# Electricity Sector Reform in Uttar Pradesh:

## Analysis of tariff adjustments and the Ujwal Discom Assurance Yojana Plan (UDAY)

**GSI REPORT**

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**Perceptions of Electricity Sector Reform in Uttar Pradesh: Political economy analysis of tariff adjustments and interim evaluation of the Ujwal Discom Assurance Yojana (UDAY) plan**

March 2018

Written by Shruti Sharma, Tom Moerenhout and Vibhuti Garg

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# Executive Summary

Uttar Pradesh, India's most populous state, is home to the country's largest number of people without electricity access: as of late 2017, 14.6 million households—49 per cent of the state's total—are yet to be electrified (Government of India, n.d.). Among those with an electricity connection, many receive poor-quality service, with limited hours of supply, frequent blackouts and voltage fluctuations.

At present, the state's public electricity distribution companies (discoms) are not financially sustainable—that is, they do not collect enough revenue from their consumers to recover their costs. The revenue gap has increased over the years resulting in a significant gap of INR 21,486 crores (USD 3.2 billion) in FY16. Since that year, however, the Government of India, in partnership with the state government, has been actively pursuing two targets: universal household electrification by 2019; and 24/7 power for all by 2022. Demands from a growing consumer base conflict with the discoms' inability to generate revenue from the same consumers. How then can discoms improve their financial viability in order to meet the state's energy access needs?

One approach is to reform end-user tariffs. Nominally, these are set by state-based market regulators on a cost-plus basis, with a complex structure that generally provides lower tariffs for households and farmers and higher tariffs for commerce and industry. But, due to several factors—including strong political pressure for low tariffs, perceptions of discoms' inefficiencies and disagreements on the accuracy of subsidy claims—regulators have in general failed to allow prices to rise with power supply costs over time. The revenue gap is supposed to be partially covered by annual subsidy transfers, but in practice these have not been sufficient to prevent discoms' growing debts.

Another form of financial assistance emerged in 2015, when the central government launched the Ujwal Discom Assurance Yojana (UDAY). The UDAY scheme absorbs discoms' debt against targets to improve operational efficiencies, reduce power and interest costs, enforce financial discipline through monitoring of AT&C losses, and tariff revisions

## APPROACH

This study investigates both tariff reform and the UDAY scheme.

Among households, surveys were conducted with 1,917 households, split equally between urban and rural areas (see Appendices 2 and 3 for details). Among agricultural landholders, surveys were conducted with 413 farmers, 284 of whom use diesel pumps for irrigation and 129 of whom use electric pumps; interviews were conducted with 67 of the latter. Among industry and commerce, interviews were conducted with 34 commercial and 31 industrial consumers in a variety of business sectors. Unless otherwise stated, findings for rural households and agricultural landholders represent statistically significant estimates of the views of the total state population of these consumers; while findings on urban households, commerce and industry are only indicative.

The interim assessment of UDAY was conducted by identifying U.P.'s progress against various milestones specified in the scheme and 12 interviews with officials of discoms and the state government.

## KEY FINDINGS

### Data on Energy Use, Billing, Perceptions and Preferences With Respect to Tariff Reform

- **Poor metering and billing in rural areas contributes significantly to low cost recovery:** Only 25 per cent of rural households have a meter installed, compared to 85 per cent of urban households. Further, less than 10 per cent of the rural population pays for meter-based grid electricity. This contributes to poor cost recovery because rural households make up roughly half of total residential consumption, and non-metered households pay only a very low fixed charge regardless of the total volume consumed; significantly impacting the revenues received from such consumers. These findings are similar for agricultural consumers, where between 1–8 per cent of farmers using electric pumps reported having a meter installed, and 53 per cent have never received an electricity bill at all. For these consumers, any tariff reform that is not coupled with efforts to improve metering and to increase billing efficiency may be insufficient.
- **Perceptions about fair pricing vary based on perceptions of need and vulnerability.**
  - Households and farmers do not agree with the view that tariff hikes are justified to help discoms recover their costs.
  - There is no general sense of entitlement to free electricity, among any consumer grouping.
  - There is a consensus that low income households should receive some form of subsidy, although the extent varies. Approximately 80 per cent of rural and urban households believe that low income households should get free electricity. Farmers, industry and commerce were less likely to agree with the provision of free electricity to these groups, but agreed that they should receive subsidies.
  - Attitudes vary with respect to farmers' needs. Among urban households, only 65 per cent agreed that farmers should receive free electricity; 30 per cent of households explicitly disagreed with this. Farmers were less inclined to argue in favour of governments providing free electricity to various groups, including themselves. Modest shares of industry and commercial interviewees were in favour of subsidies for farmers.
  - Although many respondents espoused the view that vulnerable households and farmers should be protected, 81 per cent of industrial and 68 per cent of commercial interviewees reported that they were not in favour of continuing cross-subsidies, where they pay higher tariffs to keep agriculture and household tariffs lower.
- **Awareness of subsidies is low among most consumer groups.**
  - Almost all households and farmers are unaware of the cost of electricity and the percentage of subsidies they receive.
  - Only 10 per cent of interviewed farmers using electric pumps were aware that their electricity tariffs were subsidized.
- **An overwhelming majority of consumer groups believe that tariffs are likely to increase.**
- **Different consumer groups will cope with higher prices in different ways.**
  - Among households, 60 per cent reported that they would consume less electricity while decreasing expenditure elsewhere; around 45 per cent reported that they were likely to switch fuels.

  - Few farmers using electric pumps said they were likely to switch crops. Roughly two thirds reported that they would keep using the same pump while around one sixth would consider purchasing a solar pump set.
  - The large majority of industrial and commercial consumers report that absorbing the costs of tariff hikes is their only available coping mechanism.
- **Preferences vary with respect to size, frequency and timing of price changes.**
  - An annual increase in tariff was the most popular option for households and agricultural consumers, but a single large increase was more popular among higher-income households.
  - Around 70 per cent of farmers using electric pumps prefer to have one immediate increase in their electricity bill, rather than smaller monthly hikes.
  - Roughly 80 per cent of commercial and industrial consumers prefer one large tariff hike every 2 to 3 years, so they have greater certainty over the costs of production.
- **Consumers are more willing to view small tariff increases more positively if they receive improvements in the quality of service.**
  - For households and farmers this includes: increasing the hours of supply; immediate redress of grievances; and the delivery of the subsidy through bank transfers.
  - Industrial consumers report the need for more infrastructure support in the form of feeder segregation and fewer blackouts so that poor-quality supply does not negatively affect production cycles and profitability.

These findings create several points of guidance for governments to consider when planning tariff increases.

First, some form of communication strategy can help create the political space that enables change. The government should consider a long-term strategy focused on awareness raising and short-term strategies in support of specific reform initiatives. Awareness raising is required because most consumers expect price rises but very few understand the scale of existing subsidies. This may make them feel more entitled to low prices, and it will prevent them from understanding the rationale for reform and the scale of price increases that may be sought over the medium to long terms. Specific change strategies are required because many consumers clearly oppose price adjustments. Careful messaging can help convey how price adjustments will ultimately benefit consumers and not simply recover costs for discoms.

However, no communications strategy can enable a reform plan that fails to adequately protect the most vulnerable consumers from price shocks. Poor households will not be served by an improved electricity supply system that they cannot afford—politically, their welfare is a key priority for all consumer groups. The government should identify appropriate mechanisms to minimize impacts on the needy, including the timing of reforms and linkages with other benefits—possibly including improvements in subsidy targeting, improvements in electricity service delivery or access to non-energy-based benefits schemes.

## THE UJWAL DISCOM ASSURANCE YOJANA SCHEME

Launched in late 2015, the Ujwal Discom Assurance Yojana (UDAY) scheme reworks the debt of discoms to improve their financial health and operational performance. Both the state government and the discoms issue bonds to cover the discoms' losses. Since joining the scheme in March 2017, the government of Uttar Pradesh and the state's discoms have issued bonds worth INR 49,847 crores (USD 7.5 billion). Reportedly, this has saved the state INR 3,323 crore (USD 506 million) through lowered interest costs. However, despite the savings discoms continue to post losses: the latest provisional data points to a loss of INR 6,320 crore (USD 962 million) in FY 2016.

This review found that progress on UDAY milestones to date has been limited, though some progress has been made on feeder metering, distribution of LEDs and electricity access to unconnected households. Little or no progress, however, has been made against other milestones, like distribution transformer metering, smart metering, feeder segregation, consumer indexing, GIS mapping of losses and reductions in technical and commercial losses. In particular, the gap between the average cost of supply and the average revenue requirement remains high, and no progress has been made with the commitment for a quarterly tariff revision.

In a series of interviews, officials at UPPCL and other discoms reported that although UDAY was signed in January 2016, implementation did not begin until mid-2017. This suggests that delays should be expected, and some targets may not see results for another 2 or 3 years. Officials further underlined that there are additional efforts that could help achieve intended milestones. Some of the key asks of discoms are summarized below:

- **Revision of Timelines and Separate Targets for Different Areas**
  - Targets to be segregated based on different geography or loss levels, and assigning different timelines for achieving the milestones in, for example, urban and rural areas.
- **Technical and Implementation Assistance for Discoms**
  - Agencies to take ownership of functional responsibility for putting up meters, measuring consumption, and generating and collecting bills.
  - Train and hire more staff to manage the growing consumer base.
  - Government should move away from its current relaxed approach and avoid wasteful use of financial resources.
- **Financial Support**
  - Allocation of funds to control theft first. The savings from improvement in billing and collection should then be channelled into system strengthening and improvement.
  - While the centre and the state are running different schemes in Uttar Pradesh to enhance energy access and improve the operational and financial performance of state utilities, there is scope for aligning some of the milestones laid under the UDAY scheme to gain from other government programs like National Smart Grid mission, and thereby leverage existing financial resources.
- **Independent Functioning of the Discoms**
  - Each distribution utility should be allowed to independently procure power through a mix of long- and short-term contracts.
  - Discoms should be allowed to pass on the increased cost to consumers in terms of regular tariff hikes and fuel supply adjustment charges.

    - Tariffs should be rationalized and made cost-reflective. Government should develop a registry of identified beneficiaries and subsidies to be transferred directly to their bank accounts.
- **Consumer Awareness**
    - Consumers lie at the centre of the reform process. Officials noted that as part of demand-side measures an awareness campaign is needed to build understanding about the true cost of power, the reliable supply of power and energy efficient appliances.

The U.P. state government, along with discoms, can integrate its commitments and progress on UDAY into plans for tariff hikes. In the near term, communication strategies can be differentiated by discom areas to highlight relevant commitments and messages for various consumer groups. This approach will, however, require strong ongoing progress in implementing the technical milestones under UDAY, thereby confirming the commitment of discoms and the state government to electricity consumers.

# Acronyms

| | |
|---|---|
| AAP | Aam Admi Party |
| ACS | Average Cost of Supply |
| APL | Above Poverty Line |
| ARR | Average Revenue Requirement |
| AT&C | Average Technical and Commercial |
| BJP | Bhartiya Janta Party |
| BPL | Below Poverty Line |
| BSP | Bahujan Samaj Party |
| DDUGJY | Deen Dayal Upadhyaya Gram Jyoti Yojana |
| Discoms | Electricity Distribution Companies |
| DSM | Demand-Side Measures |
| DVVNL | Dakshinanchal Vidyut Vitaran Nigam Limited |
| FI | Financial Institution |
| GDP | Gross Domestic Product |
| GFD | Gross Fiscal Deficit |
| GoI | Government of India |
| Ha | Hectare |
| HH | Household |
| HV | High Voltage |
| IMF | International Monetary Fund |
| IPDS | Integrated Power Development Scheme |
| KESCO | Kanpur Electricity Supply Company |
| kWh | Kilo Watt Hour |
| LMV | Light Medium Voltage |
| MkWh | Mega Kilo Watt Hour |
| MoP | Ministry of Power |
| MoU | Memorandum of Understanding |
| MPCE | Monthly Per Capita Expenditure |
| MVVNL | Madhyanchal Vidyut Vitaran Nigam Limited |
| MW | Mega Watt |
| MYT | Multi-Year Tariff |

| | |
|---|---|
| NREGA | National Rural Employment Guarantee Act |
| O&M | Operation and Maintenance |
| PAVVNL | Pashchimanchal Vidyut Vitaran Nigam Limited |
| PLF | Plant Load Factor program |
| PUVVNL | Purvanchal Vidyut Vitaran Nigam Limited |
| RAPDRP | Restructured Accelerated Power Development and Reform |
| RECPTCL | REC Transmission Projects Company limited |
| Rs | Rupees |
| RWA | Resident Welfare Association |
| SEB | State Electricity Board |
| SME | Small Medium Enterprise |
| SoP | Standard of Performance |
| SP | Samajwadi Party |
| T&D | Transmission and Distribution |
| UDAY | Ujwal Discom Assurance Yojana |
| U.P. | Uttar Pradesh |
| UPERC | Uttar Pradesh Electricity Regulatory Commission |
| UPPCL | Uttar Pradesh Power Corporation Limited |
| UPRVUNL | Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd. |
| VICRA | Vidyut Chori Roko Abhiyan |
| WTP | Willingness to pay |

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# 1.0 Overview of Uttar Pradesh's Electricity Distribution Sector

The state of Uttar Pradesh was selected for this study following a detailed profiling and shortlisting exercise. From a list of various factors like financial, regulatory and operational, Uttar Pradesh emerged as the state with the poorest-ranking electricity sector (see Appendix 1 for details on shortlisting of states). This section focuses on understanding the electricity distribution sector of Uttar Pradesh in an effort to understand its various stakeholders and opportunities for tariff reform across different consumer groups.

## 1.1 STATE PROFILE

Uttar Pradesh (U.P.) has a population of 199.8 million, making it the most populous state in India, with 16.5 per cent of its population (Census of India 2011). U.P. has 7.3 per cent of India's land mass (Census of India 2011) and contributes approximately 7 per cent to India's GDP (see Figure 1). Though the state's GDP has increased over the years, U.P.'s average contribution as a percentage of the national GDP at constant (2011–12) prices has been declining (see Figure 1).

The agriculture and related sector[1] is the largest economic activity, comprising almost 22 per cent of the state's GDP (Planning Commission U.P., 2017; see Appendix 20). This is followed by manufacturing, construction and tourism (see Figure 2).

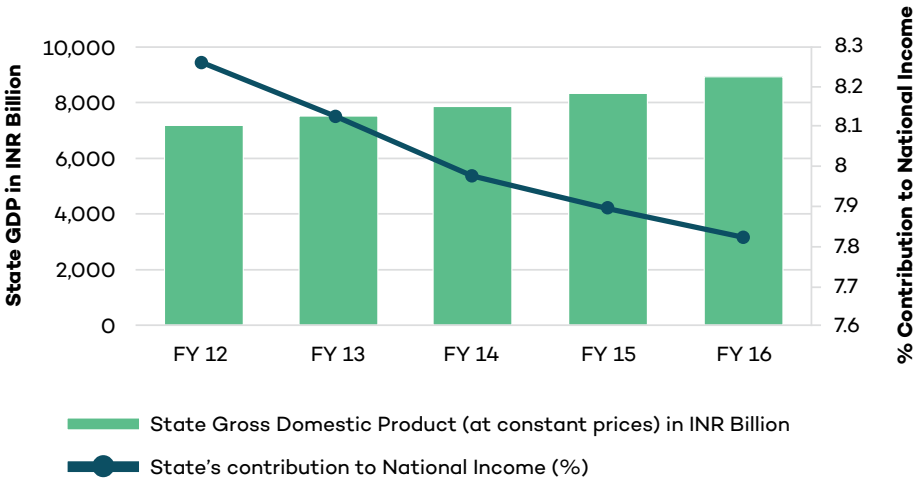


**Figure 1. Gross state domestic product (GSDP) and state's contribution to national income**

*Source: Planning Commission U.P., 2017.*

[1] Agriculture and related sector consists of crop, livestock, forestry, logging and fishing subsectors. These subsectors comprise almost 95 per cent of the overall GDP of the sector.

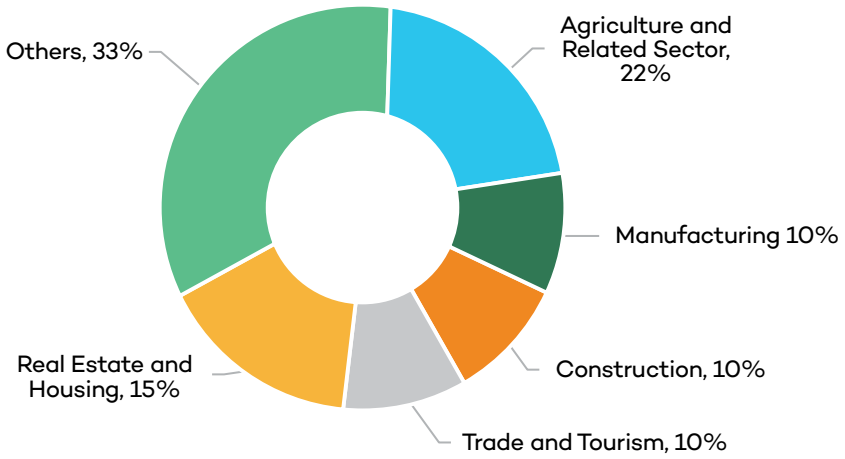


**Figure 2. Gross state domestic product of Uttar Pradesh by economic activity**

*Source: Planning Commission U.P., 2017.*

## 1.2 AN OVERVIEW OF UTTAR PRADESH'S ELECTRICITY SECTOR

Electricity is a shared jurisdiction in India, with the central government deciding on national policies and the states responsible for implementing those policies. Years of reforms have transformed U.P.'s electricity sector into distinct subsectors—generation, transmission and distribution. Each subsector is managed by either a single state-owned agency (or several). The section below provides an overview of the agencies responsible for managing each subsector.

**Generation and Transmission:** U.P. has a low energy supply deficit, with energy demand only slightly higher than energy supplied. In June 2017 this deficit was small, standing at 1.1 per cent. This deficit has been falling over the years, a sign of increasing electricity supply. U.P. has 7 per cent of India's installed capacity, generating 22,602 megawatts (MW) by the end of FY 2017, almost 80 per cent of which is coal-based. However, most of this coal-based electricity is generated by centrally and privately owned thermal power plants. The state-owned thermal power plants contribute only 34 per cent of the total coal-based electricity capacity. There are five state-owned thermal power plants, managed and operated by a public body called the Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd. (UPRVUNL). Another state body—the U.P. Transmission Corporation Ltd—oversees transmission of electricity.

**Distribution:** U.P. has both public and private distribution companies. There are five state-owned distribution companies focusing on different areas in the state and headquartered in different cities (see Table 1). They operate independently of each other, though their power purchasing is done collectively, and their tariffs are harmonized. Nevertheless, there are differences in performance between these five discoms. Table 1 gives a comparison of these five discoms along different parameters. Pashchimanchal Vidyut Vitaran Nigam Limited (PAVVNL) and Purvanchal Vidyut Vitaran Nigam Limited (PUVVNL) have the highest capital expenditure owing to their very large consumer base. Kanpur Electricity Supply Company (KESCO) has the lowest gap between costs and revenues (after subsidy payments) owing to its largely urban consumer base which allows for ease of operations such as metering and bill efficiency.

**Table 1. List of discoms in Uttar Pradesh**

| **Public Discoms** | |
|---|---|
| Dakshinanchal Vidyut Vitaran Nigam Limited (DVVNL) | Agra Zone Discom |
| Madhyanchal Vidyut Vitaran Nigam Limited (MVVNL) | Lucknow Zone Discom |
| Pashchimanchal Vidyut Vitaran Nigam Limited (PAVVNL) | Meerut Zone Discom |
| Purvanchal Vidyut Vitaran Nigam Limited (PUVVNL) | Varanasi Zone Discom |
| Kanpur Electricity Supply Company (KESCO) | Kanpur City Discom |
| **Public Discoms** | |
| Noida Power Company Ltd | Greater Noida |
| Torrent Power | Agra City |

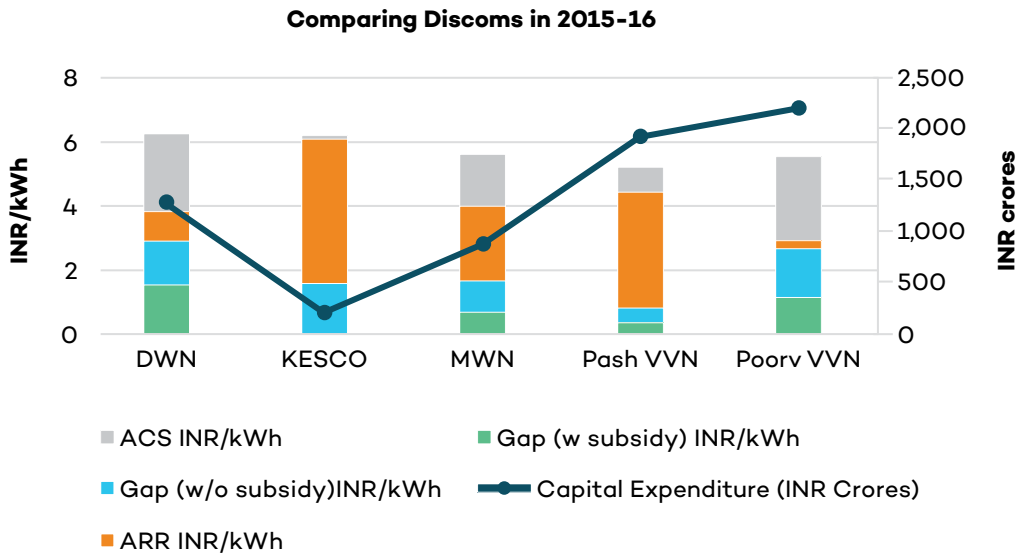


**Figure 3. Comparison of discoms FY 2016**

*Source: Power Finance Corporation (PFC), 2017.*

## 1.3 ASSESSMENT OF U.P. ELECTRICITY DISTRIBUTION SECTOR

An assessment of U.P.'s distribution sector will take into account the five public sector distribution companies listed in Table 1. The assessment examines the ability to cover cost and to provide reliable power.

### 1.3.1 Ability to Cover Costs

Discoms can remain financially sustainable if they are able to recover their costs. Revenue for discoms is primarily derived from power sales and fiscal transfers (subsidy from the state governments). Costs for discoms emerge from fuel costs, operation and maintenance (O&M) costs and interest payments on debt. Increasing consumer arrears, power purchase costs and lack of tariff revision have resulted in a significant increase in discom debt over the last five years.

The average cost of supply (ACS) has increased over the years, peaking in FY 2014 and decreasing again in FY 2015 and FY 2016. The average revenue realized has also increased over the years, reducing the gap (without subsidy) to INR 1.72 per kilowatt hour (kWh) in FY16. After accounting for subsidy from the state government, this gap reduces to INR 0.75 per kWh in FY 16. The revenue gap has increased over the years resulting in a significant gap of INR 21,486 crores (USD 3.2 billion) in FY16.

