist was poor, its financial health deteriorated over the years, and it required constant financial support from the state government. It was estimated that

by 1996 the government of Odisha had to provide OSEB with an annual subsidy of more than 40 million USD (TERI, 2015).

Vertical unbundling and initial privatisation of the distribution activity

To improve the efficiency of the electricity supply, attract private investments, and reduce the burden for the state budget, the power sector of Odisha underwent a major reform process in 1995. With its Electricity Reform Act, Odisha was the first state to carry out a vertical unbundling in India. An independent regulator, the Odisha Electricity Regulatory Commission (OERC), was established. All thermal generation units were transferred to the Odisha Power Generation Corporation (OPGC), while the newly created Odisha Hydro Power Corporation (OHPC) took on hydropower plants. All transmission and distribution assets were transferred to the Grid Corporation of Odisha Limited (GRIDCO), also in charge of system operation.

In 1998, the distribution segment was formally separated from the transmission company, with the creation of four companies in charge of different distribution areas: WESCO, NESCO, SOUTHCO, and CESCO (Western, North-Eastern, Southern, and Central Electricity Supply Corporations). The four utilities were provided with a clean balance sheet, i.e., the accrued losses of the distribution business were retained by GRIDCO (TERI, 2015). This was the first step towards allowing the entry of the private sector, which materialised through a complex bidding process for 51% of the equity of each distribution company that was initiated in 1998. Eventually, WESCO, NESCO, and SOUTHCO were handed over to BSES Limited, while CESCO was sold to a consortium formed by AES and Jyoti Structures. As further analysed in Box 2, this was a pioneering experience for electricity distribution concessions in a mostly rural environment.

The outcome of this first wave of licenses, however, did not comply with expectations. None of the companies were able to reduce the very high losses (technical and commercial ones) that characterised the distribution activity in Odisha. Furthermore, in those years, the state was affected by extreme weather events, which required substantial investments for the reconstruction of part of the grid and further complicated the financial situation of the distribution firms. AES walked out of the management of CESCO in 2001 and the company was put under the control of a public administrator, under the new name CESU (Central Electricity Supply Utility of Odisha). The other three licenses were revoked in 2015 due to poor performances under the private management. The four distribution companies returned to public hands.

Starting from 2016, the Regulatory Commission undertook a new privatisation process, which took advantage of the lessons learned in the previous experience and tried to overcome the main limitations of the initial licenses.

Box 2: Rural electrification concessions

Public-private partnerships (PPP) are an essential tool to foster universal energy access by attracting private capital and expertise. In the distribution segment, these partnerships may take the form of concessions. This term is commonly used to define a situation in which a firm is granted exclusive rights for the provision of a service over a certain territory. The activity is carried out under the requirements of a contract with the state, which in many countries, including India, is materialised in a license. In other countries, most of the conditions are predefined in an electricity act, and their secondary developments and an ad-hoc concession contract establishes the specific additional terms of the PPP agreement.

Concessions for rural electrification have been analysed in the specialized literature (Hosier et al., 2017; Jacquot et al., 2020). They can be classified according to the level of involvement of the private partner in the diverse activities involving distribution (Figure 1), as well as with the allocation of the different risks that characterise these activities in emerging economies. Generally, risk is distributed among the concessionaire, the government, and consumers according to which player is in the best position to manage it.



Figure 1. Different level of private engagement in concessions (Hosier et al., 2017).

However, concessions can be also classified according to the characteristics of the distribution area. Electricity distribution in rural areas faces several additional challenges with respect to concessions in urban or peri-urban zones. The unit cost of the service is higher, the demand for electricity is lower and subject to higher uncertainties, and the purchasing power of customers is also commonly lower, requiring subsidised end-user tariffs and/or grants and compensations from the state or donors to guarantee full cost recovery for the concessionaire. The key regulatory feature of concessions is that they allow

the definition of a new business model starting from a clean slate, shielding the new activity from the legacies of the past management of the distribution company. Therefore, it is possible to define, by mutual agreement, a perfectly viable business model for the concessionaire during the term of its concession.

Most concessions in emerging countries, so far, have covered urban areas and zones that have already been electrified. In rural areas, there have been several experiences with mini-grid and solar-home-system concessions. A successful example is the *Luz en Casa* (Light at Home) initiative in Peru started in 2009, which provided electricity to 3,500 households through solar home systems. The concession covers some rural areas that were not planned to be reached by the network. The concessionaire is in charge of the installation and maintenance of the solar home systems and receives a regulated remuneration for each unit, periodically calculated by the regulator to guarantee cost recovery and efficiency. End-user tariffs are defined considering affordability principles and do not cover the entire regulated remuneration. The difference is paid through a specific national fund, partly financed through surcharges in the tariffs of high-demand grid-connected customers, i.e., by tariff cross-subsidisation.

A similar approach was followed in Argentina with the PERMER project (*Proyecto de Energías Renovables en Mercados Rurales* in Spanish or Renewable Energy for Rural Markets Project in English), which promoted the installation of renewable energy systems in rural communities not yet reached by the distribution network. The implementation of the project was particularly successful in the Jujuy province, where two concessions were already in place for the distribution activity and for the provision of the service to rural customers through off-grid solutions. The latter activity benefitted from the PERMER project, which allowed the installation of micro-grids and solar home systems, with a regulated remuneration for the concessionaire that is updated every six months and subsidised end-user tariffs financed through a fund raised from a specific fee on purchases in the wholesale electricity market.

The experiences on rural concessions are commonly limited to one electrification mode and rarely consider a mandate to provide the service over a broad rural area. According to Hosier et al. (2017), the only experience with a rural zonal concession was the PPER (*Programmes Prioritaires d'Electrification Rurale* in French or Priority Programmes for Rural Electrification in English) scheme implemented in Senegal starting in 2003. These concessions were completely focused on access; the areas identified by the regulator were not connected to the grid and they were large enough to ensure some economies of scale. The concessions were meant to be technology-neutral, meaning that the

concessionaire was free to select the electrification mode that best suited each part of the distribution area. A subsidy on capital investments was provided by the state to each concessionaire. The Senegalese experience, however, is not considered as a successful one (Diouf and Miezán, 2021). The process to establish the concessions was very slow, the progress towards electrification has not been satisfactory, and the companies involved faced financial instability. The main causes of this failure were identified as flaws in the design of the tariffs for new consumers, the absence of clear rules for the concessionaires to purchase energy from the main grid, lack of cooperation by the publicly owned utility in possession of the main grid, and the low level of economic development in the concession areas.