**Table 2. Financial indicators of U.P. electricity discoms**

| Ability to Cover Costs: Financial Parameters | FY11 | FY12 | FY13 | FY14 | FY15 | FY16 |
|---|---|---|---|---|---|---|
| ACS (INR/kWh) | 3.64 | 3.71 | 4.78 | 6.12 | 5.64 | 5.51 |
| Average Revenue Realization w/o subsidy (INR/kWh) | 2.69 | 2.58 | 2.81 | 3.29 | 3.39 | 3.79 |
| Gap (ACS – Average Revenue Realization) w/o subsidy (INR/kWh) | 0.95 | 1.13 | 1.97 | 2.83 | 2.25 | 1.72 |
| Total Revenue Gap/(Surplus) (INR Crores) | 9,950 | 15,968 | 17,844 | 22,870 | 27,385 | 30,016 |
| Subsidy (INR Crores) | 2,058 | 3,596 | 4,690 | 5,174 | 10,343 | 8,530 |
| **Gap after subsidy (INR/kWh)** | **0.60** | **0.62** | **1.33** | **2.16** | **1.06** | **0.75** |
| Revenue gap after subsidy (INR Crores) | 7,892 | 12,372 | 13,154 | 17,696 | 17,042 | 21,486 |

*Source: PFC, 2017.*

Power purchase costs are the single largest contributor to the cost of supply. This cost is driven by rising fuel costs and interest costs (see Figure 4). Fuel costs for the generation utilities have increased by 53 per cent, from INR 1.77/kWh (USD 0.03/kWh) in FY 2012 to INR 2.72/kWh (USD 0.04/kWh) in FY 2016. Payment servicing of interest on debt increased 400 per cent between FY 2012 and FY 2016. The higher interest burden may be attributable to increased borrowing to meet capital investment. Such investments are made with the expectation that they would help in increasing efficiency of discoms and in bringing down costs in the future. Transmission and distribution (T&D) losses and aggregate, technical and commercial (AT&C) losses have reduced since FY 2012. However, after FY 2014, AT&C losses increased possibly because of a decrease in collection efficiency that may in turn have been largely propelled by power theft and increasing arrears (Bhalla, 2000).

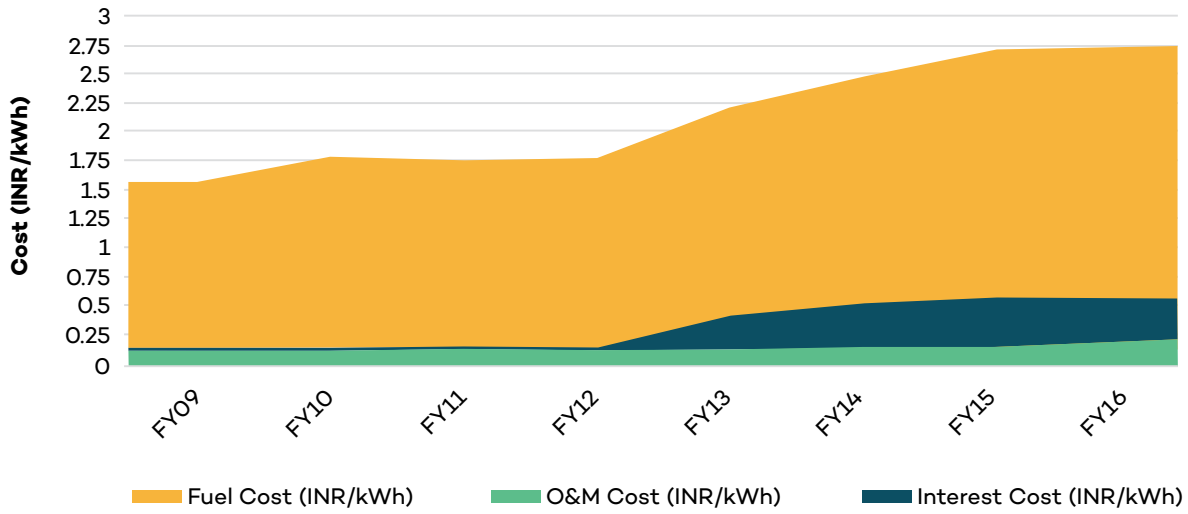


**Figure 4. Major costs of discoms between FY 2009 and FY 2016**

*Source: PFC, 2017.*

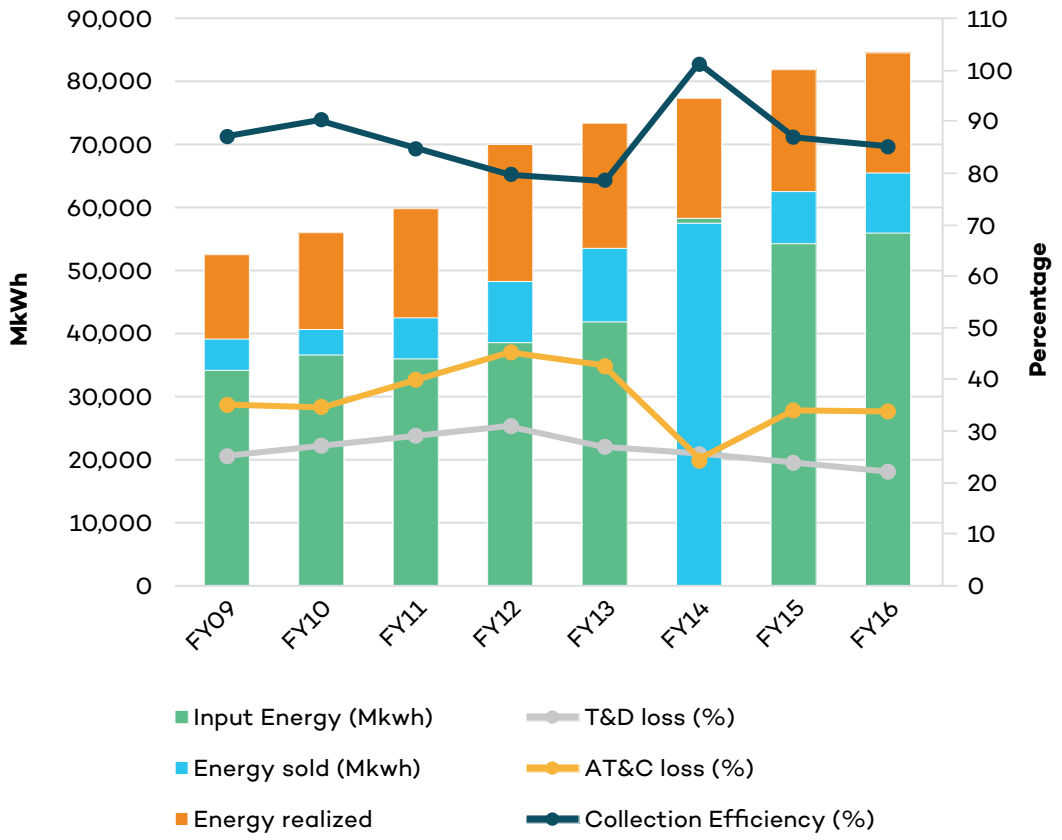


**Figure 5. T&D, AT&C losses and collection efficiency, 2009–2016**

*Source: PFC, 2017.*

The persistent gap between costs and revenue has made discoms financially unsustainable. The fiscal transfers (subsidies) constitute a major source of revenue for them and help bridge part of the gap between revenue and costs. These fiscal transfers may increase in the near future as more rural and poor households become connected to the grid. However, for discoms to be financially sustainable from their own revenue, tariffs need to be revised periodically and AT&C losses controlled to bring down costs.

### 1.3.2 Ability to Reliably Meet Demand

For reliable delivery of electricity, there must be sufficient generation capacity to meet peak demands. A rise in generation capacity increases the ratio of installed capacity to demand. A review of 110 countries, comparing the ratio of installed capacity to demand, found that a ratio of around 2 was typical (Nguyen, Bridle, & Wooders, 2014). In 2015–2016, India's ratio was 2.06 and at the state level—this ratio was 2.48 for Madhya Pradesh, 2.31 for Rajasthan, 2.23 for Tamil Nadu and 1.62 for Haryana. For U.P., this ratio is low (1.53 in FY 2016), a sharp increase over FY 2015 (see Figure 6). Capacity factor is defined as the ratio of average hourly actual generation of power to maximum possible generation at the installed capacity level. The capacity factor fell in FY 2016, implying that not all of the increase in installed capacity is leading to actual increase in generation. The financial health of discoms has been poor, and therefore they are not purchasing power resulting in low-capacity utilization. Other times, capacity utilization can be low due to fuel shortages.

Power intensity—the amount of power used to produce a kWh of GDP—reveals that India matches international standards. India's power intensity was 0.9 kWh per unit of GDP in FY 2016. Most countries use less than 1 kWh of electricity to produce 1 dollar (USD) of GDP (Nguyen, Bridle, & Wooders, 2014). U.P. consumes only slightly more, at 1.15 kWh in FY 2016. Since power intensity reflects economic activities and energy efficiency achievements, it is difficult to ascertain the exact reasons for the high power intensity of U.P.

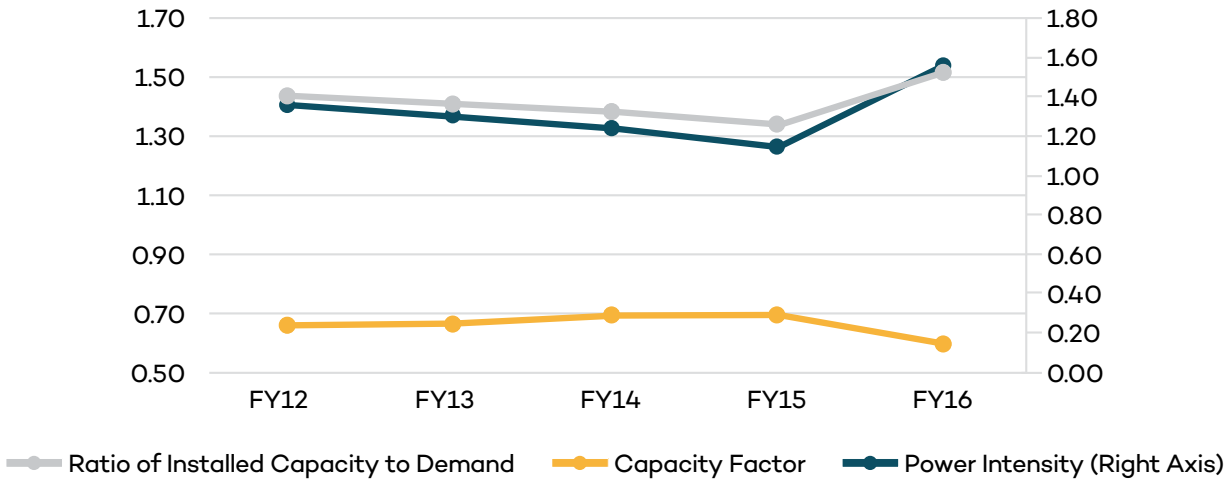


**Figure 6. Uttar Pradesh: Ratio of installed capacity to demand, capacity factor and power intensity FY 2012 to FY 2016**

*Source: Central Electricity Authority (CEA), 2017.*

Power outages, a strong indicator of reliability, can be caused by either an inability to match generation with demand because of inadequate generation capacity or because of technical problems in T&D. Examination of generation capacity reveals that the number of peak shortages fell in FY 2016. The gap between energy requirement and energy availability in U.P. is also decreasing and has fallen from 17 per cent in FY 2013 to 13 per cent in FY 2016. T&D losses have decreased over the years, but continue to remain high at 24 per cent in FY 2015.

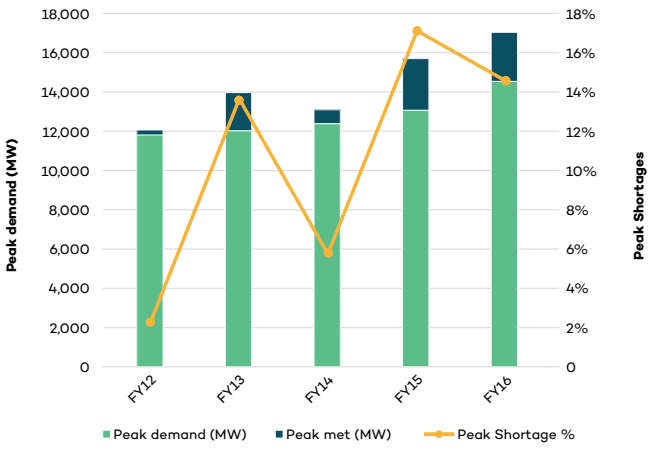


**Figure 7. Peak demand and shortages**

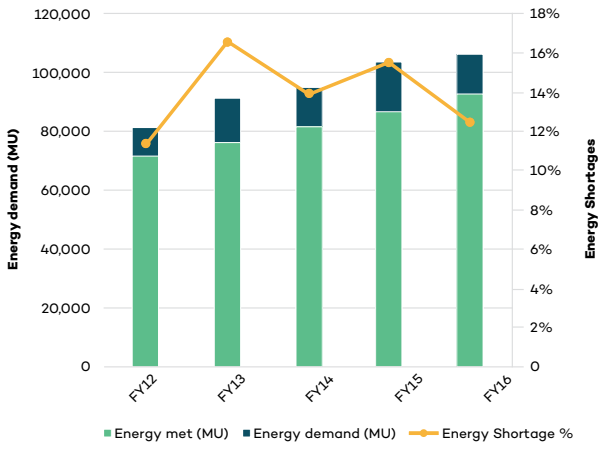


**Figure 8. Energy demand and shortages**

*Source: CEA, 2017.*

### 1.3.3 Recent Policy Changes and Challenges

Uttar Pradesh's discoms face many challenges; primarily their current inability to cover costs and provide reliable supply. Discoms bear substantial losses, with large revenue gaps, owing to line losses (power theft) and lack of bill collection.

Despite these challenges, discoms are trying to improve technical and commercial operations. The new U.P. government is in part driving this improvement in both financial and technical operations. The state government has placed household electrification as one of its top priorities and is monitoring the situation closely. It has also signed a memorandum of understanding with the central government to join the UDAY (Ujwal Discom Assurance Yojana) scheme. Under this scheme, the state government will take over discoms' debt. The discoms will have to display efficiency on a long list of technical and operational indicators.

In 2015-2016, national per capita electricity consumption stood at 1,010 kWh (CEA, 2017), while this figure for U.P. was only 524 kWh (Govt of U.P., 2017, p. 10). This is set to change as more rural consumers are connected to the grid. Out of 28.9 million rural households, 9.2 million have access to electricity ((Govt of U.P., 2017). An additional 5.9 million rural households were electrified by the end of FY 2017 but have yet to receive meters. The urban household electrification rate is higher, with 7.8 million (out of a total of 9.3 million) having access to electricity. The remaining 55 per cent of households (both urban and rural) will be electrified before 2022, under the "Power for All" scheme, which also aims to reliably provide the mandated 18–20 hours of electricity per day.

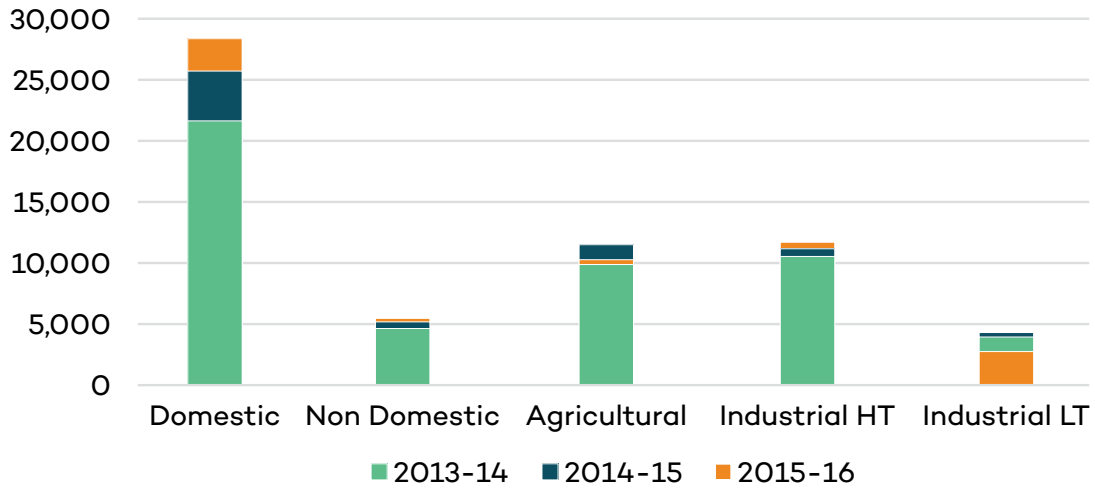


**Figure 9. Demand Mix: Consumer category-specific sale of power (MkWh)**

*Source: PFC, 2017.*

To help improve discom revenues, tariffs were revised in 2012, 2014 and 2015. In 2012, there were sharp revisions for both industrial and commercial consumers, while in 2014 and 2015, tariff hikes were in single digits. The tariff revisions in 2016 were delayed under the influence of the ruling political party because of the state elections. Tariff revisions are the subject of public debate between political parties and the Uttar Pradesh Electricity Regulatory Commission (UPERC), the agency responsible for executing tariff determination annually.

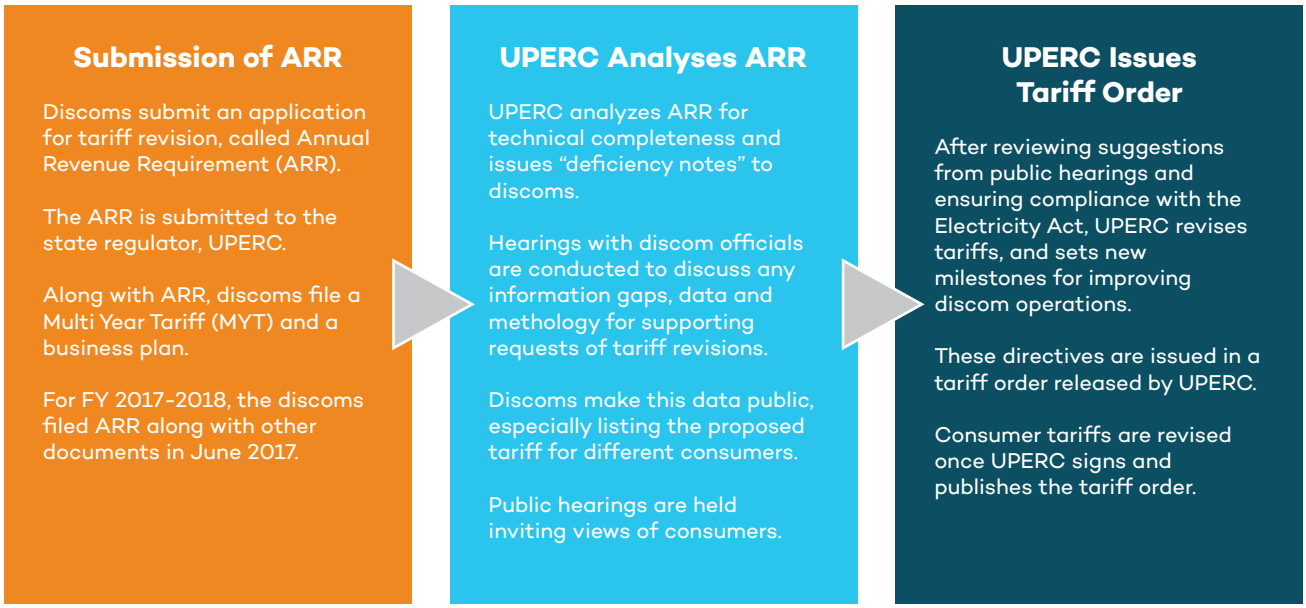


**Figure 10. Tariff-setting mechanism**

*Source: UPERC Orders, 2017.*

The 2017 tariff increases sought by UPPCL on behalf of the discoms are unprecedentedly high. An average hike of 22 per cent is proposed for all consumer categories. The greatest hikes in terms of percentage are for unmetered rural consumers, whose fixed monthly charge for 2 kW connections will increase to INR 650 per kW from the current INR 180 per kW. For metered rural consumers, the tariff revisions proposed are INR 85 per kW (as a fixed monthly charge) and INR 4.4 kWh. The corresponding current charges are INR 50 per kW and INR 2.2 per kWh (Hindustan Times, 2017). It remains to be seen if the hikes will be accepted by the UPERC and then implemented by the discoms.

U.P.'s proposed tariff is high, but a few states charge rates that are similar or higher. Haryana, Kerala, Delhi, Maharashtra, Punjab and Telangana charge more than INR 4.4 per kWh to consumers (Tongia, 2017) but these states are more prosperous and have a higher GDP than U.P. In the end, the proposed hikes may appear high especially for households, yet they do follow the national tariff policy (2006) that requires consumer tariffs to be within +/- 20 per cent of the average cost of supply (Das, 2016).

# 2.0 Stakeholder Mapping

## 2.1 METHODOLOGY

In many countries, the failure to reform energy pricing lies primarily with the political economy aspects of reform (Victor, 2009; GSI, 2009). Different factors can explain why some reforms are successful while others are not. According to international institutions such as the International Monetary Fund (IMF), World Bank and Global Subsidies Initiative (GSI), a good consumer subsidy reform plan often includes four elements: 1) a phased approach; 2) a new depoliticized system for determining prices; 3) targeted mitigation measures; and 4) a communications strategy (IMF, 2013; Kojima, 2013; GSI, 2013).

This section uses a stakeholder mapping framework set out by the World Bank and applied by the Global Subsidies Initiative in its technical assistance work in Egypt, Iraq and Iraqi Kurdistan. The objective of the framework is to assess each stakeholder's supportiveness for reform and their influence over decision-making processes. Having this overview can help to:

- **Understand power structures:** What stakeholders are the likely blockers or proponents of reform, and how do they (or can they) form effective coalitions?
- **Design mitigation measures:** What stakeholders should be compensated, and what type of compensation mechanisms are most effective?
- **Develop communication campaigns:** What stakeholders should be primarily targeted, and what type of messaging and communication channels are most effective?

The approach to stakeholder mapping is not intended to deliver comprehensive or objective analysis. Rather, it is intended to function as a quick, subjective exercise that captures the broad strokes of political economy concerns across a range of stakeholders, so that this information can inform more targeted analysis, such as primary research into stakeholder views through surveys, focus group discussions and interviews—as reported in subsequent sections of this paper.

The approach begins by identifying key stakeholders linked to the reform in question: upward adjustment of electricity tariffs to help cover losses of distribution companies. In this project, stakeholders have been identified across the distribution chain of electricity, from policy structures through to physical generation and distribution and finally end-user consumption. Information about stakeholders throughout this chain has been collected through a desk review of analytical literature and media articles. The findings have been organized into an interest-influence matrix that assesses the "supportiveness" and "influence" of each stakeholder, in order to identify where support or resistance to reform is likely to be strongest:

- "*Supportiveness*" is scored based on how much the stakeholder is likely to welcome the prospect of fuel subsidy reform, owing to both material and ideological factors, ranging from 1 (strongly opposed) to 5 (largely neutral) and on to 10 (strongly in favour). Some actors may react less on the issue itself than on the potential it offers to mobilize in pursuit of other goals—this is noted as appropriate in the stakeholder review.
- "*Influence*" is a multidimensional concept, including political influence at an elite level, access to means of mass communication, financial resources, perceived legitimacy, propensity to engage in violence and raw numbers. These various factors will be combined into a rough measure, ranging from 1 (largely sidelined) to 10 (highly influential).

Typically, policy-makers are encouraged to spend particular attention on stakeholder groups in the "low supportiveness" section of the matrix and engage those with a high level of supportiveness to support reform openly. Of the former group, those in the "high influence" category could become political opponents to reform, while a few in the "low influence" category may need special protection. Since low influence and low support groups could easily be manipulated by high influence groups, both categories could be a target for mitigation measures and communications.

## 2.2 STAKEHOLDER IDENTIFICATION

Analyzing Uttar Pradesh's electricity distribution sector reveals many stakeholders and varying degrees of power relationships between them. The stakeholders can be visualized along a distribution chain, where one half of the chain consists of supply and the other half demand (see Figure 11).

On the supply side are government agencies determining appropriate tariffs and political parties with a stake in what tariffs are agreed. Bridging supply and consumption, there are the discoms, who must engage with the regulatory agency to receive tariff approval and implement electricity operations.

On the demand side are different electricity consumers, who can be classified in a number of ways: through the electricity tariff structures that are used to provide different tariff rates; as key groups that are typically viewed as blocs sharing similar interests, such as citizens in certain geographical areas (urban, rural), households grouped by income (well-off, middle class, poor) or key economic groupings (farmers, big business, small business); as well as formal associations that represent key groups.

# Electricity Subsidy Reform Stakeholders

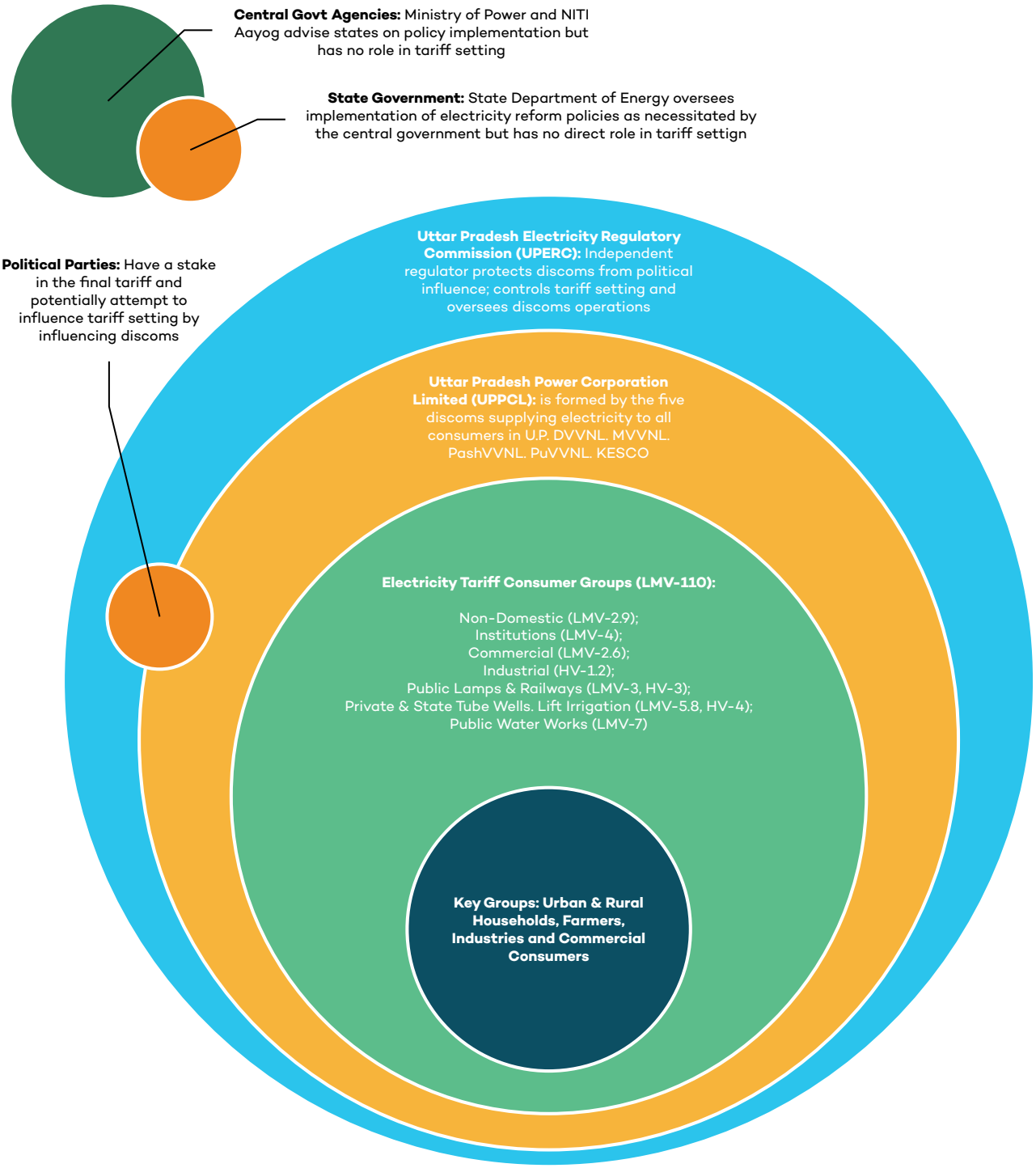


**Figure 11. Electricity subsidy reform stakeholders**

## 2.3 THE SUPPLY SIDE: DESCRIPTION OF KEY STAKEHOLDERS AND THEIR INFLUENCE IN THE ELECTRICITY DISTRIBUTION SECTOR

At the level of central government, the Ministry of Power influences state electricity sectors through reform programs and schemes, although it cannot actually interfere with tariff setting, which remains within the jurisdiction of the state. Other ministries and central agencies, as well as national political parties, can influence state-level policy through high-level analysis and messaging. At the state level, the Department of Energy is primarily responsible for electricity generation; its role with respect to pricing is restricted to implementing central government reforms and stepping in to deal with specific issues in the sector, such as theft, disputes or protests. The main state-level stakeholders who determine electricity tariffs are the Uttar Pradesh Power Corporation Limited (UPPCL), the five state distribution companies (discoms) and the Uttar Pradesh Electricity Regulatory Commission (UPERC). The process by which these actors determine tariffs is set out below. Finally, state-level political parties, under electoral sway, often exert influence over tariffs through UPERC and UPPCL.

**Central Government, Ministry of Power:** The Ministry of Power has actively launched several reforms and schemes. Key among the reforms is the Ujwal Discom Assurance Yojana (UDAY) scheme, a financial bailout package for the discoms. Among the schemes, the 24x7 Power for All campaign is important, as it aims to bring electricity to all households by 2020. The Ministry of Power is responsible for the development of electrical energy in the country and concerns itself with planning, policy formulation, processing of projects for investment decision, monitoring of the implementation of power projects, training and manpower development and the administration and enactment of legislation with respect to thermal and hydropower generation, transmission and distribution. It also focuses on power schemes that oversee electrification (24x7 Power for All) and energy efficiency. The Ministry also oversees all matters related to the regulators, like Central Electricity Regulatory Commission (CERC) and the Central Electricity Authority (CEA).

The national government has no direct influence on the state government decisions on electricity tariffs. However, over the years, the Ministry has encouraged states to reduce the debt on their respective discoms and charge consumers the true cost of electricity supply. The national government may also announce directions in policy that it expects state governments to follow. An example of this is the UDAY plan, a financial relief scheme for state discoms designed by the national government. It places conditions and targets on the state government and discoms to increase tariffs. Another example is a 2016 statement by former Power Minister, P. Goyal, where he suggested that state governments can attract investments by offering industries fixed tariffs for a fixed period (*Economic Times*, 2016). In its outlook for the electricity sector, the state government in Uttar Pradesh has increasingly aligned itself with the national government, since both are from the same political party (*Economic Times*, 2016).

**Other Central Ministries and Agencies:** The Ministry of Finance annually produces the economic survey. In the 2017 economic survey, the Ministry recommended progressive tariff schedules and the reduction of the cross-subsidy burden on industrial consumers. NITI Ayog (formerly the planning commission) has also published reports in the past that have highlighted the poor performance of the electricity sector in many states. NITI Ayog can review performance of existing policies to make recommendations to the government on how to bring a turnaround in the sector.

**U.P. Government Department of Energy**: Before the electricity sector reforms of 2003, the state Department of Energy had more authority to set the tariffs and the level of subsidies the state provided for electricity. Post-reform, the department has a greater role in electricity generation, where it oversees all major activities linked to projects, from land acquisition to the installation of substations

and provision of security. In matters of electricity consumption, the Department of Energy steps in only to deal with specific issues, such as checking on electricity theft, managing industrial disputes and protests, or communicating the Chief Minister's plans. The department also implements electricity reform policies as necessitated by the central government, like UDAY. Finally, it is responsible for the electrification of government projects such as irrigation tubewells and canal irrigation. The department also oversees the audits and functioning of the discoms (Govt of U.P., n.d.).

**Uttar Pradesh Electricity Regulatory Commission (UPERC):** The Uttar Pradesh state government created the Uttar Pradesh Electricity Regulatory Commission (UPERC) in accordance with the 1999 Electricity Act, which mandated the establishment of an independent regulator. UPERC, like most independent state regulators, is the decision-making authority in the electricity sector, which includes closely managing the electricity distribution companies. The regulator protects the electricity sector (including the discoms) from political pressures of the state government through a rules-based mechanism (described below) and simultaneously incentivizes electricity distribution companies to improve performance through competition (Dubash & Rao, 2008). UPERC was created for the smooth functioning of the electricity sector. It was intended to be a guardian of consumer interests and an enabler to generate financial resources. It has the power to make regulations to execute its functions, and act as an arbitrator to settle disputes (UPERC, 1999).

UPERC sets the tariff through a transparent process, as necessitated by the central government's electricity tariff policy issued in 2006. As part of the process, discoms are required to submit an annual revenue requirement (ARR) to the UPERC. Filing of this ARR triggers the process of tariff revision by UPERC; the latter takes into account multiple factors (such as tariff regulations set out by the Electricity Act and the Multi-Year Tariff (MYT)) framework, before approving any tariff revisions. The revised tariff is issued in the form of a tariff order through the discom (see Figure 10).

UPERC has limited powers to examine the audited accounts of discoms, which is essential to verify subsidies for select consumer categories that the state government reimburses to discoms. Where it has access to discoms' audited accounts, UPERC may alter tariffs in consumer categories to match the cost of supply (Bhattacharya & Patel, 2008, p. 224). Often, UPERC can be hindered by the ruling political party. This can happen if the political party influences discoms to delay the submission of the ARR, a necessary step for tariff revisions. If the ARR is delayed and tariff orders are not set, there is little UPERC can do. This was seen in 2016 when the ARR was held back under the influence of the then-ruling *Samajwadi* party, in light of the upcoming state elections (*Economic Times*, 2017). Other checks and balances placed by the Electricity Act—like submission of quarterly accounts to have data transparency—have on some occasions also been flouted by discoms.

**Transmission and Electricity Distribution Companies in Uttar Pradesh**: To meet the demands of the Electricity Act in 2003, U.P.'s transmission and distribution company (also known as the Uttar Pradesh Power Corporal Ltd, UPPCL) was restructured into a transmission company (which continued to be called UPPCL) and five electricity sector distribution companies (or discoms) (see Table 1). Each of these five discoms is required to submit an ARR to the UPERC. The table below lists public and private distribution companies across U.P. Though on paper the five public discoms are separate entities, yet administratively, they continue to operate in their older organizational structure, where the discom heads report to the chairman of UPPCL. The latter is politically appointed and oversees the functioning of the five discoms. The rules and regulations of the five discoms, including employee promotions are still governed by UPPCL. Tariffs of the five discoms are harmonized. Even some activities like power purchasing for all five discoms is conducted by UPPCL (Balls, 2017). These linkages between political parties and the UPPCL chairman suggests it is one of the ways in which discoms may not remain free of political influence.

**Political Parties:** Since the 1990s, there have been four major political parties in Uttar Pradesh: the Bharatiya Janta Party (BJP),[2] the Bahujan Samaj Party (BSP), the Congress Party and the Samajwadi Party (SP). Ruling parties have typically adopted populist measures, leaving the implementation of reforms as a problem for succeeding governments. This has led to delays in the execution of several reforms, particularly in the electricity sector, where the quantum of subsidies has increased over the years and electricity quality and expansion has been under-served by discoms, which have been in financial difficulties (Balls, 2017, 9). Populist practices for tariff setting by these political parties include decreasing residential tariffs and offsetting the reductions by increasing industrial and commercial tariffs, giving free electricity to poor households (see Figure 12 on key groups). Political parties also influence discoms through the process of ARR filing to delay the introduction of tariff orders (Energy World, 2017). Over time, every political party has exploited the political popularity of low-cost electricity in one way or another. In 2000, UPPCL (a former merged entity of the existing five discoms), had no debt on its books but the then-ruling BJP government refused to hike tariffs in the runup to the 2002 elections, thus creating a precedent for other political parties to imitate (Balls, 2017). Before the 2007 elections, SP announced a lower flat rate tariff for power loom weavers, an electorally significant community. But UPERC objected to this subsidy because the government did not provide upfront financing to the discoms as required by the Electricity Act. However, SP bypassed UPERC through a government order that directly influenced discoms to provide rebates on the electricity bills of the power loom weavers (*Business Standard*, 2013a).

## 2.4 THE CONSUMPTION SIDE: DESCRIPTION OF KEY STAKEHOLDERS AND THEIR INFLUENCE IN THE ELECTRICITY DISTRIBUTION SECTOR

Stakeholders among electricity consumers can be defined in a number of different ways. The first is through the different tariff structures that set out different prices for users depending on the consumer type (such as domestic, non-domestic, institutions, industry and various services such as lighting, rail and water) and size of voltage (low and medium voltage [or LMV] and high voltage [or HV]). From this, a number of key groups can be identified—households, urban and rural; farmers, some of whom irrigate crops using diesel pumps and others using electric pumps; and finally, industry and commercial enterprises, who may range from small and medium-sized enterprises (SMEs) to big businesses. Finally, there are the civil society organizations and representative associations that may represent the interests of these key groups, or a subset of any one key group.

[2] The current government is formed by the BJP.

## Consumer Groups

Figure 12 and Table 3 illustrate the proportion of demand made up by different consumer groups and the average tariffs paid by each consumer group served by the discom PAVVNL.

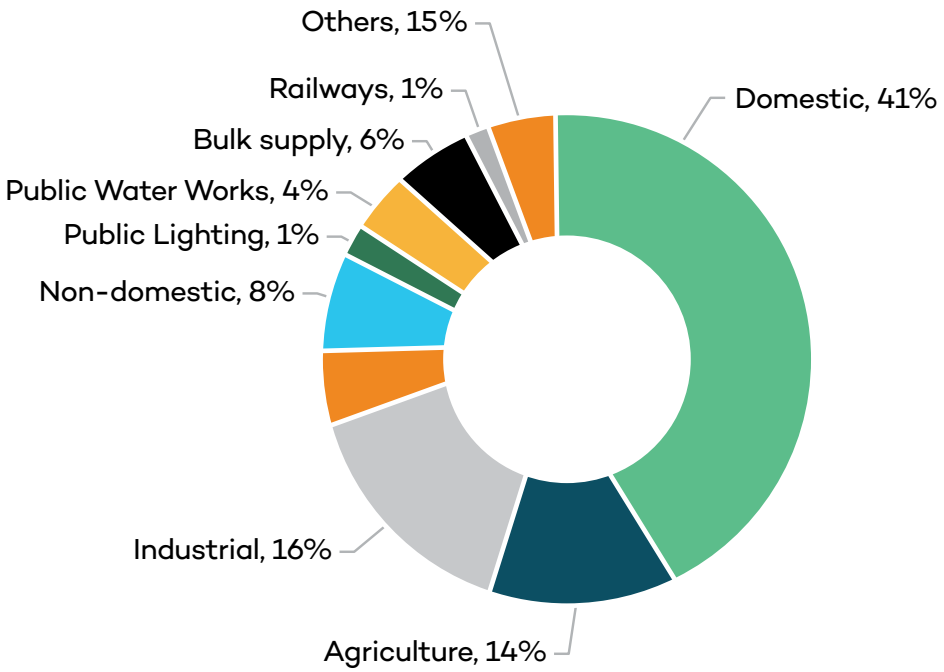


**Figure 12. Electricity Demand Mix of various consumer groups in Uttar Pradesh for FY 2015–2016**

*Source: PFC, 2017.*

**Table 3. Average tariffs across different consumer categories**

| Consumer Category | Tariff in INR per kWh in 2016 | Tariff as a % of ACS |
|---|---|---|
| Households(LMV1)/BPL Households | 3.92 / 2 | 62% |
| Farmers (LMV5) | 1.5 | 24% |
| Commercial (LMV2, LMV6) | 7.82 | 123% |
| Industrial (HV1, HV2) | 7.92 | 125% |

*Note: Tariff is average for consumer category and only for one discom, PAVVNL from 2016.*
*Source: Tariff Order of PAVVNL (UPERC, 2016)*

**Households:** Almost 75 per cent of the households in U.P. are in rural areas. According to the latest available information, 40 per cent of all domestic households (rural and urban) are unmetered (Government of Uttar Pradesh, 2017, p. 15).[3] The government has ambitious plans to meter these households and, further, make electricity accessible for unelectrified households. A total of 5.2 million poor households (14 per cent of the households across the state) qualify for a scheme announced by the new government, that gives BPL (Below Poverty Line) households a subsidized connection (Live

[3] Torrent power is excluded from this calculation.

Mint, 2017b). According to government statistics, 40 per cent of these households have been given free electricity connections, and the remaining households will be electrified by FY 2022, under the government's new 24x7 Power for All plan (Government of Uttar Pradesh, 2017, p. 38).

*Urban Households*

According to the 2011 census, U.P. had 9.3 million urban households, out of which 7.8 million are metered and on discoms' books (Government of Uttar Pradesh 2017, p. i). The state government hopes to give electricity access to the remaining 1.5 million households by the end of 2019. This target does not take into account a possible increase in population since the 2011 census.

*Rural Households*

The latest available information from discoms states that, out of a total of 28.9 million rural households in Uttar Pradesh, 9.2 million rural households are electrified and on discom records (Government of Uttar Pradesh 2017, p. 11). In addition, 8 million households have been provided an electricity connection, but metering has yet to be completed (Government of Uttar Pradesh 2017, p. i). This would bring the total electrified rural population to around 60 per cent of the rural population. The state government aims to bring electrification to all rural households by the end of FY 2019.

Currently, 40 per cent of households are unmetered. Typically, these households either pay a fixed charge per month or do not pay bills at all. Consequently, there are no recorded incidents of households staging protests against previous tariff reforms. However, this may be set to change as metering of households is a priority for discoms (Government of Uttar Pradesh 2017, p. ii). Moreover, recently announced new tariff reforms will significantly increase the fixed charges for unmetered households, which may change attitudes to future tariff reforms (Live Mint 2017a). In the past, repeated directives from UPERC to achieve 100 per cent metering (that is seen in neighbouring states) have yielded little results (Sinha, 2016). This may change under UDAY implementation, where metering has to be completed by FY 2019.

Occasionally some violent incidents have taken place when some residents have experienced very long electricity blackouts. In a few isolated incidents, residents receiving free electricity have reacted with violence against electricity discom employees when the latter arrived to check on electricity theft (Zee News, 2017b). A report by UPPCL estimates that 31 per cent of the power in the state is lost to theft (Jha, 2017).

**Farmers:** The most important use of motive power for farmers in Uttar Pradesh is for pumping water for irrigation. The majority of farmers in the state continue to use diesel pumps, limiting their reliance on electricity. A minority of farmers use electric pumps, and for this group, electricity pricing is a key concern. Approximately one million electric pump sets are used for irrigation across U.P (Government of Uttar Pradesh 2017 , p. v): electricity for irrigation accounts for 14 per cent of the electricity consumption (see Figure 12 on demand mix). With an increase in electrification and a preference for electric pumps, the number of electric pump sets for irrigation is expected to grow at 3 per cent annually, as per official government estimates. To check this growth, the government aims to use solar mini grids to power electric pump sets and launch a scheme where electric pump sets are replaced with energy efficient pump sets to create energy savings (Government of Uttar Pradesh 2017).

Since fewer farmers use electric pump sets, past tariff reforms have not seen any marked opposition from this group. This may change, however, if global crude oil prices rise, driving up the cost of

domestic diesel, and if the durability and quality of electricity supply improve at the same time. This would incentivize more farmers to switch to electric pump sets. The larger the population of farmers relying on grid electricity for irrigation, the more politically controversial any price rises will be.

**Industrial and Commercial Consumers:** Industrial and commercial consumers are a varied group. The discoms categorize commercial consumers as those having a load less than 75 kW (LMV-2, 6). These units can range from small shops, guest houses and theatres, to large offices, hotels and film studios. Loads above 75 kW (LMV-6, HV-1, HV2) are categorized as industrial consumers and can range from smaller manufacturing units like bakeries, stone cutting establishments and mills to bigger industrial units like steel plants and cement factories. Within commercial and industrial categories, discoms have created sub-groups to identify smaller and bigger consumers based on their load and kV of demand. Overall, tariff rates paid by all these groups are significantly above the average cost of supply, to help partially recover the cost of supplying electricity to other consumers at rates lower than the cost of supply. As a result, these groups are highly sensitive to price increases.

In 2012, the biggest electricity-intensive industries in the state were textile & garments, service, food, metal and leather products (ASSOCHAM, 2016). These consumers are evenly spread across the state, though a bulk of the industrial consumers are limited to certain locations.

Commercial consumers have seen average annual tariff hikes of 5 per cent since 2012, but they claim the final percentage of increase in their bills is in the double digits (Amar Ujala, 2012). Other difficulties that commercial consumers experience, particularly micro, small and medium enterprises, is in obtaining electricity connections to the grid (KNN, 2017). Consequently, they have been very outspoken against cross-subsidization, which leads to higher tariffs and a lack of financial investment in the upgrading of electricity services.

Commercial consumers have strong and formal associations headquartered in the state's capital, Lucknow. Their robust ties with the media—through formal press conferences, marches and protests—create a strong narrative that dominates the headlines when a tariff hike is announced. Specific examples of these associations and groups are listed in the stakeholder table at the end of this section. Through their associations, commercial consumers plan elaborate strikes and raise their complaints with the Chief Minister (Amar Ujala, 2012). However, in spite of their complaints there have been no tariff rollbacks for commercial consumers.

Industrial consumers' tariffs are high to cross-subsidize households and farmers. They are unable to find electricity at more competitive rates and have not seen an uptake of timely electricity sector reforms by the state's regulator UPERC. For example, as part of the early 2003 electricity reforms, state regulators across India were tasked with encouraging open access and third-party sales of electricity to break the monopolies of state-owned utilities that allowed them to charge high tariffs. An open access system encourages competitive tariffs among generating companies and is intended to identify the best rates for industries. These reforms have progressed in some states but not in U.P. Industrial consumers in the state are limited to purchasing electricity from the state-owned electricity distribution companies at high rates, impacting their profit margins. This has led to many industrial consumers migrating their operations to neighbouring states. For example, steel factories in Bijnor district are shutting down due to high power tariffs (Dabas, 2016). Out of 12 steel factories, 11 have shut down and moved to the neighbouring state of Uttarakhand where the tariff is half of U.P.'s, impacting profit margins significantly (Dabas 2016). The steel factories in U.P. want an open access system similar to the state of Rajasthan in western India, where industrial consumers can purchase power at competitive rates directly from the grid (Dabas, 2016).

### Representative Associations

**Electricity Employees Union**: This is a powerful union of employees and has a history of obstructing the government's reform plans. In 1999, when the U.P. Electricity Reform Act wanted to unbundle the State Electricity Board (SEB) into separate generation, transmission and distribution entities, more than 100,000 employees went on strike for months. The standoff finally ended when the government agreed to pensions for the workers (Balls, 2017, p. 11). This incident established an approach that has been repeated in recent years when employees protested against privatization of the discom in the city of Kanpur (Rawat, 2013).

**Umbrella Organization of Electricity Consumers in U.P.:** *U.P. Rajya Vidhyut Upbhokta Parishad* is an umbrella organization of electricity consumers in Uttar Pradesh. This is an active body safeguarding consumer interests, particularly small consumers and households. The organization's president voices concerns through coverage that routinely appears in print media. The organization has strong opinions on policy matters related to electricity, including the budget allocation for electrification, opposing privatization and protecting the interests of small consumers. Apart from regular press briefings, the organization has sought legal and formal channels of complaint against discoms. In several cases, by approaching UPERC, this organization has managed to bring about corrective action for consumers (Financial Express, 2015).

**Residents Groups:** A spike in high-rise apartment buildings has created a number of resident groups from housing complexes. These groups are active in organizing themselves and communicating their grievances, which are mostly focused on transparency of billing and tariffs. These resident groups differ from resident welfare associations (RWAs) which manage the interest of the building developers and maintenance of grounds. The summary table of stakeholders and interests below provides specific examples where these resident groups have launched legal complaints against UPERC for incorrect billing (Rajput, 2016). To date, these groups have not notably protested against tariff revisions.