It must be remarked that the distribution licenses in Odisha differ from the concession examples presented in this box, since in Odisha, as in all of India, full electrification has been achieved, at least on a formal level, through grid extension in the framework of the DDUGJY and the Saubhagya Programmes (see Box 3).

II. THE NEW CONCESSIONS

In 2016, the Regulatory Commission launched the first call for tenders for the distribution activity of CESU. Similar bidding processes were subsequently launched for the other three distribution companies. The conditions specified in these requests for proposals considered a 25-year distribution concession, in which the private partner acquires 51% of the assets while the remaining 49% remains with the Government of Odisha through GRIDCO. The key objectives of the new concessions, as defined by the Regulatory Commission in the request for proposals for the first license, were the following:

- i. improve the operational efficiency to reduce technical and commercial losses and ease the burden of inefficiency on consumers;
- ii. improve the quality, security, and reliability of supply and make electricity available at a competitive price;
- iii. bring in effective and professional management of the distribution company, by hiring experienced and seasoned senior staff;
- iv. define an effective strategy to collect past arrears from consumers;
- v. ensure necessary capital investments to support future demand growth, improve the distribution system, and introduce technical innovations; and
- vi. ensure a robust consumer indexing and reduce billing errors.

The bidders were required to define commitments on several of these aspects, such as the reduction of losses, investment plans, or the collection of past arrears. All these

elements were clearly specified in the requests for proposals and the regulatory transparency of the process enhanced the confidence from investors. Furthermore, in comparison with the first wave of privatisations, the new process was characterised by a stronger coordination and alignment of goals between the state government and the Regulatory Commission, two actors that were equally important for the success of the new licenses.

Albeit at different times, the four concessions were awarded to Tata Power, which, as mentioned in the introduction, had already been awarded distribution concessions in Delhi, Mumbai, and Ajmer. TPCODL (Tata Power Central Odisha Distribution Limited) started operation in June 2020, TPWODL and TPSODL (Western and Southern Odisha) in January 2021, and TPNODL (Northern Odisha) in April 2021. Most of the liabilities stemming from the previous licenses were not transferred to the new companies. Before outlining the main elements of the new licenses, the next subsection will describe the four distribution areas.

The four distribution areas

The State of Odisha has around nine million electricity customers. Figure 2 shows how these end users are allocated among the four distribution companies and their subdivision between urban and rural customers. The two largest companies in terms of number of customers are TPCODL and TPSODL, while the percentage of rural customers ranges from 70% in TPWODL to 82% in TPNODL. As already mentioned, such a high share of rural customers is one of the peculiarities of the electricity distribution concessions in Odisha.

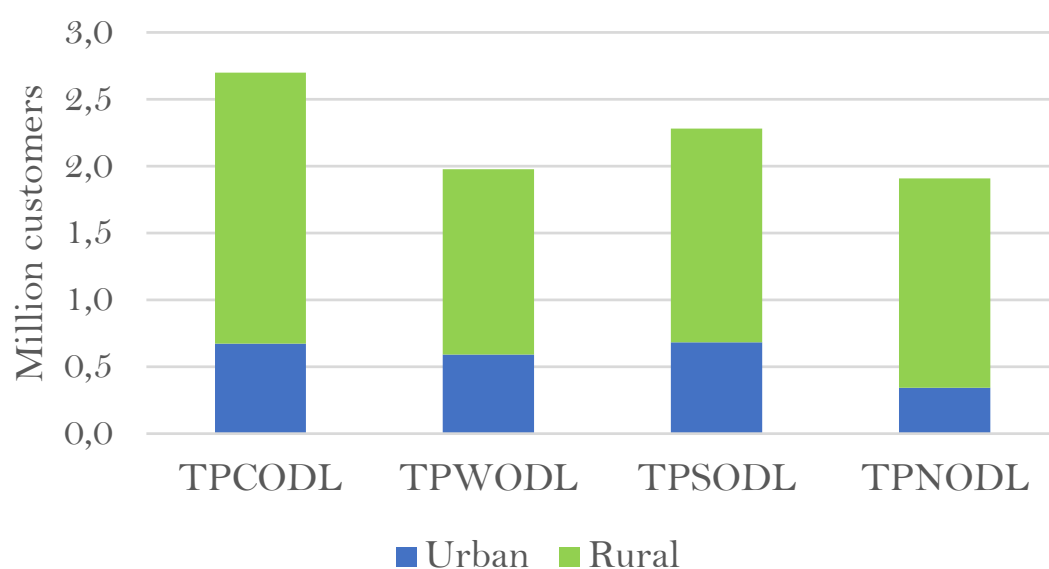


Figure 2. Number of urban and rural customers for each distribution company.
Source: OERC (2021), data for 2020.

Another feature that differentiates the four distribution areas is the number of customers below the poverty line, or BPL¹ (Figure 3), an indicator of the socio-economic conditions in each zone. In this case, TPSODL hosts more than 400,000 BPL customers, which is four times more than TPCODL.

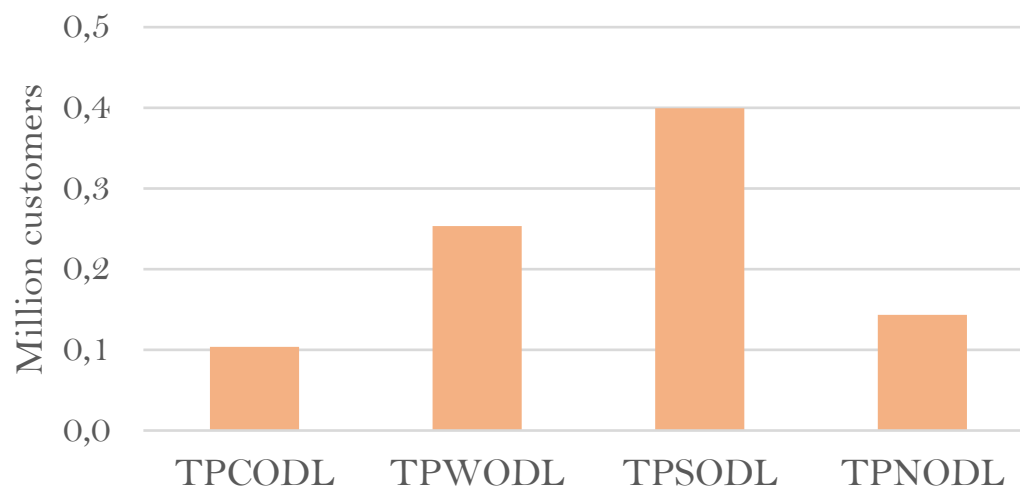


Figure 3. Number of customers below the poverty line for each distribution company.
Source: OERC (2021), data for 2020.