## 2.5 KEY STAKEHOLDERS AND THEIR POSITIONS IN U.P. ELECTRICITY TARIFF REFORM

This table examines the various stakeholders' influence and interest in the electricity distribution sector in U.P. and analyzes their positions on specific reform policies, like tariff adjustments, metering and billing charges. Tariff hikes implemented in the state in 2012, 2013, 2014 and 2015 have been used to report events below.

**Table 4. Tariff hikes in Uttar Pradesh for different consumer groups**

| | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|
| Metered Rural Households | No hike | 120% | No hike | No hike |
| Metered Urban Households (lowest number of units) | No hike | 14% | No hike | 5% |
| Urban Commercial | 20% | 4% | 6% | 5% |
| Industrial | 17% | No hike | 7% | 5% |
| Farmers | No hike | 25% | 12.20% | 2.73% |

*Note: Hikes in per kWh have been taken into consideration to calculate these figures. While there are hikes in a fixed charge, those have not been included.*
*Source: NDTV 2012; NDTV 2013; Rawat 2014; Financial Express 2015.*

**Table 5. Key Stakeholders and their positions on electricity tariff reform in Uttar Pradesh**

| Stakeholder | Description and level of supportiveness and influence | Reaction to tariff reform |
|---|---|---|
| **GOVERNMENT** | | |
| Ministry of Power<br><br>**Supportiveness score: 9**<br><br>**Influence score: 7** | The Ministry of Power<br><br>strongly supports electricity tariff reform: under the current BJP government, it has pushed for several reforms in the sector since 2014, including Ujwal Discom Assurance Yojana (UDAY), a bailout package for the discoms reviewed in Section 4 of this report. The Ministry of Power is keen to showcase a financial turnaround of the electricity sector before the next general elections in 2019.<br><br>The Ministry of Power is highly influential because the national government and the U.P. state government are from the same political party (BJP) creating ideological alignment and strong party linkages between central policy and state policy. | The national government reacts cautiously to state-level tariff announcements because electricity is under the jurisdiction of states who are free to decide their own tariffs. In the past, the Power Minister has encouraged states to charge the true cost of power supply to help lower discom debt. |
| State Department of Energy<br><br>**Supportiveness score: 7**<br><br>**Influence score: 6** | The current state department for energy is highly supportive of tariff reform under its mandate of implementing several electricity sector reforms. These include meeting UDAY targets, checking power theft, scrapping high cost power purchase agreements and meeting renewable energy targets (Mishra, 2017).<br><br>The current energy department's secretary is currently also the chairman of UPPCL. Therefore, the state department can strongly influence all upcoming tariff reforms. | Because of shared leadership, (the chair of UPPCL is also secretary, energy department), the state department is involved in the tariff determination exercise (see Figure 10 for tariff-setting mechanism). |
| Uttar Pradesh Electricity Regulatory Commission (UPERC)<br><br>**Supportiveness score: 10**<br><br>**Influence score: 10** | One of UPERC's objectives is to make the electricity sector financially sustainable. And in that light, the body supports tariff reform. When reforms are not initiated by the discoms, UPERC is seen encouraging the discoms to file their ARRs so tariffs can be revised timely (Energy World 2017).<br><br>As the official body that reviews and adjusts the tariffs suggested by discoms through the annual revenue requirement (ARR) process, UPERC is very influential. Often, though, it can be limited by the ruling political party. If the ARR is delayed and tariff orders not set, UPERC can do little. This was seen in 2016 when the ARR was held back under the influence of then-ruling political party, Samajwadi party in light of the upcoming state elections (Energy World 2017). Occasionally, UPPCL also refuses to answer queries of UPERC, undermining its authority. In one such incident, UPERC repeatedly asked UPPCL directors to answer queries. When no reply was received UPERC notified the Chief Minister about UPPCL's disregard for the regulatory body and in turn of the government (Shah, 2016a). UPERC has some degree of influence over the discoms, as it has fined some of them in the past for not meeting the targets on reducing AT&C losses (Jainani, 2015). | Previous tariff reforms have seen clashes between political parties and UPERC. In one such incident in 2014, BJP staffers who were then in opposition to the tariff reform stormed UPERC offices and demanded roll back of the tariffs (Shah, 2014).<br><br>Except for one incident, UPERC has never revoked an order to increase the tariff. The one incident where it did revoke its order was focused on unmetered consumers. In an effort to increase the metering in the state to 100 per cent it had released an order to hike the tariff of unmetered consumers by 10 per cent. But soon the order was revoked without any reasons being provided (Shah, 2016c). |

| | | |
|---|---|---|
| Electricity Distribution Companies –<br><br>PAVVNL, DVVNL, MVVNL, PUVVNL, KESCO<br><br>**Supportiveness score: 10**<br><br>**Influence score: 7** | Discoms are highly supportive of tariff reform that reduces their debts. The average cost of supply for each discom is higher than the average revenue collected. Their aggregate, technical and commercial losses have also been high, adding to their financial problems. Their degree of support for tariff reform may be mitigated to some extent by the fact discoms also have other strategies to reduce losses (such as improving metering, billing and collection) though in practice little progress has been made in these areas. This is now changing as a number of discoms have taken a more proactive stance on improving performance. PAVVNL, for example, has aligned itself with the new government's agenda of reducing power theft by stating that it will book its employees under the Gangster Act if they are found to be encouraging theft (Zee News 2017a). The UDAY program is also intended to improve discom performance in such areas.<br><br>Discoms have a fair degree of influence, as they are able to request tariff adjustments every year through the ARR process with UPERC. In practice, this influence has allowed them to increase tariffs every year. But this increase has been insufficient for cost-recovery levels as the revenue gap has increased consistently (see Section 1 on the revenue gap). | Discoms typically submit to UPERC a request for tariff adjustments through the ARR. Their request for tariff adjustments is usually much higher than what the UPERC grants them. Through repeated revisions and discussions, the UPERC often brings down discoms' tariff requests to reduce the percentage in hikes for different consumer categories. The differences in original hikes requested by discoms and subsequent revisions made by UPERC are available in more detail through each discoms' tariff orders. |
| Other Central Agencies - NITI Ayog, Ministry of Finance<br><br>**Supportiveness score: 9**<br><br>**Influence score: 5** | NITI Ayog (the erstwhile planning commission) supports tariff reform. Since its creation as a central planning body in 2015, it has routinely submitted recommendations in favour of tariff reform. The Ministry of Finance has also strongly supported tariff reform. In its annual publication (Economic Survey 2015-16), it called for progressive tariff schedules for households to maintain subsidized tariffs for the poorest, but increase tariffs for higher domestic consumers. The survey also calls for reducing the cross-subsidy burden on industries.<br><br>Since NITI Ayog is a government think tank it has an advisory role and no legislative or regulatory powers over state governments tariff procedures. State governments can choose to ignore recommendations of NITI Ayog when setting tariffs. However, the Ministry of Finance has a little more influence, as it can create committees (of senior officials and parliamentarians) to review state government performances, thus creating an accountability structure for state governments. One such government committee is currently reviewing the tariff structure and the consumer categories, which have not changed since the inception of discoms (Singh, 2016). | NITI Ayog and Ministry of Finance do not criticize the policy announcements of state governments. Neither have reacted to the tariff reform policies of the state government. Both only submit reviews and assessment reports to the national government. |
| **BUSINESS** | | |
| Industrial Consumers<br><br>**Supportiveness score: 4**<br><br>**Influence score: 7** | Industrial consumers do not support increases in industrial tariffs and typically lobby for longer tenures of predictable tariffs. This helps them predict their product costing and safeguard profit margins. Interviews with industrial consumers reveal that they are not in favour of cross-subsidization, which makes their tariff higher; however, 52 per cent of them are in favour of providing subsidies to farmers and poor households (more information available in Section 3).<br><br>Industrial consumers can exert significant levels of influence. For example, representatives of individual industrial houses can routinely access senior government officials and different government agencies to communicate their views on tariffs. In October 2012, industry representatives met government officials to express that they had experienced a tariff hike of 30 per cent and hence should be exempted from any further revisions (Times of India 2013)(Times of India, 2013a) (Hindu Business Line, 2012). In June 2013, UPERC revised tariffs for most consumer categories, but industrial consumers were exempted. | After a tariff reform in 2012, a delegation of Indian industries associations (IIA) met the Chief Minister and the principal secretary of power to request no hikes in the next financial year and also to defer the electricity duty until the next tariff hike (Indian Express, 2012). |

| | | |
|---|---|---|
| Commercial Consumers<br><br>**Supportiveness score: 3**<br><br>**Influence score: 7** | Commercial consumers do not support increases of commercial electricity tariffs and strongly object to cross-subsidization. Interviews with commercial consumers reveal that, only 35 per cent are in favour of providing subsidies to farmers and poor households.<br><br>Individually, many of these companies are fairly small and may have little to no influence. However, through a large number of associations (often headquartered in the state capital, Lucknow), they may use press conferences, protests, gatherings and demonstrations to gather the attention of the media and communicate their points of view. Despite this leverage, it seems that their effective influence is not particularly high, as such activities have failed to engineer any rollback of annual tariff hikes in the past. | In the 2012 tariff hike, these consumers gathered in Lucknow to protest and threatened to shut their shops with a nationwide strike (Amar Ujala, 2012). As a symbolic gesture, they planned to hand over their keys to the Chief Minister. They also signed a joint statement asking for a rollback of the tariff hike. Noteworthy is that many commercial consumers from the city of Bareilly reacted to the tariff reform and planned to move to the neighbouring state of Uttarakhand that they felt had more "favourable conditions" (*Hindustan Times*, 2012). Consumers also protested against the hike in fixed charges and minimum charges (Rashtriya Sahara, 2012). |
| **CONSUMERS** | | |
| Farmer Groups<br><br>**Supportiveness score: 4**<br><br>**Influence score: 4** | Our survey of farmers found low support for tariff reform. More than 50 per cent of the farmers believe they should be shielded from tariff hikes. Interviews with farmers revealed that they would support a tariff increase if it meant a better supply of electricity to other farmers and poor village households.<br><br>Individual farmers have almost no influence over tariff reform. Our survey and interviews found that most farmers were not part of any associations and did not have a collective voice. | Survey and interview findings reveal that most farmers have never protested and instead complained only unofficially about the tariff to their local discom official. They said sharp tariff hikes disrupt their monthly budgets and often they have not paid bills on time (more information on coping mechanisms to tariff hikes is available in Section 3). |
| Rural Households<br><br>**Supportiveness score: 4**<br><br>**Influence score: 9** | Rural households do not support tariff increases for residential users. Our survey findings indicate that they also have strong opinions on protecting the tariff rates of poor households and farmers. Their main concern regarding the electricity sector is to receive better quality and longer hours of grid electricity.<br><br>Rural households have no means of exerting influence over tariffs except their voting rights. | Some villages have formally protested to their discom and linked this to 2017 elections as a means of drawing attention. For example, after the transformer was burned and there was no electricity for 2 months, BKT village boycotted the elections. They complained to the discom LESA, but nothing happened until they protested in this way and the media picked up on the news (Khani, 2017). |

| | | |
|---|---|---|
| Urban Households<br><br>**Supportiveness score: 4**<br><br>**Influence score: 5** | Urban households do not support tariff increases for residential users. They also do not have a generalized sense of entitlement to free electricity. They feel strongly about protecting poor households from tariff increases. Their main response to increased tariffs has been to argue to limit the increases or to introduce differential pricing to limit bills.<br><br>Like rural households, urban households have no means of exerting influence over tariffs except their voting rights. There are some examples of residents' associations (see below), particularly in the Noida area, putting forward joint complaints to discoms and UPERC, but there is little evidence to suppose that this has been an important source of influence over tariff setting (Jha, 2016). | No data was found recording the reaction of urban households to tariff reform. |
| Residents of the Chief Minister's constituency<br><br>**Supportiveness score: 1**<br><br>**Influence score: 6** | As with most residential users, this group opposes tariff increases. Residents in the Chief Minister's constituency are more influential because they are a core part of the government's voter base. However, their influence may be more effective in bending rules than setting them. For example, the districts currently in the Chief Minister's constituency (Etawah, Kannauj and now Gorakhpur) report the highest electricity theft. | Little is known about their position on tariff reform. |
| **UNIONS AND CIVIL SOCIETY** | | |
| Umbrella Organization of Electricity Consumers in U.P.<br><br>**Supportiveness score: 2**<br><br>**Influence score: 9** | This organization does not support tariff increases for households and commercial consumers. It is an active organization that participates in protests against tariff hikes and in public hearings organized by the UPERC.<br><br>While it has little direct influence over tariff setting, it can be powerful in influencing public opinion by creating demonstrations whenever a tariff hike is announced. | The chairman of U.P. Rajya Vidyut Upbhokta Parishad, Avadhesh Verma staged an "agitational programme" against the 2015 power tariff hike (*Financial Express*, 2015). |
| Informal Residents Groups<br><br>**Supportiveness score: 5**<br><br>**Influence score: 5** | Urban residents of high-rise apartment complexes have formed informal groups to safeguard themselves against developers overcharging them for electricity. These groups differ from formal Resident Welfare Associations (RWAs) that usually are just managing operations and tend to overcharge residents. These residents are neither likely to support nor protest against tariff reform. They typically want transparency in tariff setting.<br><br>Residents groups have proved to exert some influence over discoms by representing their consumers' joint interests. For example, some, such as in the Noida area, represent residential high-rises, and purchase power in bulk and then distribute it further to apartments in return for maintenance charges. As a result, such associations may be better able to lobby for consumer rights. In other cases, residents groups may be informal but bound together by being part of one community. For example, after a lengthy power cut (caused by overloading, local faults and a heat wave), residents from Telibagh and Southcity areas forcefully barged into a substation in the middle of the night to protest against the unscheduled power cuts (Sasha, 2017). In another case, residents of Kandha in Shamli district attacked two officers from the U.P. Power Corporation with rods when they came to disconnect their connection. These residents were not paying for their electricity connection (*Zee News*, 2017b). | Tracking reactions of Uttar Pradesh's many different residents' groups can be accessed through several local city-based press coverage. |

| | | |
|---|---|---|
| U.P. Power Employees Joint Action Committee<br><br>**Supportiveness score: 5**<br><br>**Influence score: 5** | This union of discom employees does not have a stand on tariff reform, but it is important to note their agenda as it overlaps with larger electricity sector reforms. The union is strictly against privatization of electricity distribution. Further, they want all contractual employees to be regularized.<br><br>The union has proven to be very influential over its areas of concern in the past. For example, Kanpur's electricity distribution was to be handed over to a private player, Torrent Power. But after six years, the MoU was cancelled owing to violent protests and frequent strikes by the employee union. In May 2013, it held state-wide protests when the government attempted to privatize electricity distribution in four cities—Meerut, Ghaziabad, Varanasi and Kanpur—alleging that the government was only privatizing high-revenue areas while the loss-making areas would remain with the state utilities, thereby "privatising revenue and nationalising loss making" (Rawat, 2013). | There is no data available to track the reaction of this group to tariff reform. |
| Media<br><br>**Supportiveness score: 5**<br><br>**Influence score: 7** | The national print and online media does not typically take a position on tariff reforms, instead focusing on reporting the policy developments on tariff reforms. The regional- or state-level print media's primary interest so far has been on reporting negative reactions to tariff reforms. The number of articles published on activities of unions and demonstrations arising out of tariff reform suggests that the state- and city-specific media reporting tends to focus on such events.<br><br>A speculative assumption is that narratives in the print media may have influenced politicians and officials to tread cautiously on announcing any tariff reforms to avoid evoking any strong reactions. | The U.P. print media typically reported stories on protests and demonstrations. There was little probing why the government had to hike tariff reform or the position of discoms. There was limited comparison to other states that are doing better on the financial sustainability of their electricity sector. |


**Figure 13. Supportiveness-influence matrix**

*Source: Authors' analysis*

# 3.0 Consumer Group Attitudes

This section presents consumer attitudes toward electricity subsidies and tariff reform. Consumer groups include: urban and rural households, agricultural consumers, and commercial and industrial consumers. Together, these consumers account for 76 per cent of U.P.'s electricity demand mix (PFC, 2016). Within them, households or residential consumers constitute 41 per cent of the demand mix and are important for both political and economic reasons. The attitudes of these consumer groups were gauged through both quantitative and qualitative methods. Households and agricultural consumers were surveyed, while interviews were conducted for agricultural, commercial and industrial consumers. The results presented for each group include views on their experiences as electricity consumers, perceptions on subsidies, tariff reform, coping mechanisms against tariff hikes and their means to channel influence. This section will use the findings to identify opportunities for introducing tariff reform among different consumer categories. Those will be listed in Section Five.

## 3.1 METHODOLOGY & DESCRIPTIVE DATA

### 3.1.1 Residential Consumers

For households,[4] a large survey was conducted across 12 urban and rural districts in Uttar Pradesh.[5] A detailed description of the sampling methods for both rural and urban surveys can be found in Appendix 2. In short, rural surveys were first divided in four geographical groups and subsequently three random districts in each geographical group were sampled. This created a representative survey of rural households in Uttar Pradesh. Because of limitations in budget and time, urban surveys were conducted in the same 12 districts. Urban representativeness was maximized in these 12 districts, but the urban sample was not representative for Uttar Pradesh as the sampling of those 12 districts was based on rural population shares. Results reported in this report are therefore representative of urban populations in the 12 districts, but not in Uttar Pradesh as a whole.

In total 960 rural households and 957 urban households were surveyed. The survey covered populations serviced by four different electricity distribution companies: PAVVNL, PUVVNL, DVVNL and MVVNL (see Figure 14).

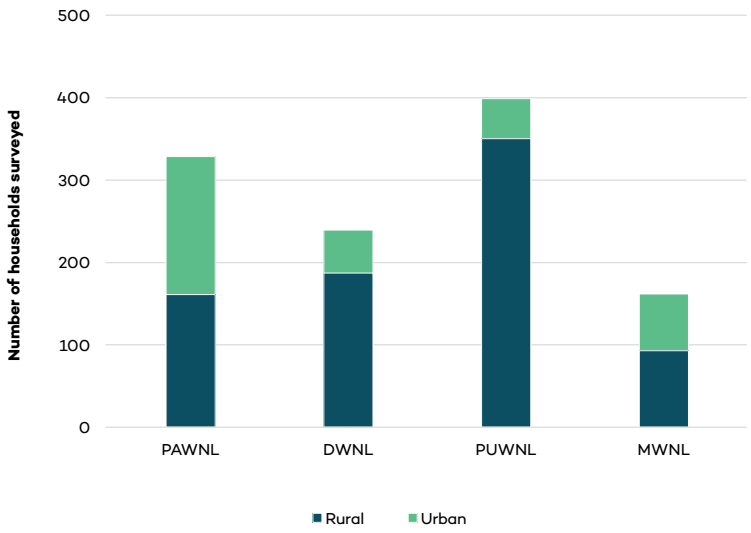


**Figure 14. Surveyed households and utilities**

[4] Households are also referred to as domestic consumers under the discoms' tariff structures
[5] UP is divided into 75 districts

## Response Rates

Around 60 per cent of both rural and urban surveys were conducted with men, and around 60 per cent of all respondents were heads of their household. The size of rural households was on average seven people,[6] while that of urban households was six.[7] Roughly 83 per cent of rural respondents were Hindu and 16 per cent Muslim. This was respectively 68 per cent and 32 per cent for respondents from urban households. Caste composition was similar, across rural and urban households with around 16 per cent of respondents belonging to upper caste, 61 per cent other backward caste (OBC), and 20 per cent scheduled caste (SC).

## Demographic Profile

As expected from a representative survey, there was a large variation in the level of schooling and occupation. Around 32 per cent and 40 per cent of urban and rural respondents respectively had received no formal education (see Figure 15). Around 29 per cent of rural and 34 per cent of urban respondents respectively were employed as labourers. Exactly one third of rural respondents worked in agriculture, while19 per cent of urban respondents were businessmen. The survey included a significant amount of non-working respondents (14 per cent rural and 25 per cent urban).

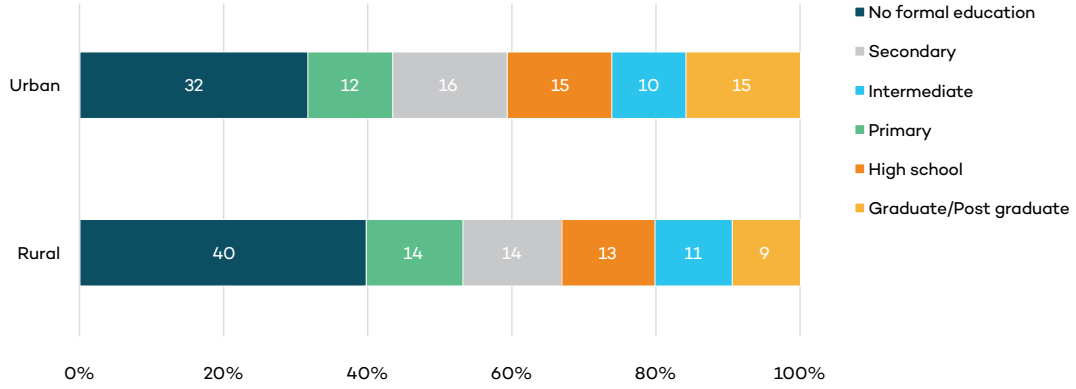


**Figure 15. School completed (rural & urban)**

*Note: 95% CI[8]; Sample size rural 960/960; Sample size urban 957/957.*

## Income Profile

Rich rural households tend to skew the average reported monthly expenditure of U.P. households in general and rural households in particular. With a reported average monthly expenditure of about INR 18,000, rural households seem to spend much more compared to average urban households (INR 8,700). Median monthly expenditure for rural households is about INR 5,000 and for urban households INR 8,000. Around 10 per cent of rural households and 5 per cent of urban households spend less than INR 3,000 per month.

Per capita monthly household expenditures for both rural and urban populations show that rural households generally spend much less than urban households. These ranges also show that a large part of both urban and rural households live under the poverty line. Analysis from the planning commission put the 2014 poverty line at INR 972 monthly per capita expenditure (MPCE) in rural

[6] Median 6; SD 3.5; 95% CI [¬6.7-7.2]
[7] Median 5; SD 2.8; 95% CI [5.8-6.2]
[8] 95% CI Rural No formal education [37%-43%]; Rural Primary [12%-16%]; Rural Secondary [11%-16%]; Rural High school [11%-15%]; Rural Intermediate [9%-13%]; Rural graduate/postgrad [7%-11%]; Urban No formal education [29%-35%]; Urban Primary [10%-14%]; Urban Secondary [14%-18%]; Urban High school [12%-17%]; Urban Intermediate [9%-12%]; Urban Graduate/postgrad [13%-18%];

areas and at INR 1,407 monthly per capita expenditure in urban areas.[9] While by now these numbers are likely higher (due to inflation), based on the 2014 poverty lines, 48 per cent of rural households and 53 per cent of urban households live below the poverty line. This may seem large, but it should be recalled that poverty is a dynamic concept. Currently living in poverty may not mean that the respondent will remain poor tomorrow, and there is always a discrepancy between the proportion of population holding a ration card or otherwise and the MPCE as 1) there are always errors of exclusion and inclusion (Type 1 and Type 2 errors); 2) there is always a gestation lag for a real poverty status to get reflected in the colour of the ration card being held; and 3) A BPL survey, carried out by the Ministry of Rural Development is quite independent of the estimates of poverty at the macro level that is brought out by Planning Commission.