This socio-economic disparity partly explains the significant difference in the electricity demand in the four distribution areas. As it can be observed in Figure 4, although TPSODL ranks second in terms of number of customers, it registers the lowest energy sales among the four distribution firms. The behaviour of the maximum load in each distribution grid follows a similar trend.

¹ In the entire Indian territory, BPL customers receive two kinds of support: free connections to the grid, as in the framework of the Saubhagya Programme, and subsidised tariffs for low-volume consumers. The latter are expressed in most Indian States, including Odisha, as increasing block tariffs (IBT), in which the first tier of consumption is subject to a tariff below cost recovery, regardless of the total consumption or the socio-economic condition of the household. According to Mayer et al. (2015), this approach is inefficient in tackling energy poverty, with 87% of subsidy payments going to households above the poverty line instead of to the poor, and over half of subsidy payments being directed to the richest two-fifths of households.



Figure 4. Energy sales and maximum load in each distribution area.

Source: OERC (2021, 2020a), data for 2020.

The peak demand in the entire Odisha power sector in 2020 was 4,337 MW (OERC, 2020a). In 2019, the installed capacity in the state was equal to 5,710 MW (2,334 MW of hydropower, 3,218 MW of thermal generation, and 158 MW between solar photovoltaic and biomass; OERC, 2020b).

After this initial characterisation of the distribution areas, the following subsections will describe the main elements of the new licenses awarded in 2020/2021.

Reduction of losses

The high electricity losses registered in Odisha probably represent the major challenge of the distribution business. Losses impede cost recovery, deteriorate the financial health of the companies, and hinder new investments. In India, distribution losses are referred to as AT&C, i.e., aggregated technical and commercial losses. They encompass the billing efficiency, i.e., the total energy billed to consumers divided by the total energy input² (both in kWh); and the collection efficiency, i.e., the collected revenues divided by the billed amount (both in INR). They are commonly calculated as: $1 - (\text{billing efficiency} \times \text{collection efficiency})$.

Figure 5 shows the historical distribution of AT&C losses in Odisha before the new licensing process, which oscillated around 40% before entering a slow decreasing trend in the recent years.

² The total energy input is the energy withdrawn from the transmission network; therefore, the billing efficiency encompasses technical losses.

ELECTRICITY DISTRIBUTION CONCESSIONS IN ODISHA

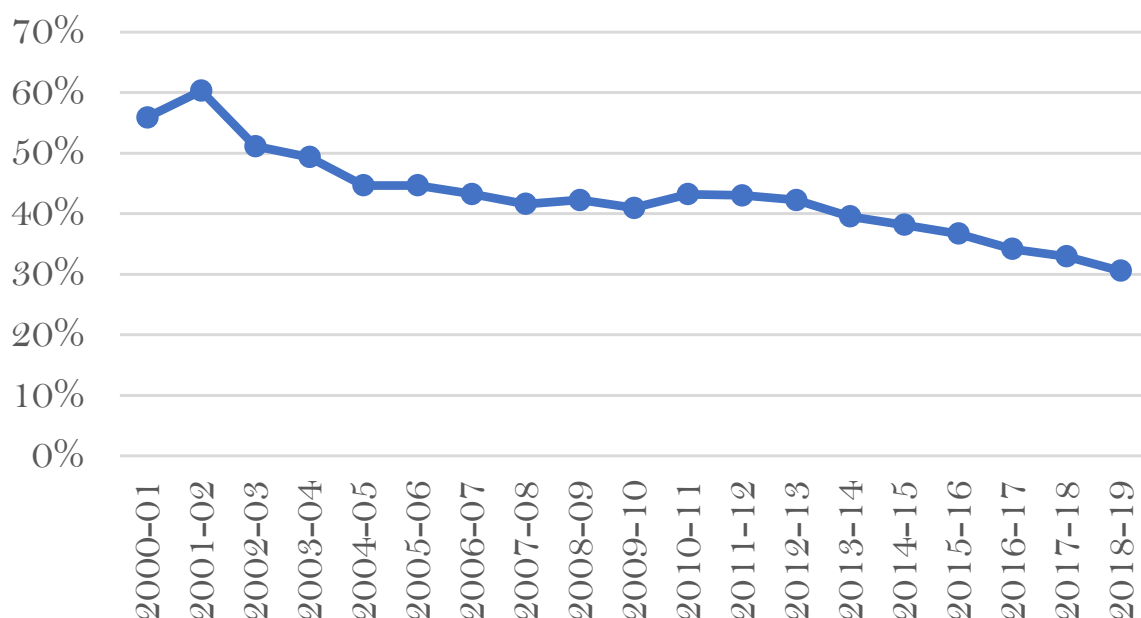


Figure 5. Historical AT&C losses in Odisha. Source: OERC (2020b).

The Regulatory Commission identified losses as one of the main causes behind the failure of the initial licenses. Therefore, the new licenses included two regulatory incentives for the reduction of AT&C losses. First, the requests for proposals specified the losses that were going to be considered to set tariffs in the following 10 years (Figure 6). Bidders could therefore internalise these losses (and their economic consequences since real losses were expected to be higher, at least at the beginning of the license) in their offer, but they have an incentive to reduce losses beyond these targets, in order to obtain an additional revenue beyond the approved return on equity.

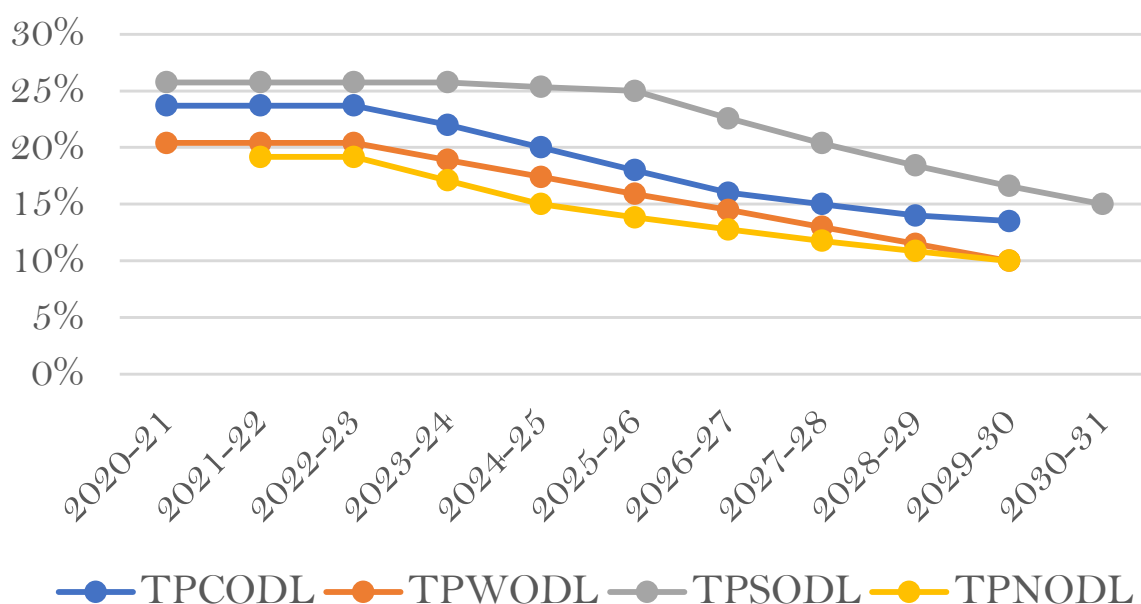


Figure 6. AT&C losses for tariff determination. Source: Vesting orders of the new licenses.

Second, bidders were required to include in their proposal an official commitment for the reduction of AT&C losses, as presented in Figure 7. This reduction path would be assessed at the end of the third and fifth year of the license period. Any upward deviation from these targets are subject to a penalty. Every 1% upward deviation are subject to a fee of 4 million USD for TPSODL, 5.2 million USD for TPWODL, and 6.5 million USD for TPCODL and TPNODL³.

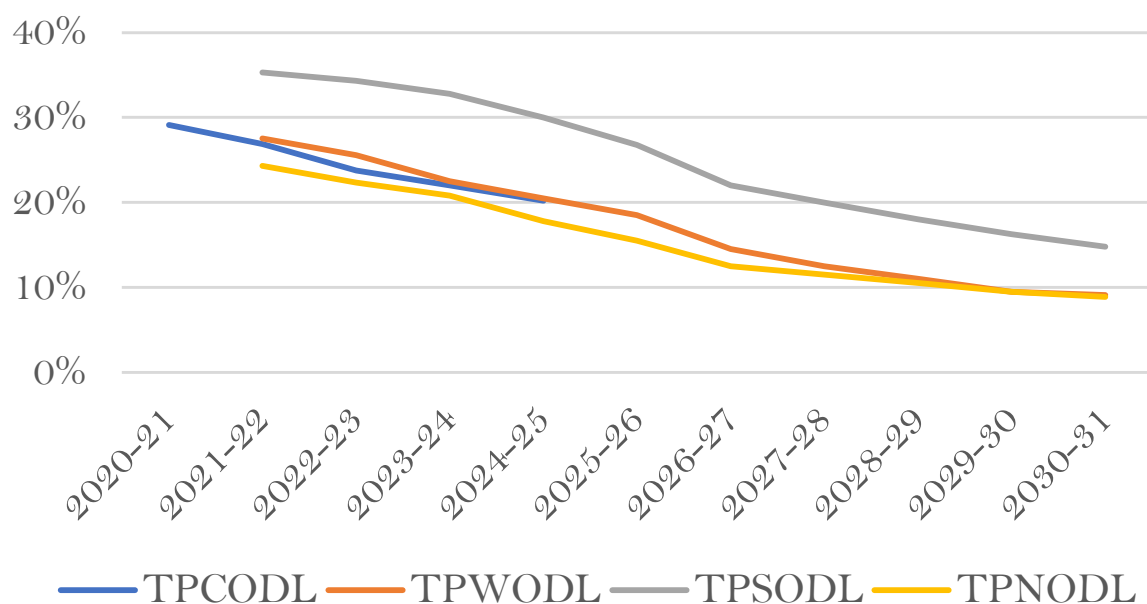


Figure 7. AT&C losses reduction commitment by Tata Power. Source: Vesting orders of the new licenses.

This commitment is probably the strongest responsibility that the licensees were required to accept in the framework of the new license and, according to the Regulatory Commission, is the main motivation that should foster new investments and efficiency improvements by the licensees.

Collection of past arrears

All distribution companies have arrears from both connected and permanently disconnected customers. In the requests for proposals, bidders were required also to include in their offer a commitment in terms of collection of these past arrears. The collection path committed by the four distribution licensees is presented in Figure 8. Total past arrears commitments vary between 10 million USD for TPSODL to more than 50 million USD for TPNODL.

³ Economic values, here and in the rest of the document, are computed through the INR/USD exchange rate applied at this writing (1 INR = 0.013 USD).

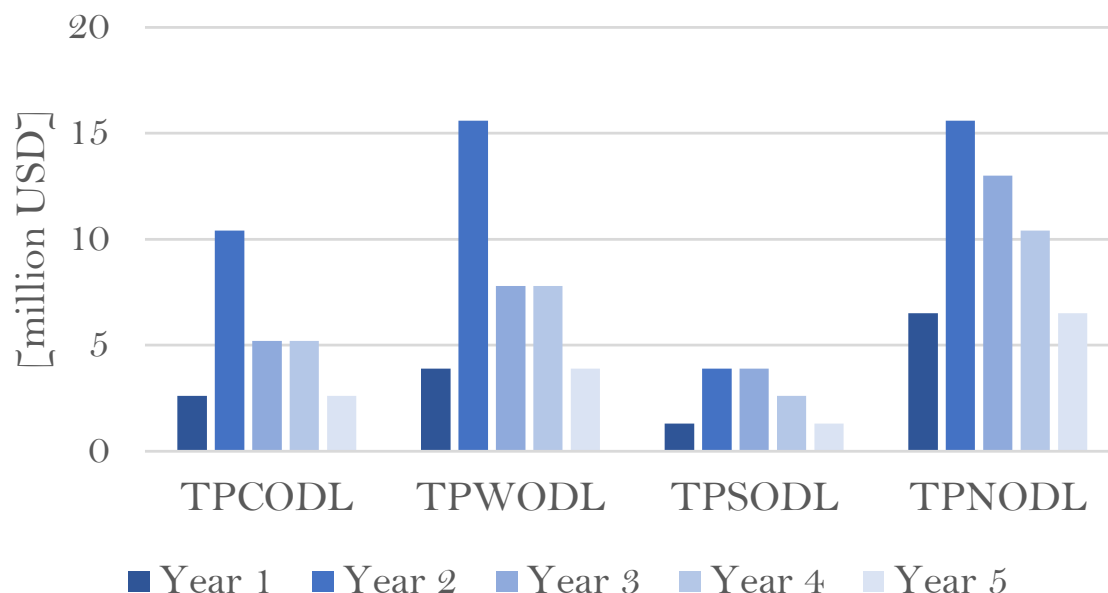


Figure 8. Collection of past arrears commitments from Tata Power.
Source: Vesting orders of the new licenses.