**Table 6. Rural reported monthly HH expenditure per capita (%)**

| Monthly income | Share of households (%) |
|---|---|
| [0-500] | 17.92 |
| [501-800] | 22.29 |
| [801-1000] | 21.25 |
| [1001-1500] | 19.27 |
| [1500-max] | 19.27 |

**Table 7. Rural reported monthly HH expenditure per capita (%)**

| Monthly income | Share of households (%) |
|---|---|
| [0-900] | 23.51 |
| [901-1200] | 18.6 |
| [1201-1600] | 20.38 |
| [1601-2300] | 17.76 |
| [2301-max] | 19.75 |

*Note: 95% CI[10]; Sample size rural 960/960; Sample size urban 957/957; Income categories constructed to approximate quintiles in respective rural and urban settings.*

About two thirds of surveyed households owned a ration card. About half of ration card owners have a BPL card, whereas the other half have an APL card. Rural ration card owners have more BPL cards (50 per cent) relative to urban households (42 per cent) and vice versa for APL cards (42 per cent versus 57 per cent).

### 3.1.2 Agricultural Consumers

About 70 per cent of U.P. residents directly or indirectly depend on agriculture and associated sectors. In 2010–2011, 80 per cent of land holdings were smaller than 1 hectare (Ha), with another 13 per cent between 1 and 2 Ha. In 2012–13, 67 per cent of irrigated land was serviced through the use of private tube wells (Ramendu & Hasib, 2015).

Given its focus on electricity, this project conducted two surveys with agricultural users: one with agricultural landholders that primarily use an electric pump for crop irrigation; and the other with landholders that use a diesel pump. This is because the main source of electricity usage in the agricultural sector is related to irrigation. The majority of landholders in Uttar Pradesh still use diesel pumps, so electricity pump users were oversampled in order to ensure that this sub-population was adequately surveyed (both with surveys and in-depth interviews). Electric and diesel pump users were surveyed in the same 12 districts where the rural household surveys were conducted. For every sampled village, the protocol for sampling electric and diesel pump users was: 1) If there are no electric pumps, then five diesel surveys; 2) If there is one electric pump, then interview that pump

[9] Government of India Planning Commission. (2014). *Report of the Expert Group to Review the Methodology for Measurement of Poverty*. Retrieved from http://planningcommission.nic.in/reports/genrep/pov_rep0707.pdf

[10] 95% CI Rural 0-500 [16%-20%]; Rural 501-800 [20%-25%]; Rural 801-1000 [19%-24%]; Rural 1001-1500 [17%-22%]; Rural 1500-Max [17%-22%]; Urban 0-900 [21%-26%]; Urban 901-1200 [16%-21%]; Urban 1201-1600 [18%-23%]; Urban 1601-2300 [15%-20%]; Urban 2301-max [17%-22%];

owner and do four diesel surveys; 3) If there is more than one electric pump, then interview one electric pump owner, survey another electric pump owner, and do three diesel surveys.

In total, 284 diesel pump and 129 electric pump users were surveyed (see Table 8). Given the relatively low sample size for electric pump users, in addition to surveys, the project partners also conducted 67 additional in-depth interviews with electric pump users.

**Table 8. Districts and pump users in survey and interviews**

| District | Surveyed Diesel pump users | Surveyed Electric pump users | Interviewed Electric pump users |
|---|---|---|---|
| Muzaffarnagar | 15 | 17 | 8 |
| Bulandshahr | 21 | 11 | 8 |
| Hathras | 9 | 23 | 8 |
| Mainpuri | 9 | 24 | 7 |
| Jhansi | 32 | 4 | 4 |
| Allahabad | 24 | 11 | 5 |
| Faizabad | 25 | 9 | 6 |
| Bahraich | 39 | 0 | 1 |
| Siddharthnagar | 40 | 0 | 0 |
| Azamgarh | 27 | 6 | 7 |
| Ghazipur | 18 | 14 | 8 |
| Sonbhadra | 25 | 10 | 5 |
| **Total** | **284** | **129** | **67** |

## Demographic Profile

All respondents except one were agricultural landowners, and all respondents but two were men. There are a few notable distinctions between electric and diesel pump users in our survey. Electric pump users are on average more educated and also have larger land holdings (see Figure 16).

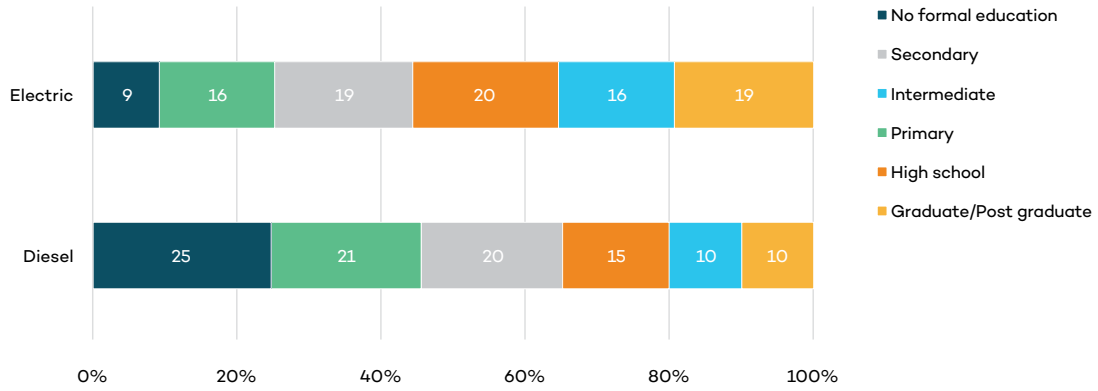


**Figure 16. School completed (%)**

*Note: 95% CI[11]; Sample size electric 129/129; Sample size diesel 284/284.*

[11]95% CI Electric No formal education [4%-14%]; Electric Primary [10%-23%]; Electric Secondary [13%-26%]; Electric High school [13%-27%]; Electric Intermediate [10%-23%]; Electric graduate/postgraduate [12%-25%]; Diesel No formal education [20%-30%]; Diesel Primary [16%-26%]; Diesel Secondary [15%-25%]; Diesel High school [11%-19%]; Diesel Intermediate [6%-13%]; Diesel Graduate/postgraduate [6%-13%];

Land holding sizes used in the survey are categorized as marginal (<1 Ha), small (1 Ha–<2 HA), semi-medium (2 Ha–<4 Ha), medium (4 Ha–<10 Ha), and large (10 Ha and above). This classification corresponds to the breakdown of land holdings in the 2010–11 Agriculture Census (Dubbudu, 2015). In that census, marginal holdings account for more than 60 per cent of operational holdings, which is more than results from this survey (see Table 9). This can be explained by the fact this survey was conducted solely with pump owners. Around 70 per cent of diesel pump users and 53 per cent of electric pump users have a ration card.

**Table 9. Share of respondents by land holding size and ration card ownership**

| | | Diesel pump owners (%) | Electric pump owners (%) |
|---|---|---|---|
| Land holding size (%) | Marginal | 32 | 19 |
| | Small | 28 | 33 |
| | Semi-medium | 21 | 25 |
| | Medium | 16 | 20 |
| | Large | 3 | 3 |
| Owns ration card (%) | | 70 | 53 |
| Ration card type (%) | 1 - BPL | 48 | 22 |
| | 2 - APL | 45 | 78 |
| | 3 - Other | 8 | 0 |

*Note: 95% CI[12]; Sample size electric 129/129; Sample size diesel 284/284.*

Most diesel and electric pump owners engage in paddy-wheat crop rotation (see Table 10). More than 95 per cent of all farmers grow wheat during Rabi[13] season, with 70 per cent of electric pump users and 80 per cent of diesel pump users also growing paddy during Kharif season. Both groups of farmers then mostly grow pulses during all three seasons, followed by sugarcane and vegetables. Rabi is a popular season to grow vegetables. About half of electric and diesel pump owners grow vegetables during this season.

**Table 10. Top 5 crops grown by electric pump users (Mean; 95% Confidence Interval)**

| | Kharif | Rabi | Zaid |
|---|---|---|---|
| **#1** | Paddy (71%) | Wheat (95%) | Pulses (39%) |
| **#2** | Pulses (43%) | Vegetables (53%) | Sugarcane (24%) |
| **#3** | Maize (28%) | Pulses (33%) | Vegetables (23%) |
| **#4** | Sugarcane (26%) | Chickpea (29%) | Maize (16%) |
| **#5** | Vegetables (23%) | Sugarcane (26%) | Other (6%) |

*Note: Sample size 129/129.*

[12]CI 95% Diesel Marginal [27%-38%]; Diesel Small [23%-33%]; Diesel Semi-medium [16%-26%]; Diesel Medium [12%-21%]; Diesel Large [1%-5%]; Diesel Ration card [65%-76%]; DieselRC BPL [41%-55%]; DieselRC APL [38%-52%]; DieselRC Other [4%-11%]; Electric Marginal [12%-25%]; Electric Small [25%-42%]; Electric Semi-medium [17%-32%]; Electric Medium [13%-27%]; Electric Large [0%-1%]; Electric Ration card [44%-62%]; ElectricRC BPL [12%-32%]; ElectricRC APL [68%-88%].

[13]Kharif season is for crops harvested in monsoon, Rabi season is for crops harvested in the winter while Zaid is for crops harvested between March and June.

### 3.1.3 Commercial and Industrial Consumers

Key industries in U.P. are textile and garments, service, food, wood, metal and leather products industries (ASSOCHAM, 2016). Together, these six employ the maximum number of people across the state. Consequently, these industries are the population for extracting a sample of industrial and commercial consumers. However, the wood product manufacturing industry is not power-intensive, and the sample will exclude it. To ensure a representative sample of these industries, the research conducted 65 interviews at five locations (listed below). These locations are hubs for the chosen industries and are major cities of the state, ensuring a geographical representation. Lucknow is not a major export location of any of the above products, but as the state's capital it is a hub of commercial and industrial activities and hence commanded a space in the selection.

- Agra – Textile, Garments, Floor Covering and Leather
- Allahabad – Food Products
- Moradabad – Metal
- Gautam Budh Nagar – Service Industry
- Lucknow – Capital city

Table 11 presents the number of commercial and industrial consumers interviews at each location. The respondents were selected based on the following parameters:

- Type of Unit: Commercial and Industrial
- Type of Industry: Manufacturing, Service, Processing/ Value Addition etc.
- Load/ Type of Electricity Connection:[14]
  - Commercial Consumers: LMV-2, LMV-6,
  - Industrial Consumers: HV-2, HV -1
- Sector: Leather, Food Processing, Metal etc.
- Location: Urban and Rural

A wide range of commercial and industrial consumers with varying loads were interviewed. Some manufacturing units, cold storage, and auto service were electricity-intensive, while auto sales, retail shops, small-scale footwear manufacturing etc. were moderately dependent on electricity.

**Table 11. Types of connections covered**

| | Types of Connections | | | |
|---|---|---|---|---|
| **Location** | **Commercial (%)** | | **Industrial (%)** | |
| **Agra** | 7 | 54 | 6 | 46 |
| **Lucknow** | 8 | 62 | 5 | 38 |
| **Moradabad** | 8 | 62 | 5 | 38 |
| **Noida** | 5 | 38 | 8 | 62 |
| **Varanasi** | 6 | 46 | 7 | 54 |
| **Total** | **34** | **52** | **31** | **48** |

[14]Type of electricity connection is the classification used by discoms based on electricity load of consumers

The cost of electricity in the overall operational cost of a commercial or industrial unit varies significantly depending upon diverse factors such as type of industry, scale of operation and processes. About 92 per cent of respondents reported absolute dependence on electricity for their operations, while the remaining 8 per cent reported moderate dependence. Each unit's dependence on electricity for their business operation is different, but none of them can operate without electricity. The cost of electricity in the overall operational cost varied from 0–3 per cent to more than 25 per cent. Figure 17 shows the distribution of consumers by the proportion of power cost to total operational cost.

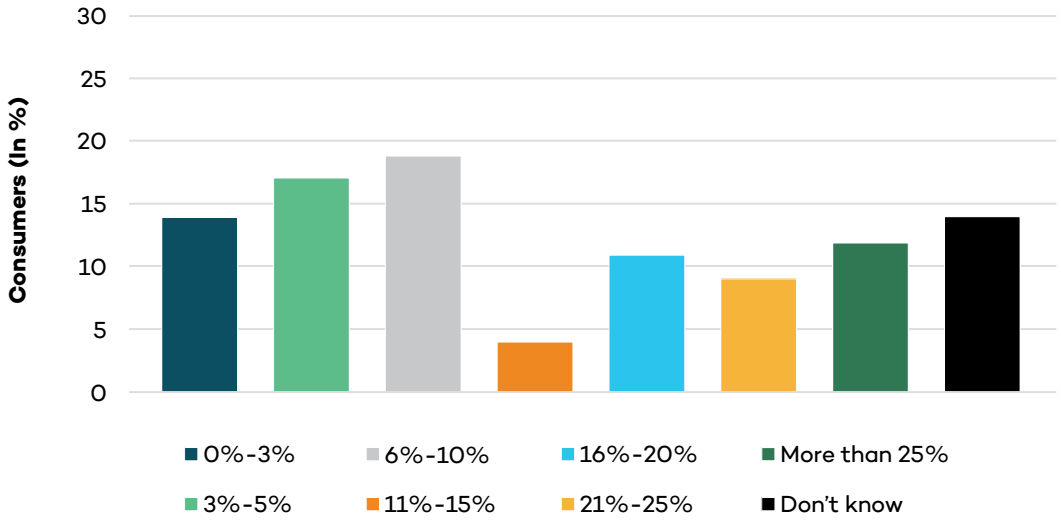


**Figure 17. Proportion of power costs in total operating cost (Total in %)**

The sample shows that industrial and commercial consumer's power cost is up to 10 per cent of their total operating cost.

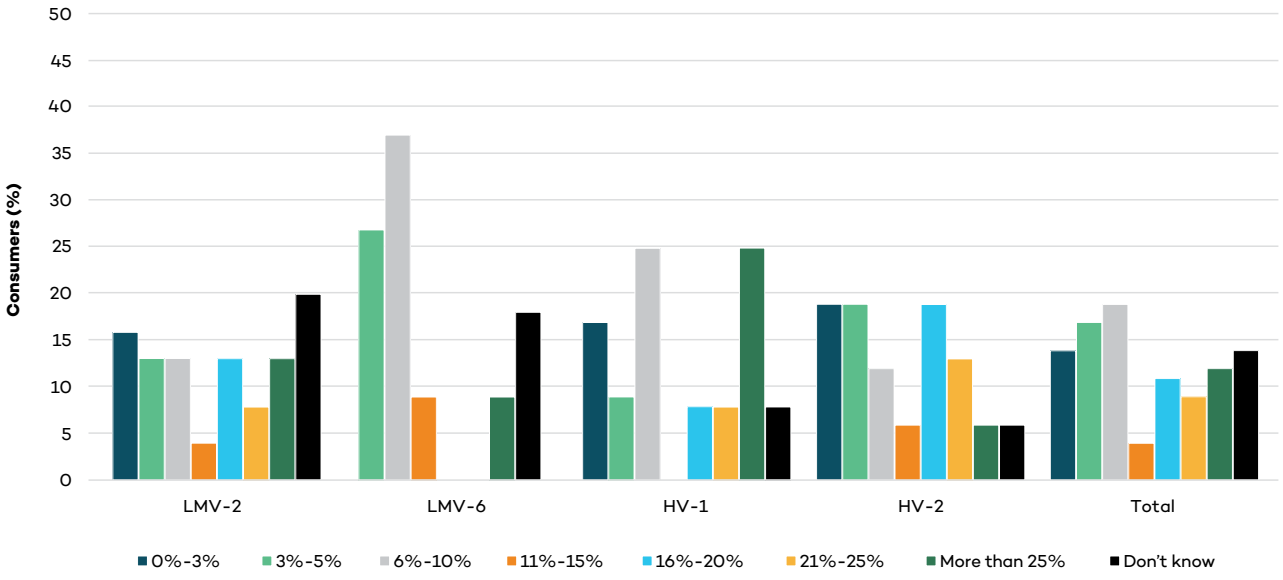


**Figure 18. Proportion of power costs in total operating cost disaggregated by type of connection (Total in %)**

## 3.2 KNOWLEDGE ON METERING AND BILLING, ELECTRICITY, UTILITY

### 3.2.1 Residential Consumers

Most rural households report that they do not have a meter installed. Only 25 per cent of rural households have a meter installed, compared to 85 per cent of those in urban areas. Of those rural households with a meter installed, only 40 per cent of bills are based on the reading of that meter, meaning less than 10 per cent of the rural population pays for grid electricity according to the meter. For urban households this is 92 per cent. In particular, few rural households covered by the discom PAVVNL have meters installed. Only about 10 per cent of households were found to have a meter there, compared to 90 per cent of urban households covered by the same discom. In urban areas, the discom PUVVNL performs most poorly, with only three quarters of households covered.

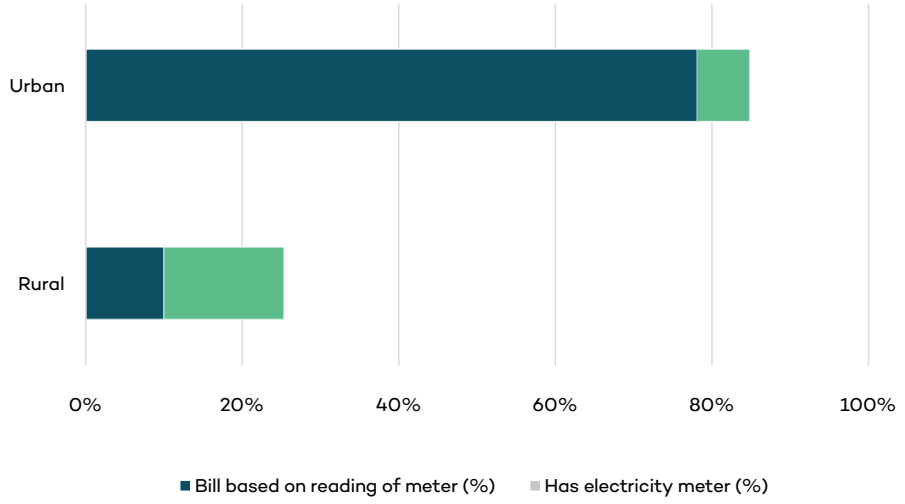


**Figure 19. Meter installed and bill based on meter**

*Note: 95% CI[15]; Sample sizes are those with access to grid electricity (824 rural, 912 urban).*

Around 47 per cent of rural households receive a bill that varies month on month, compared to 74 per cent of urban households. Respectively, 15 per cent and 11 per cent receive a bill that is fixed. Roughly 39 per cent of rural and 15 per cent of urban households receive no bill at all, while only 22 per cent and 7 per cent respectively did not have access to grid electricity. Most urban households pay according to the meter, which explains why their bills vary more month on month.

There is a significant variation in what people pay for electricity. Rural households that receive grid electricity pay on average INR 384 per month, while urban households pay on average just over INR 1,000 per month. Around 50 per cent of the rural population pays INR 300 or more per month, whereas half of urban households pay at least INR 750 per month for electricity.

[15]95% CI Urban meter ownership [83% to 87%]; Rural meter ownership [22% to 28%]; Urban bill based on meter [76%–80%]; Rural bill based on meter [8%–11%].

**Table 12. Percentiles of monthly electricity payment (non-grid electricity households excluded)**

| | Rural | Urban |
|---|---|---|
| 10% | 25 | 250 |
| 25% | 225 | 500 |
| 50% | 300 | 750 |
| 75% | 480 | 1200 |
| 90% | 700 | 2000 |
| **Average** | 384 | 1007 |
| **Did not pay (count)** | 59 | 37 |

*Note: Sample size 896 rural, 947 urban.*

The fact that urban bill collection is better than rural bill collection also shows in households' reported bill frequency. Almost 85 per cent of urban households receive a bill every month, with an additional 10 per cent receiving a bill every two months. In contrast, only about 22 per cent of rural households receive monthly bills. 60 per cent of rural households receive a bill every two or three months, and 15 per cent even less often than that. Most consumers in rural (83 per cent) and urban (90 per cent) areas pay an official agent at a dedicated office.

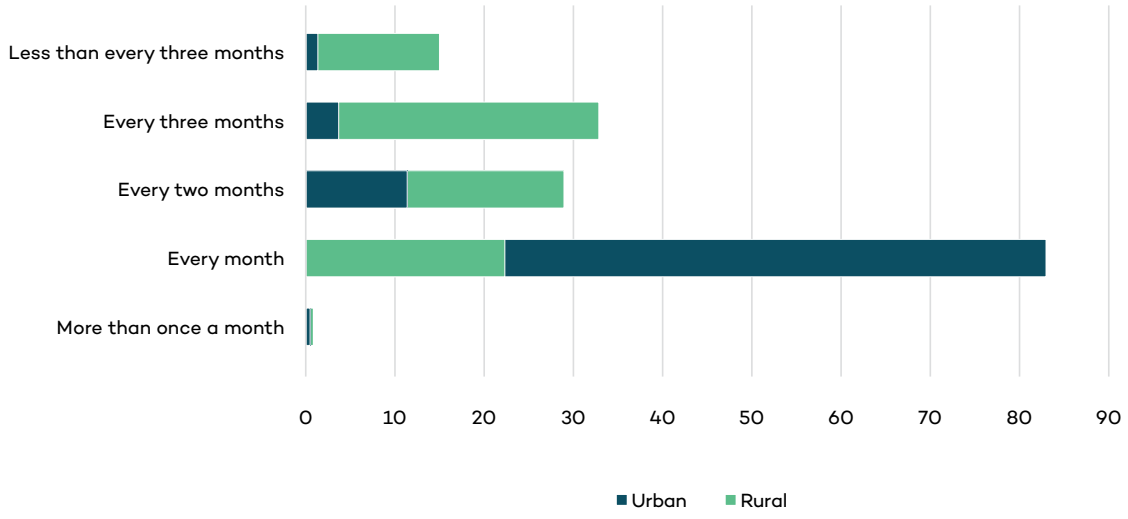


**Figure 20. Frequency of bill reception (rural and urban, %)**

*Note: Rural sample size 550 and urban sample size 802 (others did not know).*

Urban consumers have a better track record in paying their bills always or usually on time (81 per cent) compared to rural consumers (49 per cent). 40 per cent of rural consumers indicate that they only "sometimes" pay their bills too late. The overwhelming reason for both urban and rural consumers not to pay on time is a lack of disposable cash.

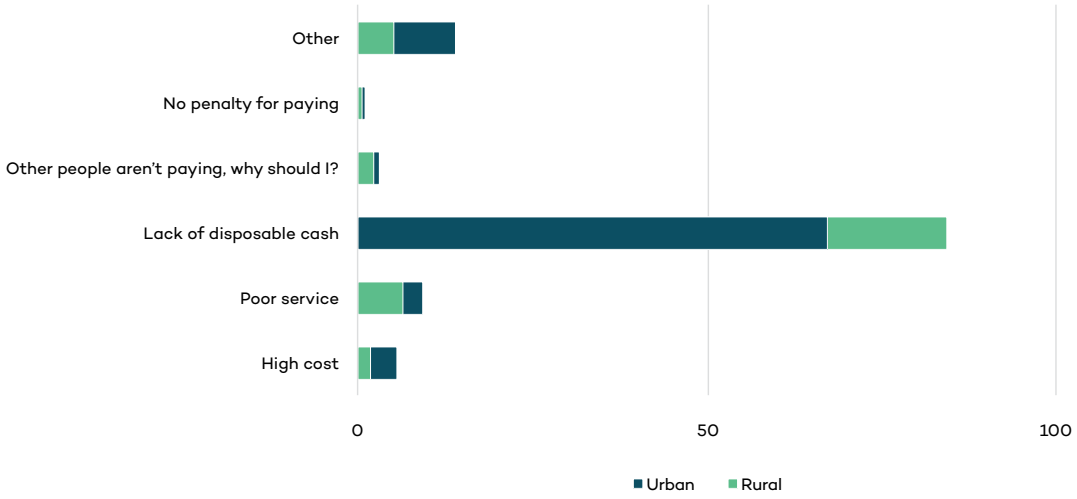


**Figure 21. Reason to pay electricity bill late (rural and urban, %)**

*Note: Rural sample size 384 and urban sample size 221.*

### 3.2.2 Agricultural Consumers

Between 1 per cent and 8 per cent of electric pump users have a meter installed that measures agricultural electricity consumption for pump sets. Around 53 per cent of the surveyed electric pump users never receive an electricity bill. Between 1 per cent and 8 per cent of electric pump users also use household connections to operate their pump sets. On average, electric pump set users in the survey paid a little over INR 1,000 per month. Roughly 75 per cent of them paid INR 1,500 per month or less. The overwhelming majority of agricultural electricity bills are fixed and do not vary month on month.

Nearly all farmers pay for electricity to an official agent at an office, often not based on a bill. Bill distribution remains very infrequent, with most landholders not receiving bills for months. Only about 20 per cent pay their agricultural electricity bill on time—35 per cent report that they are always late and about 15 per cent report that they pay rarely or not at all. As with residential households, the major reason (75 per cent) for not paying on time is a lack of disposable cash. Some farmers also complain about poor service.

### 3.2.3 Commercial and Industrial Consumers

Approximately 66 per cent of commercial and industrial consumers do not face any issue with electricity billing, while the remaining 34 per cent (20 per cent of commercial and 14 per cent of industrial) of consumers have reported some issues with electricity billing. Most of these are focused on the high fixed charges included in every bill. While this is not an incorrect procedure, it was singled out because it adds to the high cost of electricity. Very few consumers reported incorrect billing and meter reading.

Apart from billing, consumers shared information on the challenges involved in getting a new connection (see Figures 22 and 23). Challenges are experienced at two levels: first, numerous "No Objection Certificates" (NOCs) and approvals from government departments are required for new industrial and commercial connections, making them difficult to obtain. This forces consumers to approach commission agents for support against a fixed fee. Agents can deal with discoms and easily secure connections. Second, the estimates given by discoms for new connections are usually on the higher side, which are reduced later when approached through commission agents.

In Moradabad, 77 per cent of consumers believe that the present system forces consumers to approach discoms through commissions agents. Similar problems have been reported by consumers in Lucknow (69 per cent), Noida (38 per cent), Varanasi (23 per cent) and Agra (15 per cent).

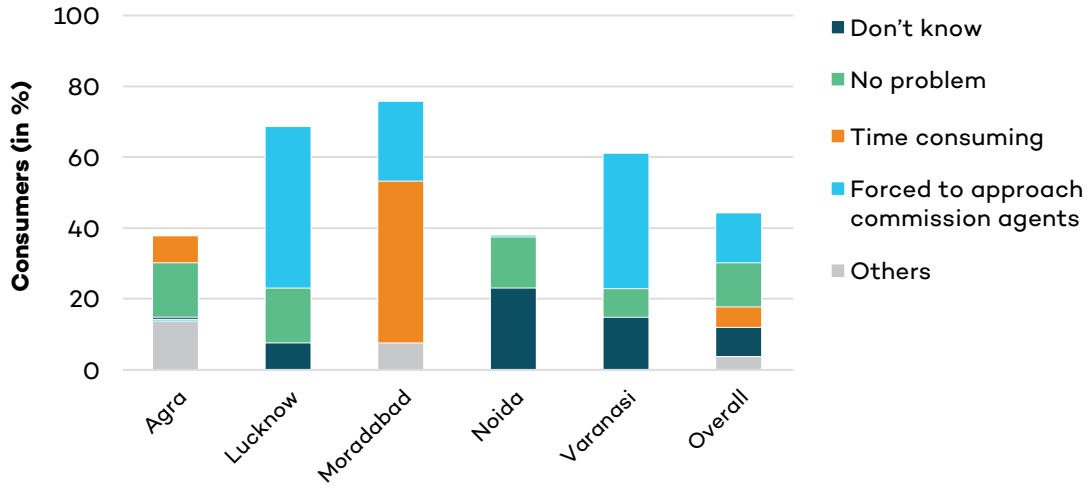


**Figure 22. Challenges faced in getting a new connection**

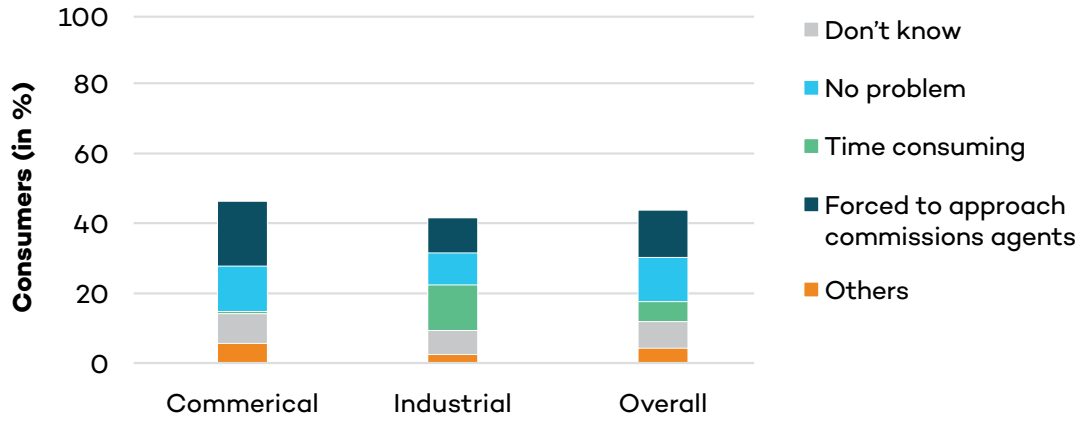


**Figure 23. Challenges faced in getting a new connection disaggregated by consumer category (in %)**

## 3.3 PERCEPTION ABOUT SUBSIDIES

### 3.3.1 Residential Consumers

In general, both rural and urban households overwhelmingly (> 80 per cent) agree that the government needs to provide free electricity to poor people, but disagree more about free power for other people. Around 80 per cent of rural households believe that farmers should get free electricity, while only 65 per cent of urban households agree. Moreover, 30 per cent of urban households explicitly disagree. Roughly 70 per cent of rural households also believe scheduled castes and villages should get free electricity, against respectively 40 per cent and 30 per cent of urban households. It seems **there is no generalized sense of entitlement to free electricity**, as between 60 per cent and 80 per cent of rural and urban households disagree that electricity should be provided free of charge to all. Also, 68 per cent of the population believe it is unacceptable for poor people to have an illegal connection, while 29 per cent believe that this is acceptable.

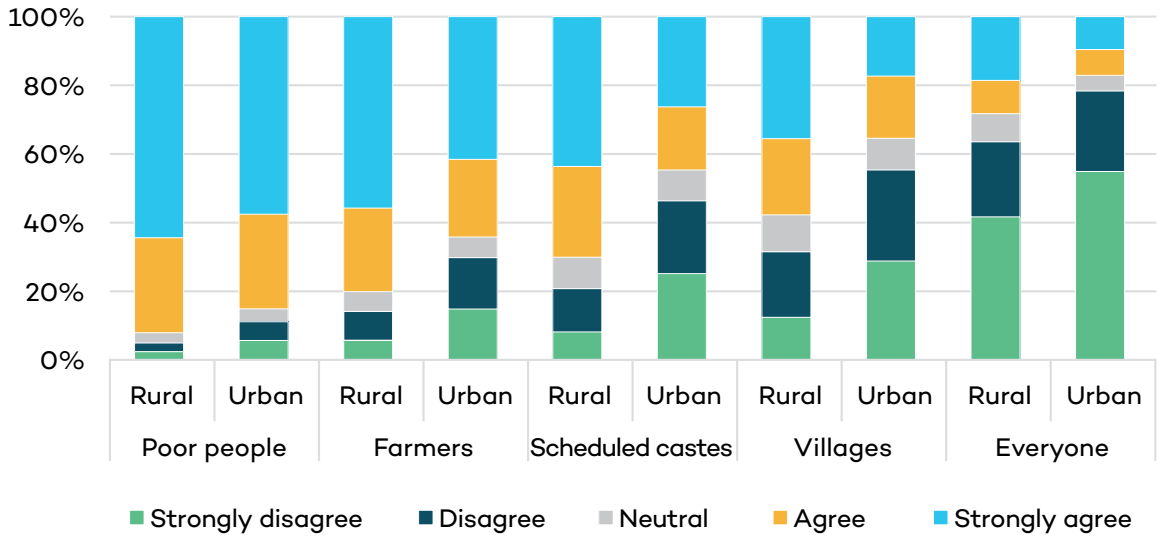


**Figure 24. Government to provide free electricity for selected groups (%)**

*Note: Rural and urban sampling size nearly complete (< 3% missing).*

There is no significant difference between rural and urban consumers on the perception about how utilities currently cover costs and how it should be done—though there are some significant differences in views on what the arrangements are and how they should be. Around 27 per cent of the population believe that the utility covers its costs through customer fees only, indicating that this share of the population is not aware of the existence of subsidies. However, less than 10 per cent think that the utility should cover its costs through customer fees only, suggesting the view that fewer people should be paying fees. Only 10 per cent of households believe that utilities cover costs only through government support but more than a quarter (27 per cent) believe that costs should be fully funded by government. Around 60 per cent believe that utilities cover costs equally through customer fees and government support and around 65 per cent believe that this is appropriate.

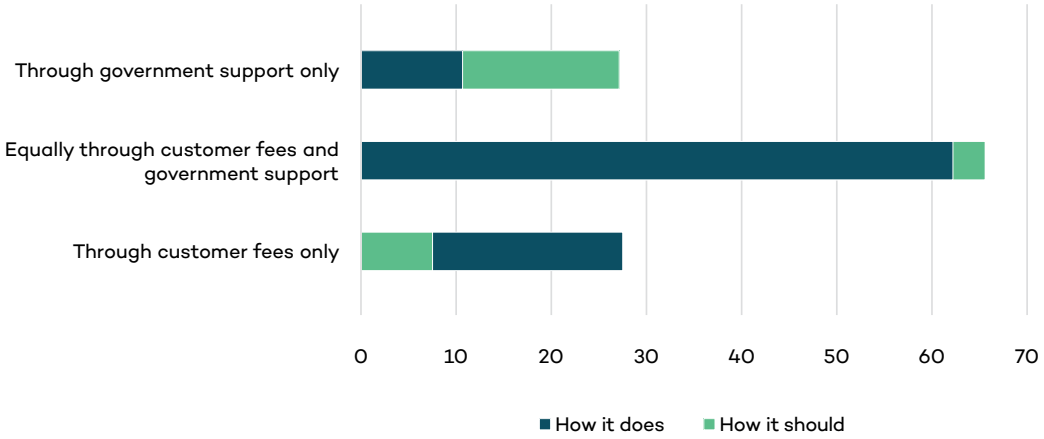


**Figure 25. Household perception of how utility should cover costs and how it actually does**

*Note: Rural and urban sampling size nearly complete (< 3% missing).*

Unsurprisingly, poorer households generally believe government support should be more significant to cover utility costs than richer households. That said, the difference is not as large as one might

suspect. Around 6 per cent of the poorest households and 14 per cent of the richest households believe a utility should cover its costs through customer fees only, while 35 per cent of the poorest households and 27 per cent of the richest households believe this should be through government support alone. These point estimates are not strikingly different.

As far as differences between utility-covered households go, almost half of urban households covered by the discom PUVVNL believe that the utility covers its costs through customer fees alone. This is more than other utility-covered urban households. Besides that, there are no large differences between households that are covered by different utilities in how they believe the utility should cover its costs and how it actually does.

### 3.3.2 Agricultural Consumers

Agricultural consumers that use electric pumps appear less inclined to argue in favour of governments providing free electricity to various groups, including themselves. For example, more than 80 per cent of diesel pump owners believe poor households and farmers should get free electricity, compared to respectively 49 per cent and 73 per cent of electric pump users. One hypothesis may be that this is linked to overall income, though this remains unconfirmed.

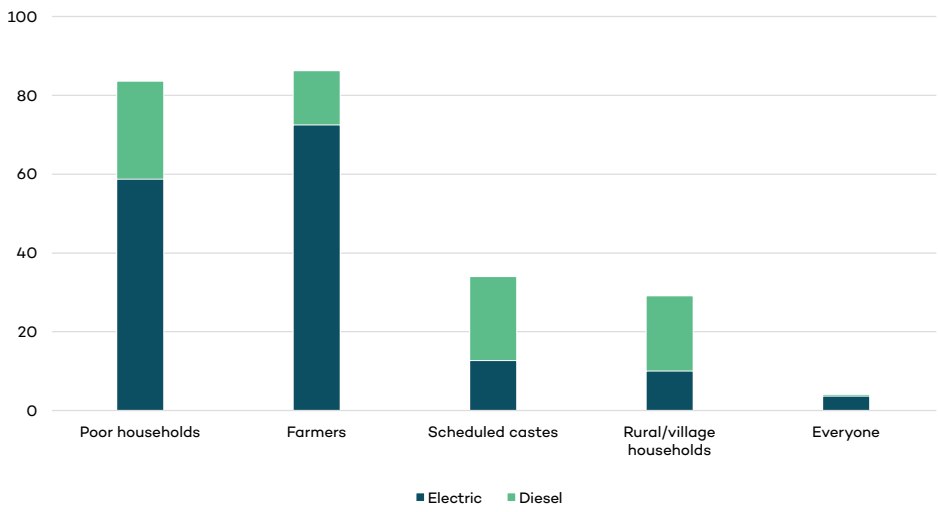


**Figure 26. Government to provide free electricity for selected groups (%)**

*Note: 95% CI[16]; Electric pump set sample size 129/129, diesel pump set sample size 284/284.*

Roughly 48 per cent of electric pump users believe the utility covers its costs through a combination of government support and customer fees, and 63 per cent believes it should cover costs in this way. Around 32 per cent of electric pump users believe that it does so through customer fees alone and almost no agricultural landholders agree that it ought to cover its costs in this way. Of the interviewed electric pump farmers, only 7 out of 67 were aware that electricity tariffs for farmers were subsidized. This indicates an essential need to communicate better about subsidies.

Around 5 per cent of surveyed pump users believe that the utility covers costs through government support only, but more than 35 per cent believe it should operate in this way. Overall, this implies that agricultural landholders believe the government ought to increase the share of support that it offers for electricity pricing.

[16]95% CI Electric poor [50%-68%]; Diesel poor hh [80%-88%]; Electric farmers [65%-81%]; Diesel farmers [83%-91%]; Electric scheduled castes [7%-18%]; Diesel schedules castes [28%-39%]; Electric rural/village hh [5%-15%]; Diesel rural/village hh [24%-35%]; Electric everyone [1%-7%]; Diesel everyone [1%-6%].

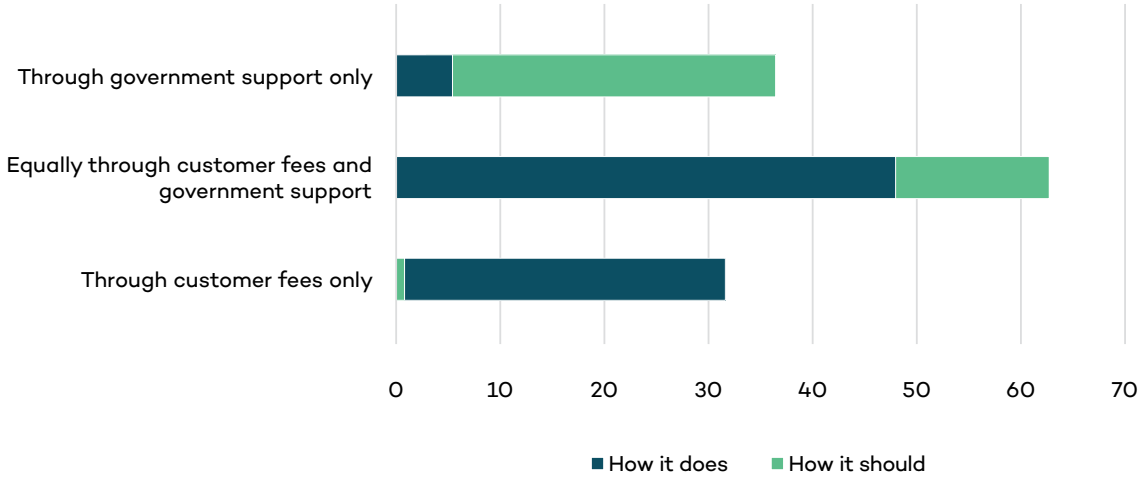


**Figure 27. Electric pump owner perception on how utility should cover costs and how it actually does**

*Note: 95% CI[17]; Sample size 129/129.*

### 3.3.3 Commercial and Industrial Consumers

Commercial and industrial consumers strongly correlate subsidies for any consumer group to an additional burden of cross-subsidy on themselves. However, category-specific disaggregation reveals that industrial consumers (52 per cent) are more in favour of providing subsidies to farmers and poor households compared to commercial consumers (35 per cent).

Over 10 per cent of business owners believe that farmers are using electricity for business purposes and hence should not receive any subsidy. Contrary to this, employees of commercial and industrial organizations believe that farmers and poor households should be given subsidies as they belong to the deprived sections of society. Some respondents from the employee group have suggested that subsidies should be provided on an income basis.

Some interesting views on subsidies, expressed by respondents during interviews, are presented below:

A business owner from Moradabad said "No one deserves free electricity. Instead of giving subsidies government should try to raise their capacity and standard of living. By giving subsidy we are making them more and more dependent."

Another business owner from Agra shared "If government wants to give free electricity to someone, it should take care of the cost as well." This perhaps indicates that consumers are not aware that the state government supports discom finances by reimbursing the subsidies offered to some consumers.

[17] 95% CI Should? customer fees only [0%-2%]; Should? customer fees and government [54%-72%]; Should? government only [28%-45%]; Does? customer fees only [24%-40%]; Does? customer fees and government [40%-57%]; Does? government only [2%-9%]; Does? respondent uncertain [9%-21%].

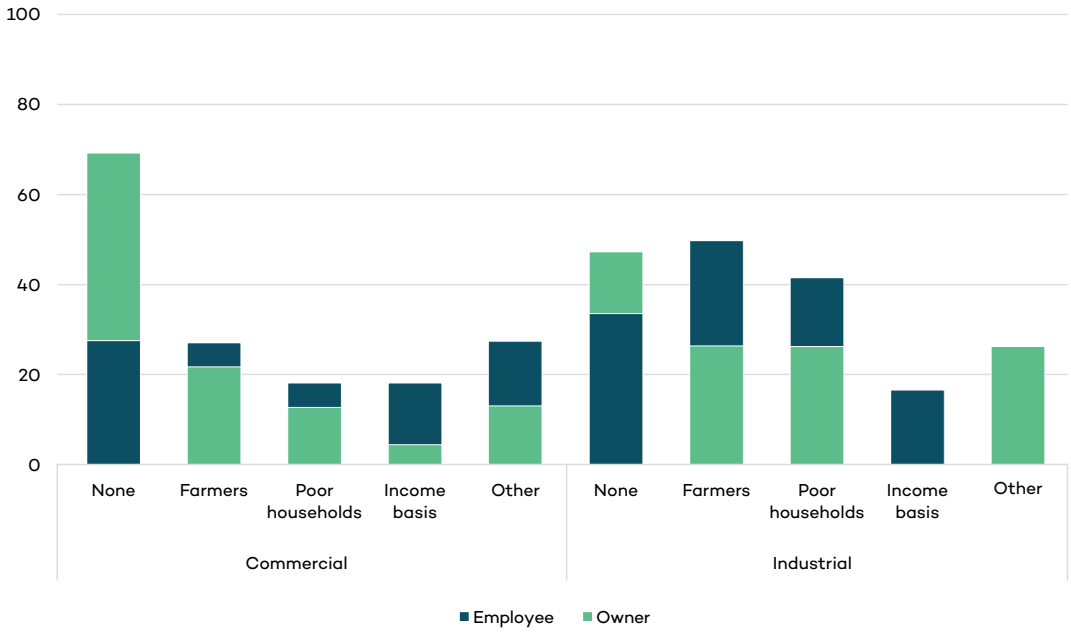


**Figure 28. Perceptions of subsidies**

More specifically, on cross-subsidies, 81 per cent of industrial and 68 per cent of commercial consumers are not in favour of continuing the current trend of cross-subsidy where commercial and industrial consumers pay higher tariffs to keep agriculture and household tariffs lower (see Figure 29).

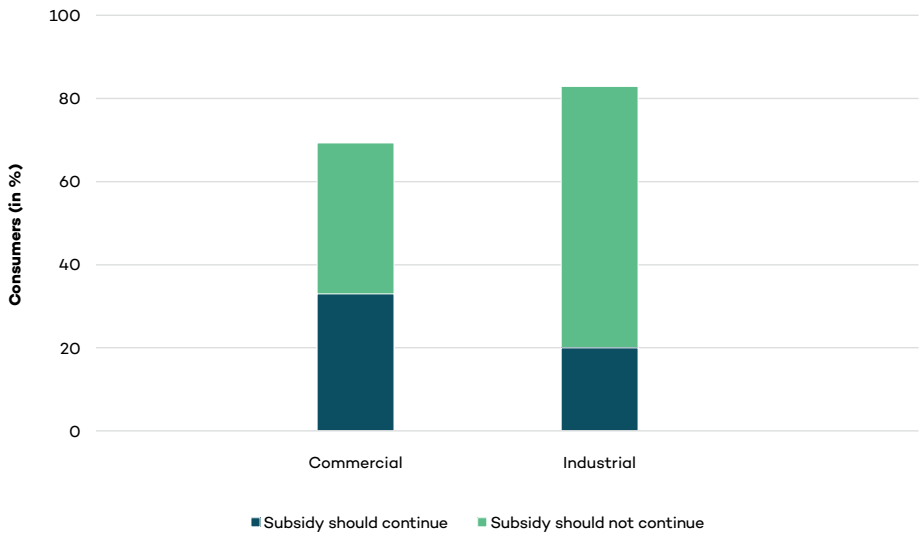


**Figure 29. Perceptions of continuation of cross-subsidy**

A business owner from Agra said "It is not fair to charge higher tariff from industrial and commercial consumers on account of cross-subsidy. The tariff should be uniform in all the states across all the sectors/consumer categories. There should be no fixed charges and no time of day (TOD) charges. Today the entire country is connected through the national grid—electricity produced in Jammu & Kashmir can reach southern states without any problem. Thus, government should consider having uniform tariff across the country without any bias."

Even though there are strong views on cross-subsidy, a large group (77 per cent) of respondents are not aware of the actual cost of power being supplied to them. They were not able estimate how much more than the actual cost of electricity supply commercial and industrial consumer pay. Only 22 per cent consumers reported that they are paying over three to five times more than the actual cost of electricity.

About 68 per cent of consumers have no knowledge of how discoms cover their costs. Of the remaining 32 per cent, about 18 per cent believe that utilities cover their cost through a combination of consumer revenue and government support, while 14 per cent believe that the cost is met through government support.