These commitments are subject to an incentive/penalty scheme. On the one hand, the licensees are allowed to retain 10% of the arrears collected from live consumers and 20% of the arrears collected from permanently disconnected consumers (these incentives rise to 20% and 30% respectively for TPSODL). On the other hand, if a company fails to fulfil its overall commitment at the end of the fifth year, it will have to pay a penalty equal to 10% of the shortfall⁴.

Capital investment plan

Another requirement of the requests for proposals was the inclusion in the bid of a capital investment plan for the first five years of the license, with minimum thresholds set by the Regulatory Commission. Figure 9 shows the capital investment plans presented by the four licensees, with overall investments that vary from 150 million USD in five years for TPSODL to 215 million USD for TPWODL.

⁴ If the commitment is 50 million USD and the company only collects 30 million USD, the shortfall will be 20 million USD and the penalty will be 2 million USD.

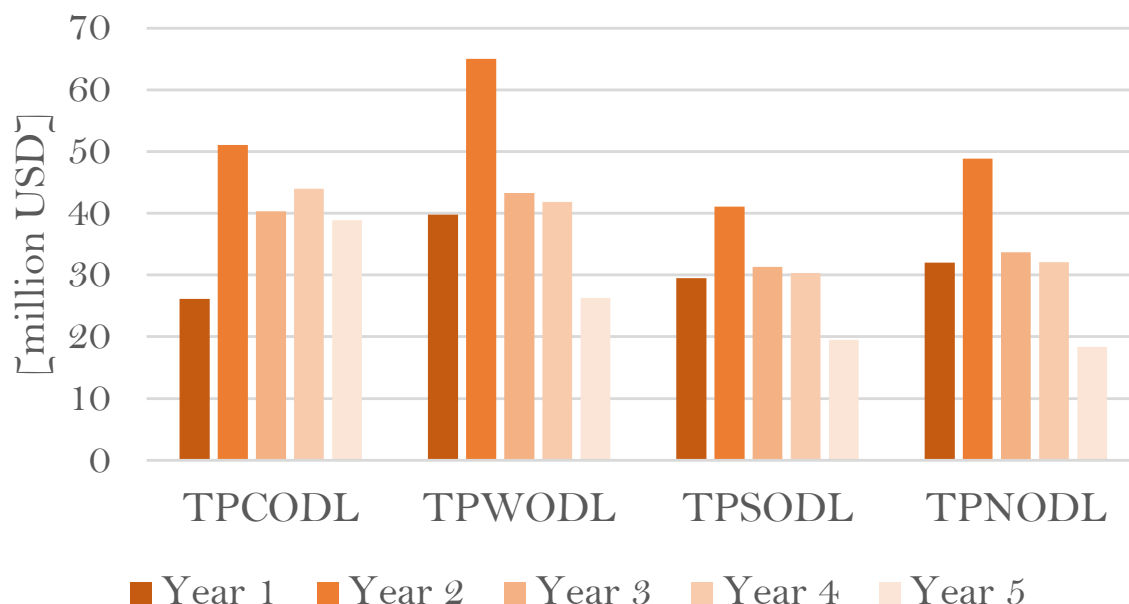


Figure 9. Capital investment plans from Tata Power. Source: Vesting orders of the new licenses.

This initial plan must be detailed year by year and all capital investments for new assets must be approved by the Regulatory Commission. The compliance with the plan will be assessed at the end of the third and the fifth year on a cumulative basis, without looking at yearly investments. A failure to fulfil the investment commitment may lead to the imposition of penalties, especially if the company also shows a deviation from the commitment to reduce AT&C losses.

As is usual in distribution concessions, capital investments enter the regulatory asset base and their depreciation is included in the company's allowed revenues, which is the reference amount used to compute the tariffs for end users. The equity used for capital expenditures is remunerated with a return on equity of 16%, while the cost of debt is determined based on the loans signed by the companies.

Power procurement conditions

The distribution licensees are not allowed to sign any power purchase agreement and should procure their entire energy demand from GRIDCO, in the framework of a bulk supply agreement between these companies. These agreements do not include any take-or-pay clause and grant full flexibility to the distribution company, which will only be required to pay the so-called bulk supply price for its withdrawals. Licensees are also required to pay transmission and SLDC (State Load Despatch Centre) charges for system operation to the Odisha Power Transmission Corporation Limited (OPTCL).

These payments to GRIDCO and OPTCL were one of the most controversial elements in the initial distribution licenses. To avoid the problems experienced in the past, the

new licenses require companies to provide GRIDCO with a revolving letter of credit equivalent to the average bill of two months bulk supply price and SLDC charges.

Existing employees and senior management team

The four licenses establish that all existing employees in each distribution area are to be transferred to the new companies. The total staff of the four distribution companies at the issuance of the new licenses was more than 12,500 workers. Furthermore, the licensees also had to include in the bid a structure for the senior management team, with which they are required to comply.

Performance guarantee

All the licensees were required to submit a performance guarantee of around 20 million USD. Money from the performance guarantee can be withdrawn by the Regulatory Commission in case the penalties imposed to each company are not paid in due time or in case the licensee is not able to pay the corresponding fees to GRIDCO or OPTCL. If this happens, the licensee is required to replenish the performance guarantee within thirty days. The performance guarantee is expected to be progressively reduced at the end of the fifth and the tenth year of the license period in case the performance of the licensee is considered adequate.

Box 3: DDUGJY and Saubhagya programmes and outcomes in Odisha

India made a tremendous effort in the last decades to achieve universal access in its territory. It is estimated that, between 2000 and 2016, half a billion people gained access to electricity in the country (SPI, 2019). To push electrification even further, the Federal Government launched the *Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY)* scheme, whose 100% village electrification target was declared as met by the government, not without controversy, in April 2018. However, what is understood by 100% electrification must be clarified to assess the actual electricity access in the country. In the case of the DDUGJY scheme, 100% electrification meant that all rural villages had been reached by the grid (or, in a very few instances, by minigrids), and that in each village at least 10% of its households were connected to the grid. Therefore, even with an official 100% village electrification rate, there were still many rural households not connected to the grid.