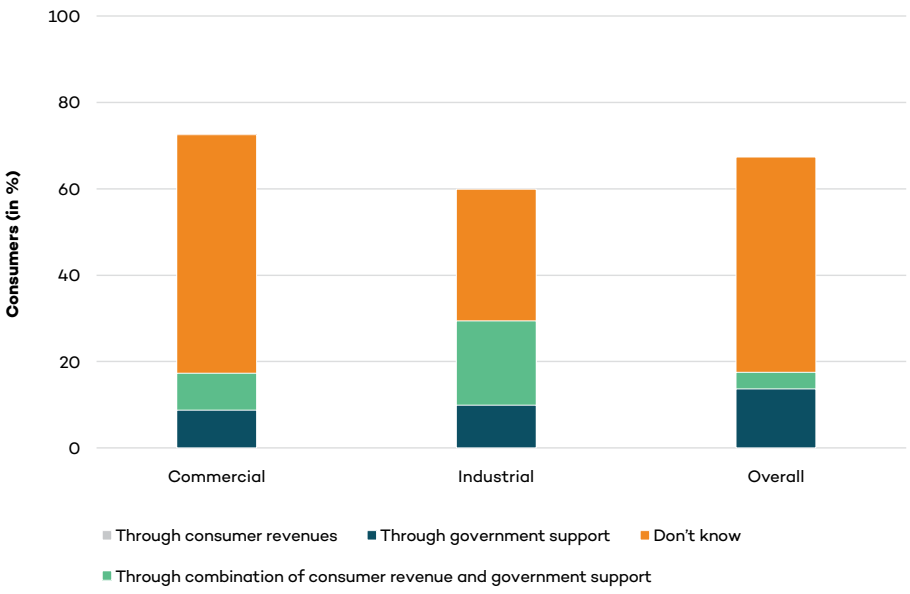


**Figure 30. Knowledge of how utility company covers its costs (%)**

Industrial consumers are more aware compared to commercial consumers, as 30 per cent of industrial consumers reported that a utility company covers its costs by a_combination of consumer revenue and government support, compared to only 9 per cent of commercial consumers.

In total, 32 per cent of consumers were aware that utility companies receive support from government to cover their costs. However, none of them were aware of the proportion or quantum of support received by utilities from government to cover their costs. Further, almost 82 per cent were unsure about what percentage of utility discoms' costs should be covered by consumer revenue and government support. The remaining 18 per cent of consumers believed that 100 per cent of discom costs should be met by consumer revenue.

An industrial consumer from Agra stated that "Utilities will never need support from government, if they improve their way of operation and collection efficiency."

34 per cent of commercial and 18 per cent of industrial consumers are not aware about UPERC and its tariff-setting mechanism. Only those consumers who were active members in an industrial or commercial association were aware of UPERC. It was observed that awareness of UPERC was higher among industrial consumers than commercial consumers.

## 3.4 ATTITUDES TO TARIFF REFORM AND COMPENSATION

### 3.4.1 Residential Consumers

**Expectations:** Both urban and rural consumers overwhelmingly believe that tariffs will increase in the next five years. About half of both groups believe tariffs will increase "somewhat," while an additional 35 per cent believe they will increase "a lot." This realization is important, as insights from behavioural psychology show that once stakeholders firmly believe a change is happening, aversion to this change reduces (unless it radically conflicts with other belief systems) in favour of more practical questions such as how the change will be implemented and at what pace (Blasi & Jost 2006). Whereas general beliefs do not vary by income, a larger share of poor households expect that prices will only increase "somewhat" rather than "a lot" compared to wealthier households. It could be hypothesized that this anticipation of future price increases might also explain why households tend to think that government should pay a larger share of electricity costs.

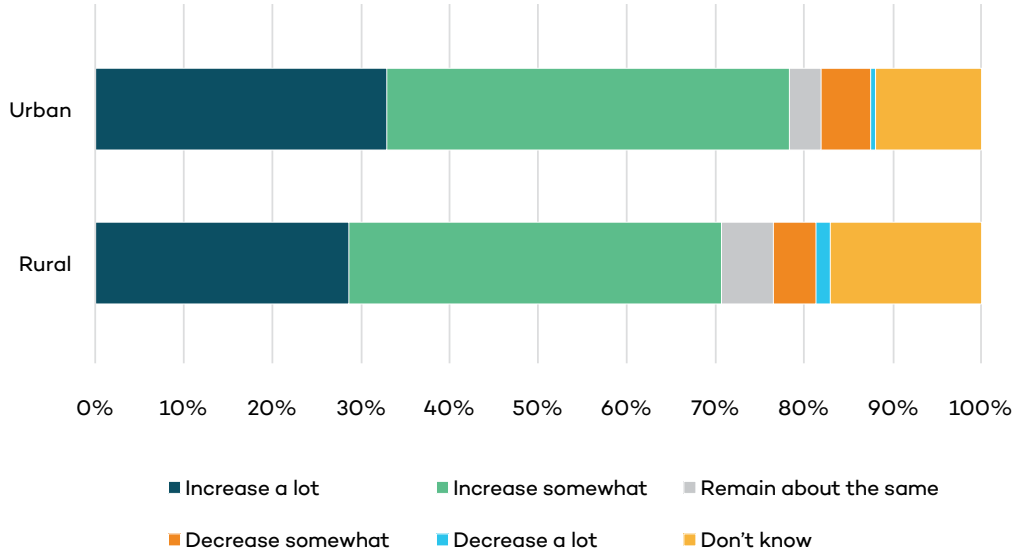


**Figure 31. Expectation of electricity cost change over next five years (%)**

*Note: 95% CI[18]; Sample size 1917/1917.*

**Reaction:** Residential consumers were asked how they would cope with a price changes—consuming less electricity, spending less on other items and/or potentially switching fuels. The items were not mutually exclusive, so households were free to choose one, two or all three options. Switching fuels was the least popular option. Only about 45 per cent of households said they were likely or very likely to switch fuels, compared to 60 per cent that thought they would consume less electricity and spend less on other items. About 15 per cent said it is somewhat or very unlikely that they would consume less electricity or spend less on other items, compared to 30 per cent who consider it unlikely they would switch fuels. Overall, there are no major differences between urban and rural consumers. The largest difference is again related to the option of switching fuels, with almost a quarter of urban residents indicating this option is very unlikely, compared to only about 12 per cent of rural consumers.

[18]95% CI Urban Increase a lot [34%-41%]; Urban Increase somewhat [48%-55%]; Urban Remain about the same [3%-5%]; Urban Decrease somewhat [5%-8%]; Urban Decrease a lot [0%-1%]; Rural Increase a lot [31%-38%]; Rural Increase somewhat [47%-54%]; Rural Remain about the same [3%-5%]; Rural Decrease somewhat [4%-7%]; Rural Decrease a lot [1%-3%].

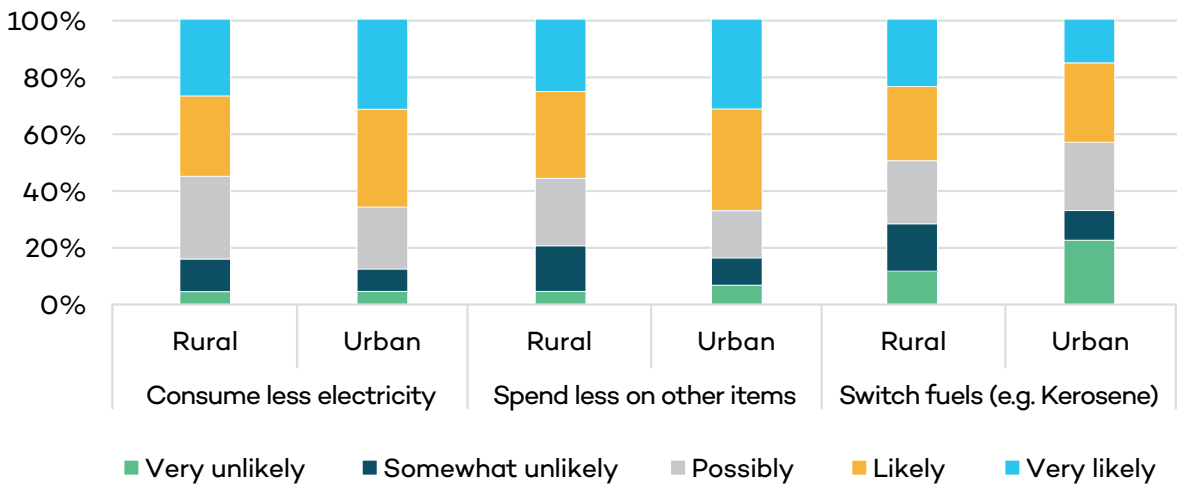


**Figure 32. Possible reaction to electricity price increases (rural & urban, %)**

*Note: Rural sample size 744/960 (those without grid electricity not surveyed); Urban sample size 890/957 (those without grid electricity not surveyed).*

**Pace:** When asked about the pace of pricing reforms, a majority of residential households prefer a rapid one-time implementation. When asked how they would prefer a INR 100 increase in their monthly electricity bill, 75 per cent of urban respondents and 59 per cent of rural respondents preferred a one-time immediate increase. A gradual approach also received a significant amount of support among rural households, where 41 per cent of respondents preferred a gradual price increase every month or every three months. The preference of the pace of price increases is, unsurprisingly, linked to income. While a one-time increase is the most popular option among all income categories, higher-earning urban and rural households generally prefer a one-time increase more than lower-earning ones. This can be simply explained by the likelihood that higher-income consumers can better absorb the shocks of a one-time price increase.

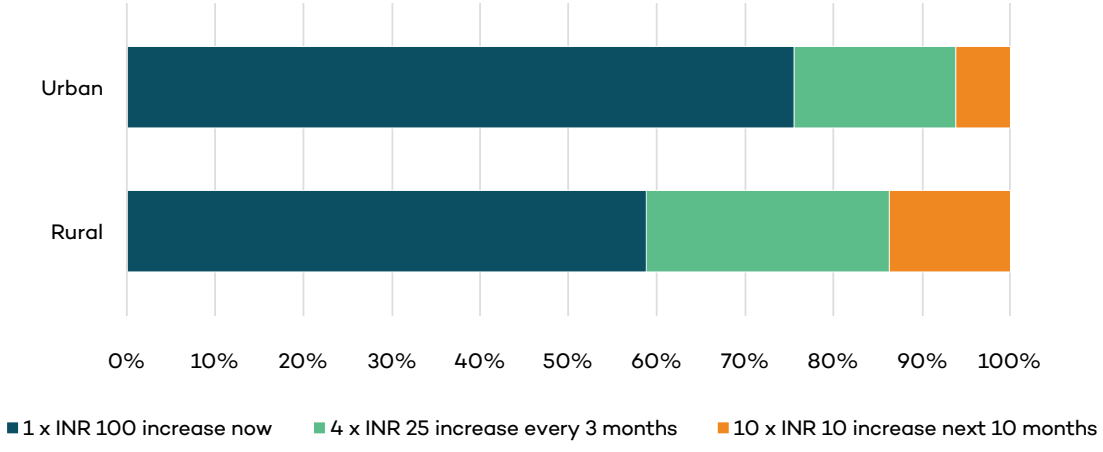


**Figure 33. Preferences for a INR 100 tariff increase**

*Note: 95% CI[19]; Sample size rural 578/960 (excluding those without grid electricity and those that "did not know"); Sample size urban 812/957 (excluding those without grid electricity and those that "did not know").*

[19]95% CI Urban 1 increase now [73%-79%]; Urban once per trimester [16%-21%]; Urban monthly [5%-8%]; Rural 1 increase now [55%-63%]; Rural once per trimester [24%-31%]; Rural monthly [11%-16%].

**Willingness to pay:** In order to explore possible linkages between price increases and improvements in service, households were asked how much they would be willing to pay for an additional 4 hours of continuous electricity supply each day. On average, rural and urban respondents reported that they would be willing to pay around INR 30. Half of the population, however, reported that they would not be willing to pay more than INR 10 (urban) or INR 20 (rural) extra (based on an open-ended numerical question). These numbers are small. It could be explained either by a general tendency to underreport actual willingness to pay when asked or a lack of affordability, especially in rural areas. It might also be explained by an unawareness of the specific benefits of higher prices in terms of better service for more households (i.e., lack of information or misinformation). Finally, it could be possible there is a relatively high level of satisfaction with current electricity supply, and households simply do not want to pay more. Related to the first option, under-reporting is a general trend in willingness-to-pay (WTP) research. For this reason, researchers often use conjoint-based methods that measure WTP more indirectly.[20] We used a direct approach, which generally results in an under-estimation of WTP (Breidert et al., 2006)

In order to explore the linkages between price increases and other improvements, households were asked if they would be willing to pay more under a range of other conditions: a doubling of hours of supply; grievance services; immediate redress of grievances; the provision of energy efficient light bulbs; assistance with other public services; and the delivery of the subsidy through bank transfers. About 60 per cent and 70 per cent of urban and rural households, respectively, reported that they would be willing to pay more for electricity under one or more of these conditions. Survey results suggest that urban residents seem less willing to pay more than rural residents. This may be because of better existing service in urban areas.

**Table 13. Willingness to pay for 4 hours of continuous supply extra (outliers excluded)**

| | Rural | Urban | Total |
|---|---|---|---|
| Average | 32.5 | 26.5 | 29.5 |
| Stand Dev | 34 | 33.1 | 33.7 |
| Min | 0 | 0 | 0 |
| 25% | 0 | 0 | 0 |
| Median | 20 | 10 | 20 |
| 75% | 50 | 50 | 50 |
| Max | 100 | 125 | 125 |

*Note: Sample size rural 960/960, sample size urban 957/957.*

[20]Conjoint-based WTP will be reported by Johannes Urpelainen in upcoming research based on the surveys that were the basis for this research.

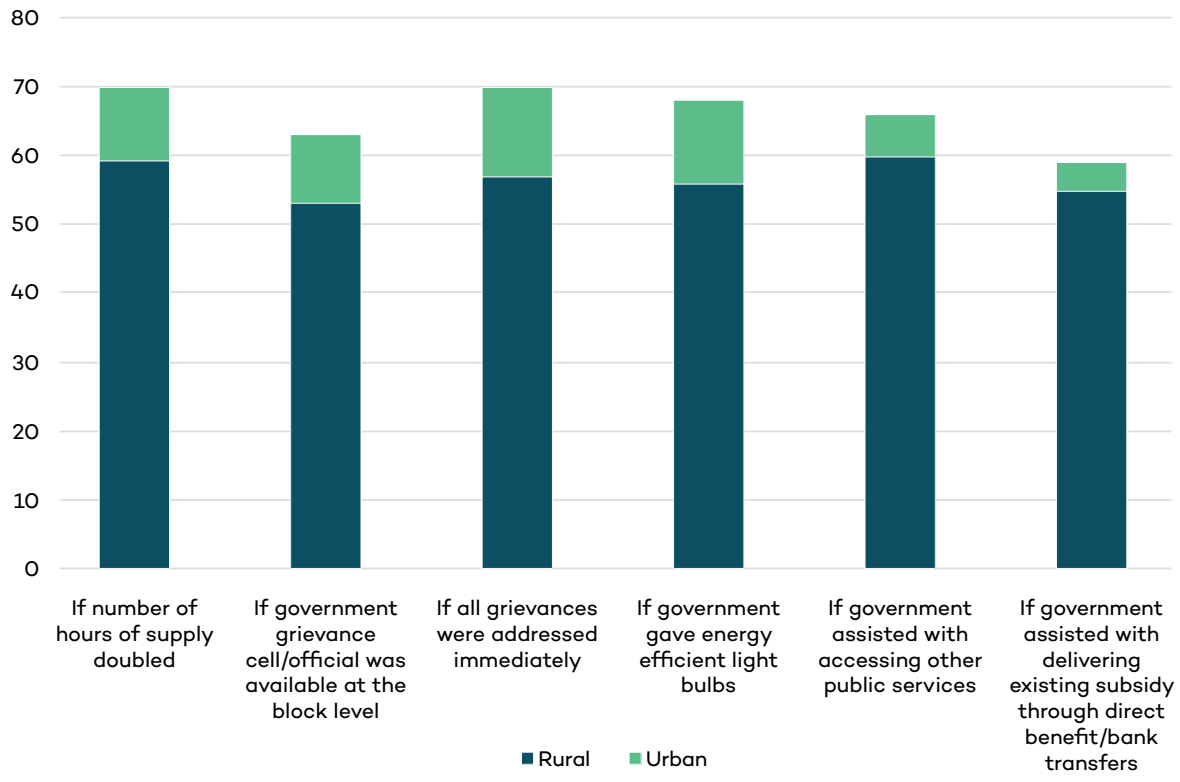


**Figure 34. Conditions under which consumers would be willing to pay more for electricity? (%)**

*Note: Sample size rural 744/960 and urban 890/957 (not including people without grid electricity).*

### 3.4.2 Agricultural Consumers

**Expectation:** A majority of electric pump users believe they will have to pay more for electricity over the next five years. Roughly 54 per cent think tariffs will only increase "somewhat." Only 7 per cent think they will increase a lot. Almost 20 per cent of surveyed pump owners think the electricity price will go down.

If prices for households increase, about half of the surveyed farmers believe electric pump users should be shielded from similar price rises. The remaining half are roughly equally divided between those that feel electric pump users should carry a similar price increase and those that believe the price increase for electric pump users should be smaller. Most diesel pump users believe farmers using electric pump sets should be shielded from price increases. Interviewed electric pump users raised the concern that their incomes were already very low, with many of them already in debt and struggling to pay for various agricultural inputs. This debt would increase if tariffs were raised. Overall, farmers did not see any justification for higher prices in terms of discoms covering their costs. Their support for a tariff increase rose if it meant a better supply of electricity to other farmers and poor village households.

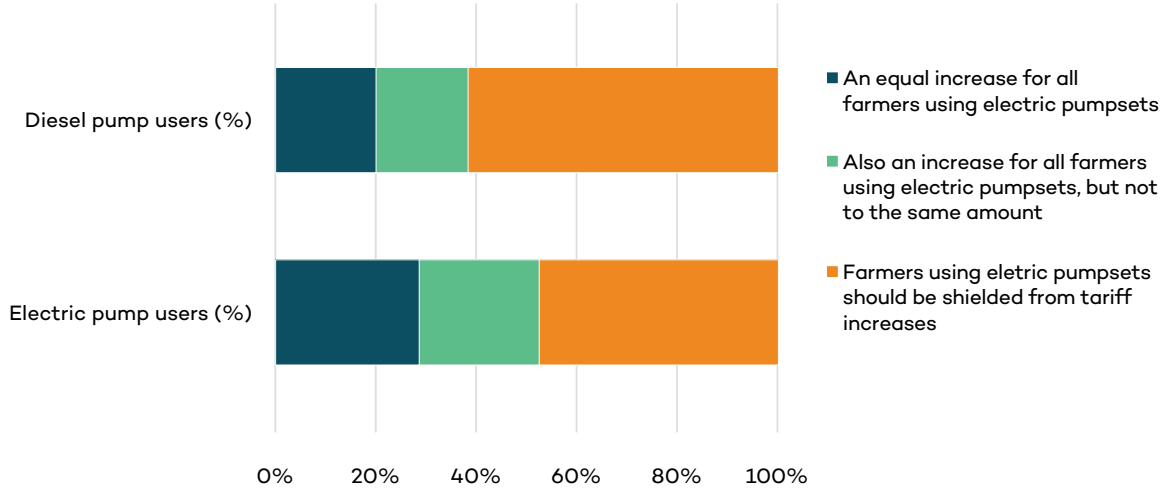


**Figure 35. Attitudes to electricity changes for farmers if tariffs increase for households**

*Note: 95% CI[21]; Sample size diesel 284/284; Sample size electric 129/129.*

**Reaction:** Farmers using electric pump sets and faced with tariff increases remain unlikely to switch crops. Roughly two thirds would keep using the same pump—half of those would reduce consumption and the other half would try to share cost with other farmers. One third of pump users would consider switching to a different type of pump. Half of those would consider purchasing a solar pump set.

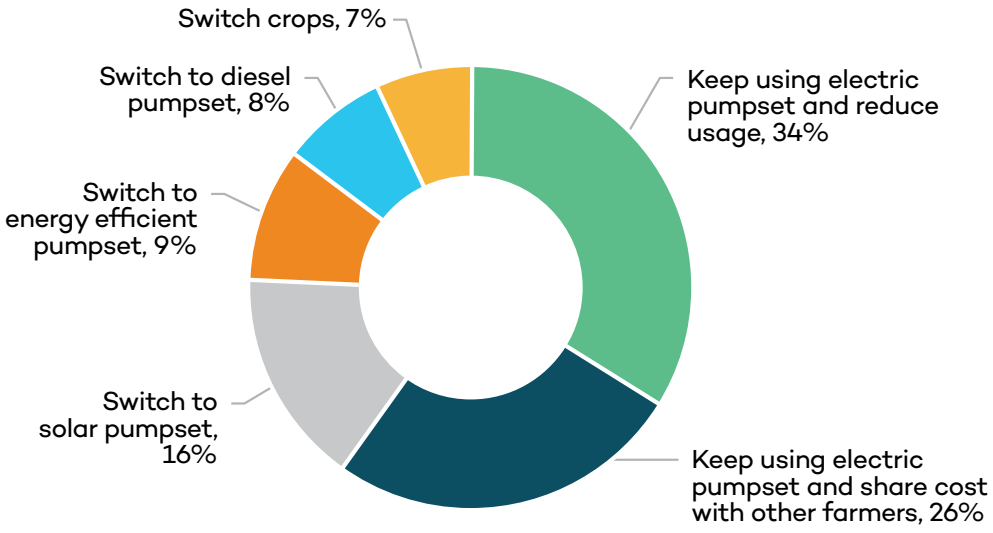


**Figure 36. Electric pump users' reaction to tariff increase (%)**

*Note: 95% CI[22]; Sample size 129/129.*

[21] 95% CI Diesel equal increase [15%-24%]; Diesel also but lower increase [14%-23%]; Diesel farmers shielded [54%-65%]; Electric equal increase [21%-37%]; Electric also but lower increase [17%-32%]; Electric farmers shielded [38%-55%].

[22] 95% CI Keep using/share cost [19%-34%]; Keep using/reduce usage [26%-42%]; Keep using/Switch crops [3%-11%]; Switch pump set [24%-41%]; Of those that switch pump sets: 95% Diesel pump [10%-37%]; More energy efficient [14%-43%]; Solar pump [32%-64%].

**Pace:** When asked how to increase the electricity bill by INR 100 per month on an annual basis, about 70 per cent of electric pump set-using farmers prefer to have an immediate increase of their electricity bill if necessary. Around 60 per cent prefer a one-time increase of 100 rupees right away and another 10 per cent prefers a one-time INR 200 increase every two years. One fourth of the farmers using electric pump sets favour a very gradual increase of INR 10 per month. This is in line with information received in the interviews.

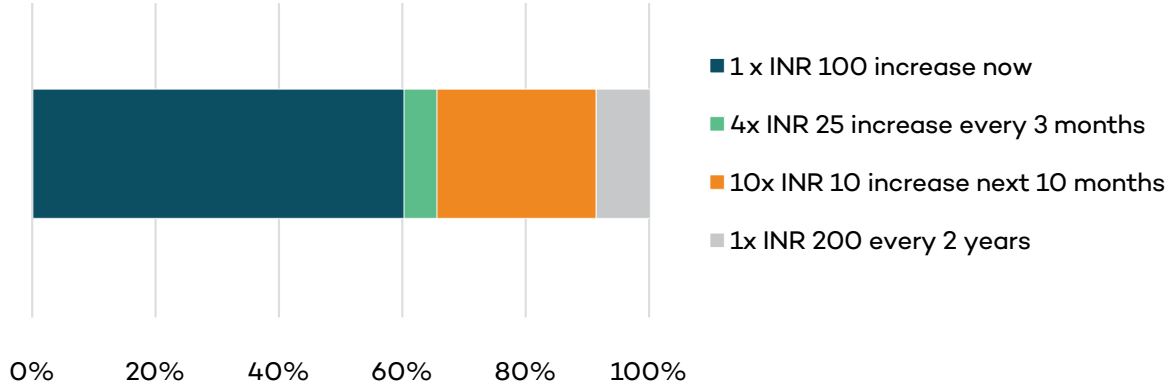


**Figure 37. If your electricity bill would increase by 100 rupees, you prefer (%)**

*Note: 95% CI[23]; Sample size 129/129 electric pump users.*

**Willingness to pay:** Public messaging strategies should consider that **electric pump farmers do not think it is reasonable to pay higher tariffs for the utility to better cover its costs.** Over 70 per cent of respondents think this a highly unreasonable justification for tariff price hikes, compared to 20 per cent that think it is somewhat or highly reasonable. This shows that it would be in the interests of the government to primarily highlight the direct advantages to farmers. Similar to residential households, around 60 per cent of farmers using electric and diesel pumps believe it is unacceptable for poor people to have illegal connections.