This prompted the Indian Government to launch the *Sahaj Bijli Har Ghar Yojana (Saubhagya)* programme to further expand the grid and reach all potential rural consumers. The programme application in Odisha resulted in the electrification of more than 2 million potential consumers, with the 100% household

electrification target declared as achieved in the state already by January 2020 (DDUGJY, 2020).

Again, the achievement of the Saubhagya target does not mean that all households are actually connected to the grid. SPI (2019) analysed different aspects of electricity access in four Indian states, including Odisha, as shown in Figure 10. According to this study, in Odisha, 98% of the population has an electric pole within a 50-metre distance (the so-called “availability rate” in the chart), but only 90% of the households are actually connected to the grid (the “access rate” in the chart). This data highlights the challenges that the state and its distribution companies still face.

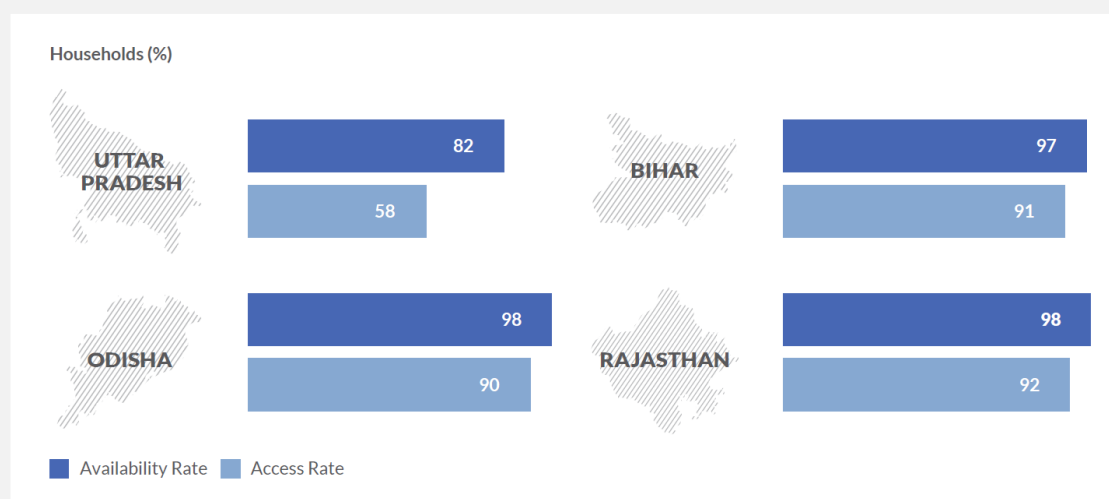
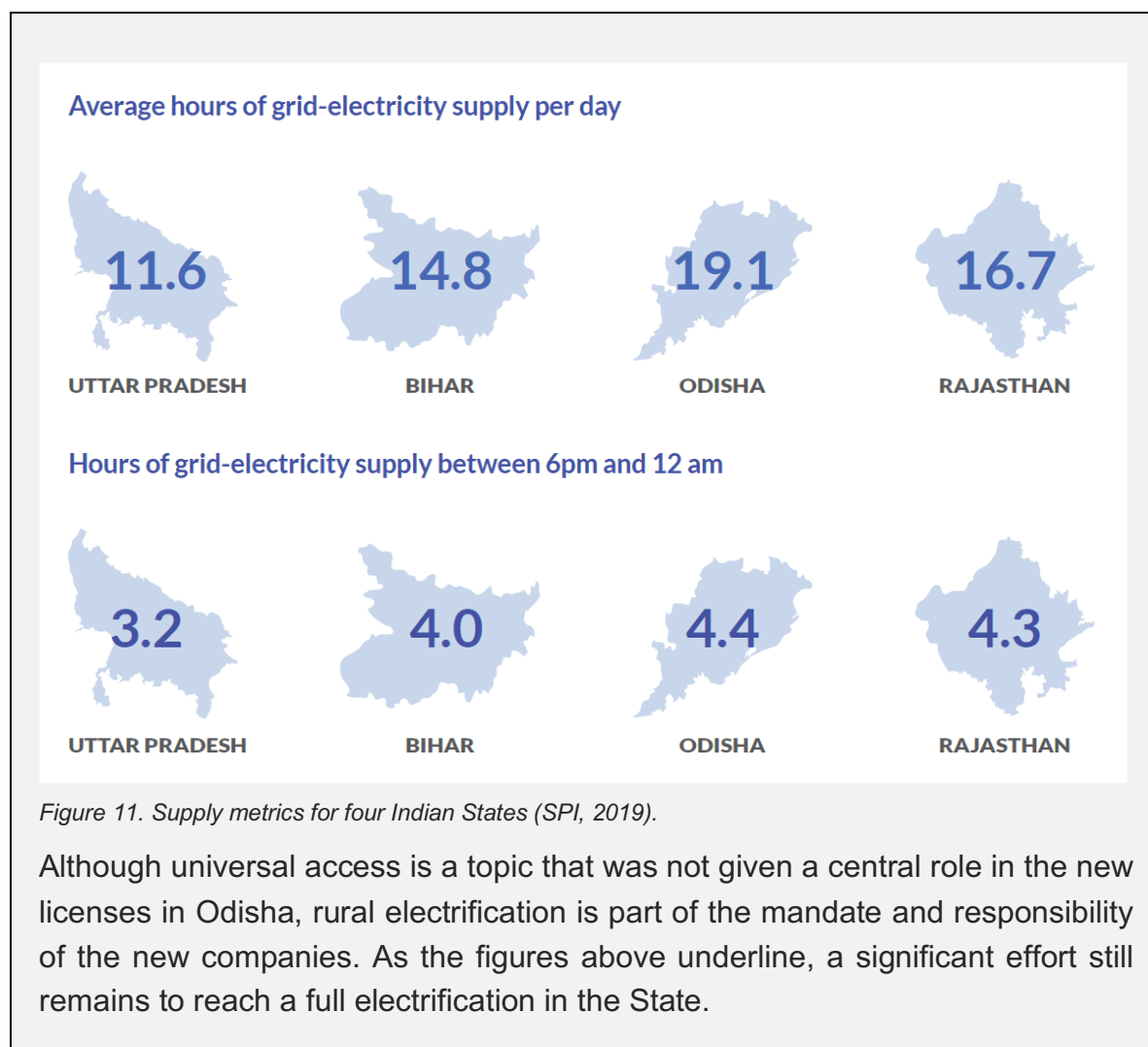


Figure 10. Availability and access rates in rural electrification for four Indian States (SPI, 2019)

Among the barriers that most households without an electricity connection cite for their condition, the most common is probably related to affordability issues. Although the Saubhagya programme provided free connections for vulnerable customers, many of these potential consumers do not believe they could afford to pay electricity bills and prefer relying on other fuels (SPI, 2020). Other reasons commonly mentioned are the complexity of connection procedures and poor quality of the service offered by the grid, other key dimensions that cannot be disregarded when analysing electricity access. Figure 11 shows two reliability metrics for grid-electricity supply in four Indian states (SPI, 2019). Although the grid in Odisha provides, on average, more hours of service than the other states under this study, the reliability of the grid may have to be further improved to attract other potential customers.



III. THE IMPACT OF THE COVID-19 PANDEMIC

The takeover of the four distribution companies by Tata Power coincided with a global crisis that was not expected when the design of the new licenses was defined. COVID-19 severely affected the Indian territory⁵, forcing the federal government to establish lockdowns starting in March 2020. These confinement measures had a large impact on electricity demand and on the ability of consumers to pay their bills. A large part of non-residential demand was lost, due to the reduced economic activity. In the residential sector, metering and billing activities, which required in-person interactions, were suspended for a long time and this created new arrears. Furthermore, the economic crisis provoked by the pandemic exacerbated the vulnerability of some end users who could not pay their bills due to the reduction in the household income.

⁵ The epidemic caused more than 8,000 casualties in Odisha at this writing.

These circumstances had a significant impact on AT&C losses, which internalise the collection efficiency. The first license to be issued, the one for TPCODL, considered a reduction of AT&C losses from 30.4% in March 2020 to 29.1% for fiscal year 2020-21. Nonetheless, for the above-mentioned reasons, AT&C losses in TPCODL had a surge during the first months of the license, reaching 42.4% in September 2020. The situation improved from then on, and in March 2021, the company was able to bring down the AT&C losses to 29.5%, almost meeting the initial target. The other three licensees are apparently on good track to reach their AT&C loss reduction goals.

According to both the licensees and the Regulatory Commission, the impact of the COVID-19 pandemic on the electricity distribution business was small and it was absorbed rapidly. It must be remarked that this performance was also favoured by the flexibility in the bulk supply agreements that the distribution companies have with GRIDCO. This insulated the business from the consequences of the strong demand reduction registered during the first wave of the epidemic since they only had to pay for the energy that was actually withdrawn from the bulk system.

IV. CURRENT PRACTICES AND CHALLENGES AHEAD

Rural customer indexing and engagement

The new licensees for the four distribution companies in Odisha found deficient consumer indexing and an inefficient management information system, especially in rural areas, where new villages and customers had been connected by the DDUGJY and Saubhagya programmes. Odisha has almost 50,000 small rural villages, where most of the problems with customer indexing were found. With connection applications not being satisfied, households disconnected from the grid that were receiving electricity bills, and customers connected to the grid whose demand was not being billed. These circumstances were obviously affecting the collection efficiency and the AT&C losses.

Following the new corporate culture and its focus on customer engagement, the four companies tried from the very beginning to tackle this situation, although the effort was initially hindered by the pandemic. TPCODL was the first company to implement the *Gaon Chalo* initiative (“Let’s go to the Villages”), which was built around customer interaction camps that the company staff organised in different rural villages. These camps provided a platform for end users to present their complaints to the company. By March 2021, more than 400 interaction camps had been organised and were able to collect 25,000 complaints from customers, out of which more than 15,000 could be resolved on the spot, allowing for the collection of arrears totalling more than half a million USD after bill revision.

Despite the relative success of these experiences, the *Gaon Chalo* initiative should be scaled up in order to reach a significant share of all rural villages in the central distribution area and all over Odisha. TPCODL also launched an application for smartphones, called TPCODL Mitra, meant to improve the interaction with its customers. The app allows end users to communicate meter reading; pay their bills online; report outages, safety issues, or power theft; or register an official complaint. All of these measures may improve customer engagement, with the consequent benefits also in terms of reducing commercial losses. Beyond the interaction with their customers, the four distribution licensees are also trying to improve the physical infrastructure in the consumers' premises. TPCODL, for instance, has already replaced around 150,000 faulty meters.

Despite these fast-paced improvements, the remaining effort, in terms of consumer indexing, is large and it will dramatically influence the collection efficiency and the compliance with the committed reduction path for AT&C losses. A central element of this strategy is the deployment of smart meters, whose rollout is expected to start soon, which can both reduce costs and improve the operation of the distribution network. According to the capital investment plan presented by the licensee in the central region (TPCODL, 2021), in the next three years, smart meters will be installed for all end users with monthly demands exceeding 300 kWh. Beyond smart meters, the investment plan presents a strong impetus towards technological innovation and grid modernisation.

The potential for extended customer engagement remains mostly unexplored. There is currently no programme to foster electricity use with commercial value nor focus on development (e.g., electric cooking or cooling chains for food conservation). There is also no partnership with the Government of Odisha to exploit the nexus of electricity with other sectors, like agriculture or water sanitation.

Inefficient grid extension

As mentioned in Box 3, the DDUGJY and the Saubhagya programmes have pursued universal access through grid extension, bringing electric poles to basically all villages. In rural areas like Odisha, this implied the installation of very long medium-voltage lines and feeders in forest areas characterised by low population density and presence of wildlife. The length of these lines provokes, in many cases, power quality issues for the supplied villages. Moreover, the location of the lines complicates their operation and maintenance, increasing the cost and the time needed to detect the fault, and then reach and repair it. In some cases, it may even be cheaper to disconnect these villages from the main grid and to supply them through a dedicated minigrid.

Minigrids are the focus of another initiative of Tata Power, developed in collaboration with the Rockefeller Foundation. In November 2019, the two entities announced the

launch of Tata Power Renewable Microgrid Ltd., a company meant to address the lack of access to affordable, reliable electricity for millions of rural homes and enterprises in India. By scaling up an innovative microgrid model to be designed in collaboration with Smart Power India (SPI) and the Institute for Transformative Technologies, TP Renewable Microgrid Ltd. aims to provide clean power to nearly 5 million households and to improve the reliability and coverage of the service currently provided by the conventional grid⁶.

However, it must be remarked that this approach contrasts with the philosophy of the electrification programmes implemented by the federal government. Furthermore, although the State of Odisha has a specific regulation and technical standards for minigrids, these assets are not considered by the distribution licenses, and they would not be included in the regulatory asset base of the new companies.

This operation and maintenance challenge will probably have to be solved by applying different strategies, such as the installation of new substations closer to the villages currently supplied by long medium-voltage lines, the introduction of technological innovation for fault detection and repair, and the pursuit of an agreement with the Regulatory Commission for those cases that cannot be solved efficiently through on-grid technical solutions.

Disaster management

Odisha is subject to cyclones, whose frequency and intensity are increasing due to climate change (Rao et al., 2020). The additional costs due to extraordinary maintenance after cyclonic events were one of the causes behind the failure of the first distribution licenses. The new licensees had to face the problem very soon after the takeover, since Odisha, as already mentioned in the introduction, was hit by cyclone Yaas in May 2021. In that case, both the federal and the state government made generous donations for the reconstruction of the part of the grid that was damaged by the weather event. This financial aid was used by the licensees to restore the service and was accounted for separately, without affecting the normal financial operation of the companies and the tariffs charged to consumers.

However, the licenses do not contain specific clauses on disaster management, and this may introduce a significant risk in a region like Odisha that is subject to extreme weather events. Due to this, the Regulatory Commission expressed its willingness to

⁶ “We are proud to bring energy to millions of people. Once at scale, TP Renewable Microgrid Ltd. anticipates supporting 100,000 rural enterprises, creating 10,000 new green jobs, and providing irrigation for over 400,000 local farmers”, Praveer Sinha said in an interview. “We look forward to empowering communities across India by creating micro enterprise and opportunities for all people”.

improve recognition of these extraordinary costs, allowing their inclusion in the allowed remuneration of the licensees and their recovery through tariffs.

These adopted or foreseen measures by the Government of Odisha and the Regulatory Commission in response to unexpected circumstances affecting the concessionaire indicate their favourable disposition to make the new concessions a success, learning from the prior experience.

Commitments on losses and past arrears and risk of penalty

The reduction of AT&C losses is probably the main pillar of the new licenses, and will serve as a proxy to assess the overall performance of the new companies. The reduction commitments from Tata Power were ambitious. Recent performance reports suggest that the target for 2020-21 is being achieved by TPCODL, despite the COVID-19 pandemic and the negative impacts it has on collection efficiency. However, larger reductions will have to be achieved in the following years and the potential penalties for non-compliance are high.

The targets set for the collection of past arrears were ambitious too; however, the improvements in the management of customer complaints and in collection strategies have allowed the companies to rapidly advance on this commitment. According to initial data, the companies are complying with the yearly targets set in the licenses.

Improving quality of supply

The new licenses do not contain any specific mention of the quality of supply, nor do they directly link the remuneration obtained by the licensee with its performance in this aspect of its activity. The State Regulation (OERC, 2019) does consider standards for quality of supply. The SAIDI (System Average Interruption Duration Index) should be lower than 600 minutes per customer per month (7,200 minutes per year); the SAIFI (System Average Interruption Frequency Index) should be lower than 15 interruptions per customer per month (180 interruptions per year)⁷. However, the enforcement of these standards is based on the imposition of compensations to be paid to consumers for different kinds of faults, most of which must be claimed by end users.

In the electricity distribution licenses in emerging countries, it is understood that during an initial phase, a strict enforcement of ambitious reliability targets can be counterproductive. This is because it would require expensive investments by the

⁷ Before the takeover by Tata Power, these standards were not frequently met. In the fiscal year 2019-20, only TPCODL/CESU stayed below these limits, while the other companies had a SAIDI as high as 12,500 minutes per customer per year and a SAIFI ranging from 235 and 838 interruptions per customer per year (OERC, 2020c).

licensee that the end-user tariffs in place cannot cover, therefore resulting in unpopular tariff rises. This reflects the current situation in Odisha, but it is understood that it cannot be maintained in the future. As analysed in Box 3, the power sector of Odisha and its distribution networks already present a high reliability if compared with other Indian states. However, the level is still not aligned with international standards. A higher quality of supply, in terms of increased reliability of supply or reduced voltage fluctuations, can improve customer engagement, diminish commercial losses, and attract new customers.

Safety issues

In the fiscal year 2019-20, before the issuance of the new licences, the entire Odisha electricity distribution network registered 91 fatal accidents (OERC, 2020c); these involved both employees of the distribution companies and the public at large. Furthermore, fatal accidents were also registered among animals, most of the time cattle. In May 2020, the Regulatory Commission released a notification that substantially increased the compensations to be paid by distribution companies for fatal and non-fatal accidents, both for humans and animals (OERC, 2020d).

The new licensees found a network with “33 kV overhead lines that are long, radial with undersized, worn-out bare conductor having extremely long spans, having damaged, bent, tilted poles, poor joints, compromised safety clearances, and non-availability of guard wires in MV overhead feeders” (TPCODL, 2021). The improvement of safety conditions in the network is one of the central elements of the capital investment plans presented by the licensees. The safety interventions commonly included in the plans are the procurement of personal protective equipment for the staff, specific training on safety issues for all of the workforce, the installation of fencing or walls around distribution substations and other elements of the network, the full refurbishment of some obsolete distribution substations, and the establishment of a meter-testing laboratory. The reduction in the number of accidents would also be beneficial to improve the trust in the distribution activity and to engage more customers.

Staff management

As already mentioned, the four licensees “inherited” more than 12,500 employees from the previous distribution companies. In Odisha, Tata Power applied a staff engagement strategy that had already been implemented in Delhi (see Box 1) and Mumbai. Most of the office buildings and other facilities were renovated, improving sanitation and the physical working environment. The staff in Odisha was offered employment benefits, such as health insurance and educational programmes.

Employees were also offered the opportunity to switch to a remuneration regime based on performance incentives, improving staff motivation.

Tata Power also promoted interactions between the Odisha licensees and its distribution companies in other regions of India to take advantage of previous expertise. Some employees from Delhi, Mumbai, and Ajmer were assigned to key positions in the distribution companies in Odisha. At the same time, several training visits to Mumbai and Delhi were organised for the employees from Odisha to give them first-hand experience of the corporate strategy and to bring best practices back to their companies.

V. A QUESTION FOR DEBATE

Praveer Sinha and his board had to ponder the pros and cons of extending the reach of the concession to the entire state of Odisha, contemplating the implications of all the elements presented above and how to cope with and benefit from them, gauging the risks of this new business and how to design mitigation strategies for them, while also drawing from the experience gained in Delhi, Ajmer, and Mumbai. You are asked to weigh in on the considering factors to make the decision of whether or not to become the distribution concessionaire in Odisha for the next 25 years.

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