**Reception and importance of other benefits:** The vast majority of the surveyed diesel and electric pump users indicate that they have not received any benefits from government related to water harvesting public works under NREGA, soil tests, irrigation schemes, energy efficient and solar pumps, subsidized seeds, subsidized fertilizer or other agricultural equipment. Either this type of support is not widely distributed or the respondent receives support but does not realize it. The most important priority for farmers using electric pump sets remains access to reliable electricity, followed by access to irrigation water from canals. This shows that while electricity is the most important, potential mitigation measures to compensate price hikes could be explored in other areas.

[23]95% CI 1 time increase [52%-69%]; Once per trimester [1%-8%]; Monthly [19%-34%]; One big increase per two year [4%-13%].

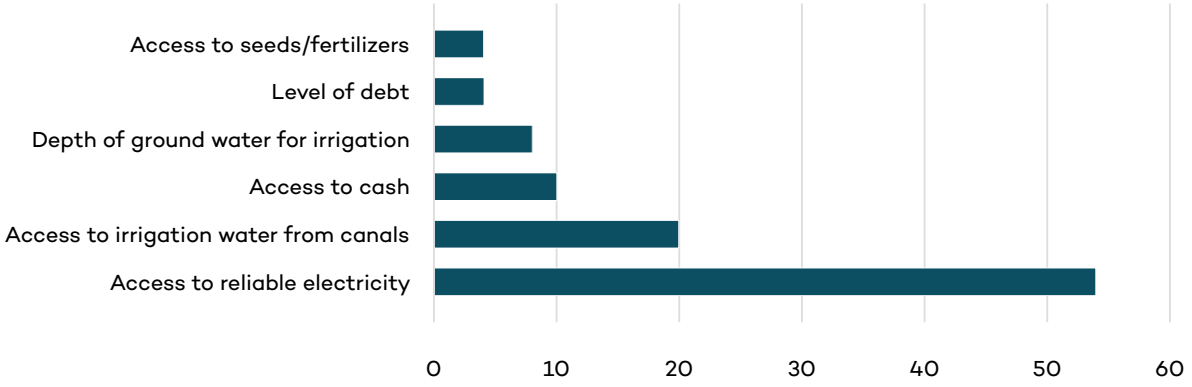


**Figure 38. Most important to electric pump set users (%)**

*Note: 95% CI[24]; Sample size 129/129 electric pump users.*

### 3.4.3 Commercial and Industrial Consumers

**Expectation**: Most consumers are aware that tariff hikes are forthcoming, and know that the utility company needs to adjust for inflation. Around 82 per cent of commercial and 84 per cent of industrial consumers think that tariffs will increase gradually. However, a large proportion of consumers is opposed to a tariff hike, with many stating that "the tariff will increase, but it should not." Figure 39 indicates that there is no significant difference between industrial and commercial consumers on expectations of tariff hikes.

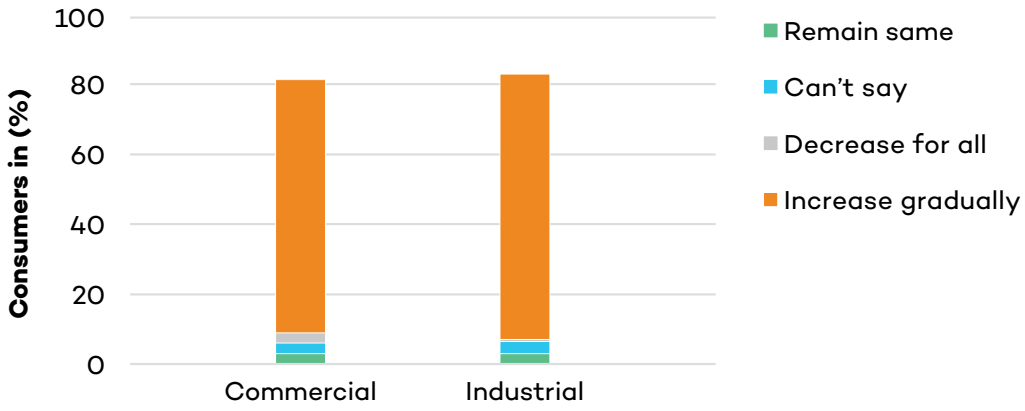


**Figure 39. Expectations about tariff change in future**

**Reaction:** Around 71 per cent of commercial and 61 per cent of industrial consumers have reported that, if there is an increase in tariffs, they will have to absorb the higher energy costs and pay the increased tariff. Consumers strongly believe that there is no alternative to grid electricity in U.P. Diesel generators are expensive and polluting, while solar is expensive and not feasible at all locations. Further, commercial consumers are more reluctant to move from grid power to other sources of power like solar rooftops, as they do not have adequate space for installation and capital for upfront investment.

[24]95% CI Access to reliable electricity [46%-63%]; Access to canal irrigation [13%-27%]; Access to cash [3%-12%]; Depth of ground water [1%-7%]; Level of debt [5%-15%]; Access to seeds/fertilizers [1%-7%].

A business owner from Noida says "We can't do anything. We will have to compromise. It's a monopoly market; some competition in this sector would be really helpful."

Lastly, purchasing power from the open market is currently not allowed in U.P., but 10 per cent of industrial consumers expressed their willingness to buy power from the open market if the state allowed.

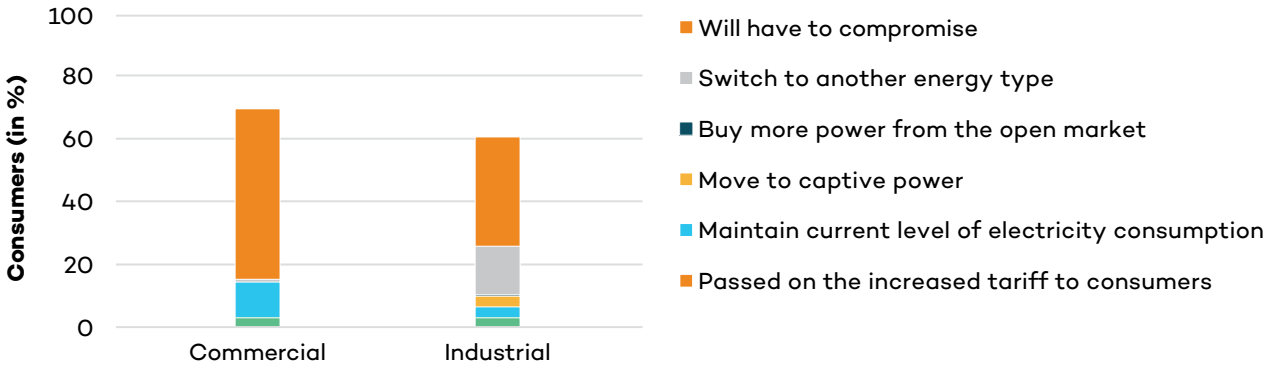


**Figure 40. Coping mechanism to counter increases in tariff**

**Demands to compensate tariff hikes:** In light of tariff hikes, industrial and commercial consumers are seeking government assistance through several fronts to reduce their energy costs (see Figure 41). More than a quarter (26 per cent) of consumers (30 per cent of industrial and 24 per cent of commercial) have suggested that government should provide higher rebates on the capital costs of a solar rooftop system as a measure to help consumers reduce their energy costs. As an enabling step to promote solar rooftop systems, the government of U.P. has started net metering. However, the consumers believe that more schemes and incentives should be introduced for commercial and industrial consumers to reduce the upfront capital investment required for switching to a cleaner energy source. Industrial consumers from the manufacturing sector and commercial consumers from the hospitality sector have shown interest in receiving support for solar rooftop systems.

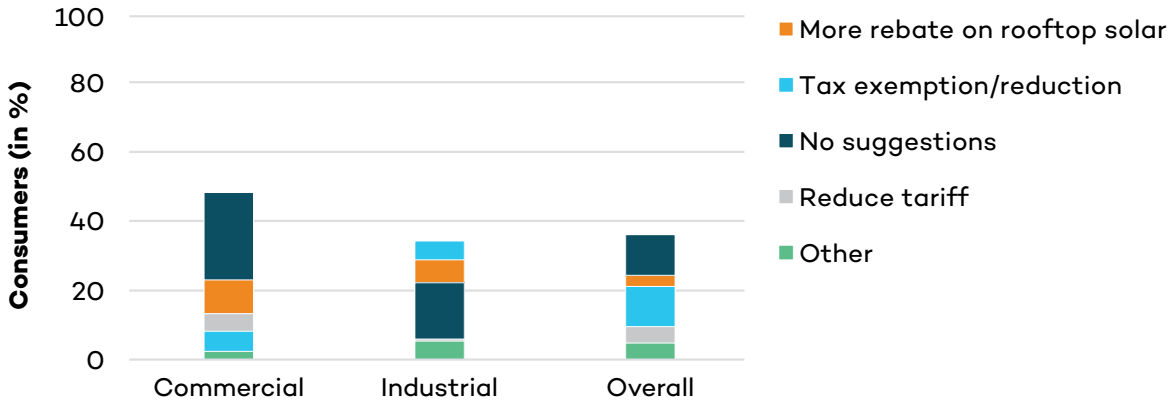


**Figure 41. Type of assistance required from government for reducing energy cost (in %)**

About 22 per cent of consumers suggest that the government should give tax exemptions or allow consumers to take tax credits on the electricity duty[25] that they currently pay on the electricity bill. Consumers strongly believe that they pay hefty taxes on their electricity bill and any reduction or opportunity to offset these taxes would be a relief.

Other suggestions included discounts on advance payment and reduction of fixed charges, as industrial consumers with bulk loads find it difficult to pay fixed charges during lean seasons when their production volumes are very low. Discoms have a special tariff plan for seasonal industries, and they currently also offer rebates to consumers who prepay their bills. However, it appears that consumers are not aware of these offers. In their communications, discoms can announce such offers close to the monthly bill collection time, to encourage consumers to take advantage of such offers, allowing industrial and commercial consumers to feel that they are receiving some financial relief.

**Pace**: **Roughly 80 per cent of commercial and industrial consumers prefer a tariff hike every 2 to 3 years.** A small subset of consumers (6 per cent) prefers an annual increase at the start of the new financial year. The remaining 14 per cent were of the view that the tariff should not increase. Only 8 per cent of consumers prefer predictability in tariff revisions to plan their manufacturing and production cycle accordingly. According to the remaining consumers, prior information about proposed tariff hikes does not help because they are not in a position to directly pass on costs to their consumers. For example, for export-oriented industries, increasing the cost of the product on account of increased electricity tariff (input cost) is not an option for two reasons—(i) lock-in periods of long-term rate contracts do not allow product costs to change for 12 to 24 months (ii) increase in product costs will make the product less competitive in the international market. Additionally, long gestation periods (8 to 12 months) between sales pitch and production do not allow rate adjustments to factor in additional input costs owing to electricity tariff hikes.

Consumers believe that discoms are accountable to provide an uninterrupted power supply to their consumers, and charging a higher tariff on account of improved supply (longer duration of supply and stable voltage) is not justified. Both commercial and industrial consumers strongly expressed their disapproval of this approach.

## 3.5 EXPERIENCE OF ELECTRICITY CONSUMERS

### 3.5.1 Residential Consumers

**Electricity Access:** Overall, 85 per cent of surveyed U.P. households had access to grid electricity (see Figure 42). The difference between survey statistics finding 85 per cent of households with electricity access and government electricity access data can be attributed to a few theories—possibly the different time periods between survey and official data, or the fact that official estimates are based on discom records, which occasionally lag behind field data. Lastly, the survey was conducted in 12 districts, which could affect state representativeness. Of the 15 per cent without access to grid electricity, two thirds were living in rural areas. Among rural respondents, 22 per cent did not have access to grid electricity, which is less than other reported figures in news media (Patil, 2017). Most of these households were living below the poverty line. Similarly, most households without grid electricity in urban areas also live below the poverty line. Around 9 per cent of the total population had no access to electricity at all (14 per cent of rural households and 5 per cent of urban households). The next most common source of electricity was storage batteries (or inverter/UPS), used by more than 10 per cent of both rural and urban households. After this, dry cell batteries and solar home systems were also of some importance (each used by 5 per cent of the population and in three quarters of rural households). There appears to be very limited usage of electricity generators and solar micro-grids or mini grids among residential users.

[25] in 2016–17, 5 per cent of the per kWh tariff of electricity was charged as electricity duty or surcharge to industrial and commercial consumers DVVNL Tariff Order 2016-17 available at http://www.uperc.org/App_File/DVVNLTariffOrderFY2016-17-August1,2016-pdf81201633501PM.pdf.

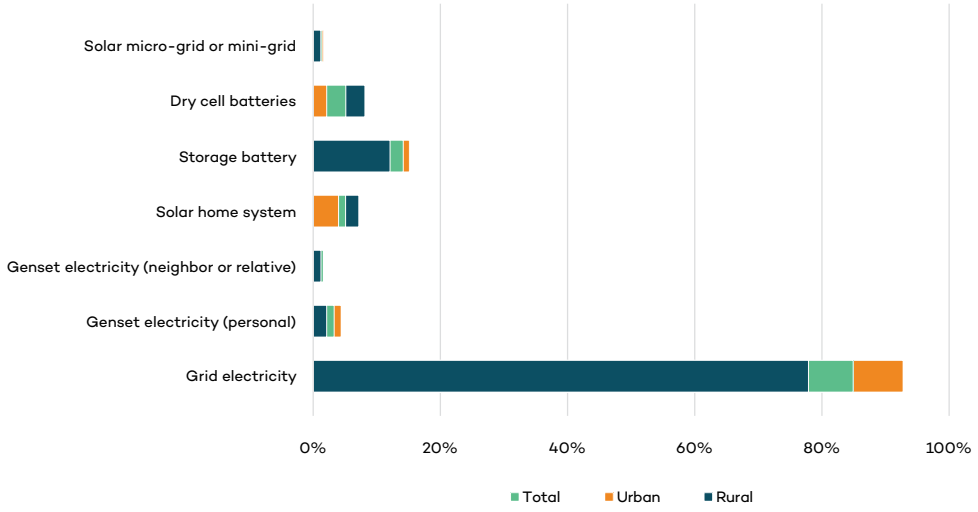


**Figure 42. Access to electricity (%)**

*Note: 95% CI[26]; Rural sample size 960/960; Urban sample size 957/957.*

**Electricity Usage:** In over 80 per cent of connected rural and urban households, electricity is used for lighting, fans and cell phones. It is also heavily used for TV or radio in both urban (82 per cent) and rural (57 per cent) households. Urban households use it frequently (58 per cent) for refrigeration, while this is less prevalent among rural consumers (21 per cent). The usage of inverters to store electricity for usage during periods of no supply is significant among urban households (25 per cent), but remains limited among rural households (9 per cent). Electricity is used to pump water by both urban (22 per cent) and rural (30 per cent) households, while a significant share of rural households also report that they use electricity for irrigation (14 per cent). The use of electricity for other appliances, such as cooking, hot water heating and household businesses remains very limited among both rural and urban households.

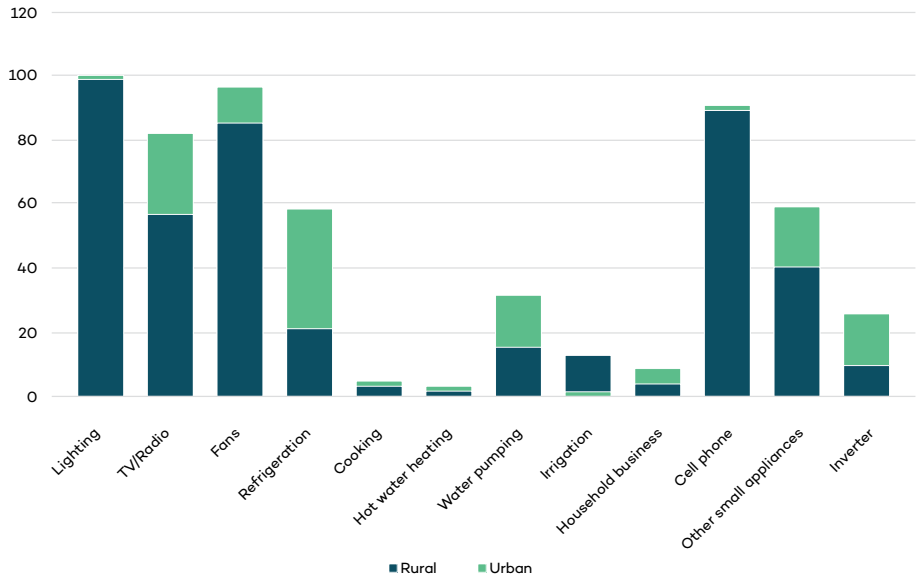


**Figure 43. Uses of electricity (%)**

*Note: Rural sample size 824/960 (those without electricity not surveyed); Urban sample size 912/957 (those without electricity not surveyed).*

[26]95% CI Rural Solar micro or mini-grid [0%-1%]; Rural Dry cell batteries [6%-9%]; Rural Storage battery [10%-15%]; Rural Solar home system [5%-8%]; Rural Genset neighbour or relative [0%-2%]; Rural Genset personal [1%-2%]; Rural Grid [75%-80%]; Rural No electricity [12%-16%]; Urban Solar micro or mini-grid [0%-1%]; Urban Dry cell batteries [1%-3%]; Urban Storage battery [13%-17%]; Urban Solar home system [2%-5%]; Urban Genset neighbour or relative [0%-1%]; Urban Genset personal [3%-5%]; Urban Grid [92%-95%]; Urban No electricity [3%-6%].

**Quality of service**: Unsurprisingly, 67 per cent of households in Uttar Pradesh consider adequate electricity supply as very important to the household. Urban households are on average more satisfied with current electricity supply. While about 45 per cent of both rural and urban households report themselves "satisfied," 36 per cent of urban households report they are "very satisfied" (this rate is only 16 per cent for rural households). 10 per cent of urban households are not satisfied with current supply, compared to 27 per cent of all rural households.[27]

Attitudes to supply are likely linked to the available hours of grid electricity in different seasons and the amount of blackout days per season. Figure 44 shows that most urban consumers enjoy more hours of electricity per day more than rural consumers. On average, rural households have 13 hours of electricity in winter, 12 hours in summer and 10 hours in monsoon. Urban households, on the other hand, have on average 17 hours in winter, 18 hours in summer and 14 hours during monsoon. Urban consumers also experience fewer blackouts than rural consumers. Rural consumers have on average 2 blackout days per month in summer, 3 in winter and 4 in Monsoon. This is respectively 1, 1 and 2 for urban households.

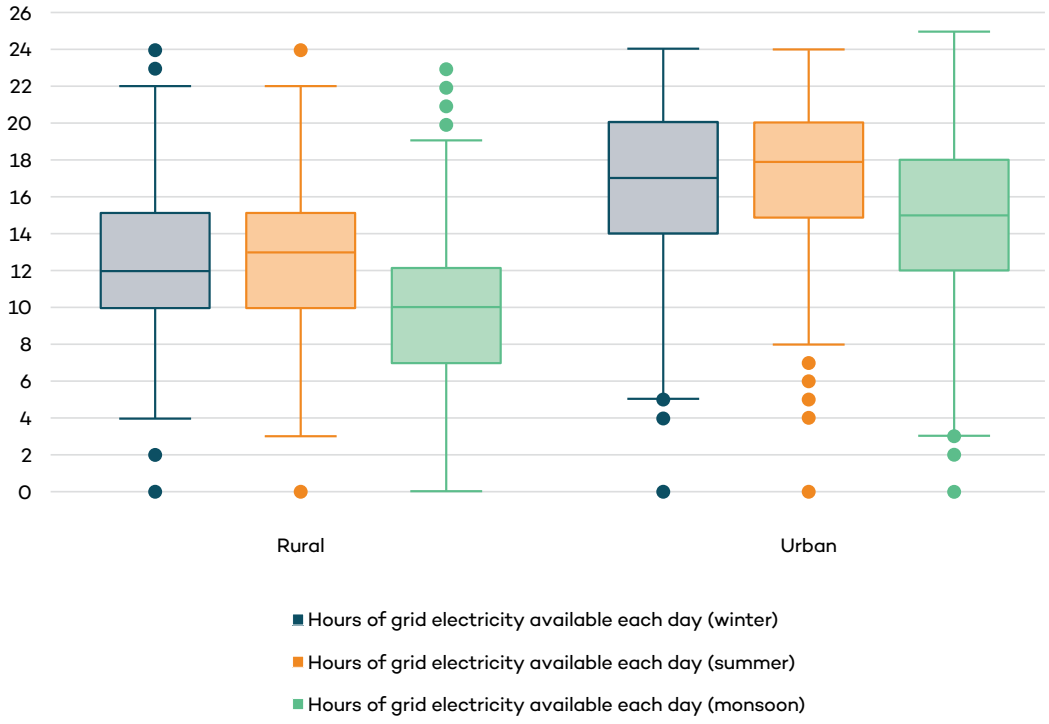


**Figure 44. Available hours of grid electricity per day**

*Note: The lower and upper limits represent the minimum and maximum values (outliers excluded); the box represents 50% of the data (lower limit of box = 1st quartile, upper limit = 3rd quartile, and dividing line = median); the dots represent outliers.*

Unreliable grid electricity affects both urban and rural consumers. Roughly 67 per cent and 72 per cent of urban and rural U.P. households respectively have indicated that poor electricity supply has caused problems for the household in terms of education and health, while 27 per cent of the population also link income loss to poor electricity supply. Finally, 52 per cent of rural respondents had experienced appliance failures in the last 30 days, compared to 41 per cent of urban respondents.

[27] 95% CI Rural Very unsatisfied [9%-13%]; Rural Unsatisfied [13%-19%]; Rural Neutral [9%-14%]; Rural Satisfied [42%-49%]; Rural Very satisfied [14%-19%]; Urban Very unsatisfied [2%-5%]; Urban Unsatisfied [6%-9%]; Urban Neutral [5%-9%]; Urban Satisfied [43%-49%]; Urban Very satisfied [33%-39%].

### 3.5.2 Agricultural Consumers

**Pump Usage:** Nearly all electric pump users surveyed owned their electric pump and used it for field irrigation by pumping water from the ground. Few electric pumps were used to draw water from a canal or common well. Half of pump owners use the pump to extract water for their own fields. The other half extract water for their personal use and to sell as a product to other farmers. Only a small share of electric pump users purchases additional water from other farmers. Half of electric pump owners loaned out their pumps to other farmers. More than half of the electric pumps in the survey were purchased after 2007, while 32 per cent of the pumps were older than 20 years. In-depth interviews showed a similar pattern, with more than half of respondents having purchased their pump after 2000 and many even since 2012, in line with improved electricity supply. That said, the interviews revealed that many farmers also still owned very old pumps. There is thus a large variance in electric pump quality. About 10 per cent of electric pump owners also own a secondary diesel pump set.

**Quality of service:** Slightly more than 40 per cent of electric pump owners are unsatisfied with the level of current electricity supply. Almost the same proportion of the electric pump owners, on the other hand, is satisfied or very satisfied with current supply.[28] Farmers from medium and large land holdings in particular were more dissatisfied than those with smaller land holdings.

Figure 45 indicates that farmers report a large range of needs and supply, which may be due to the crops grown or the quality of electricity supply in a specific region. On average, farmers would like 3 hours of electricity more during monsoon, while this is 4 hours and 5 hours respectively in winter and summer. Electric pump owners also experience on average 4, 3 and 5 blackout days per month during respectively Kharif, Rabi and Zaid seasons.[15] These blackouts occur during both day and night.

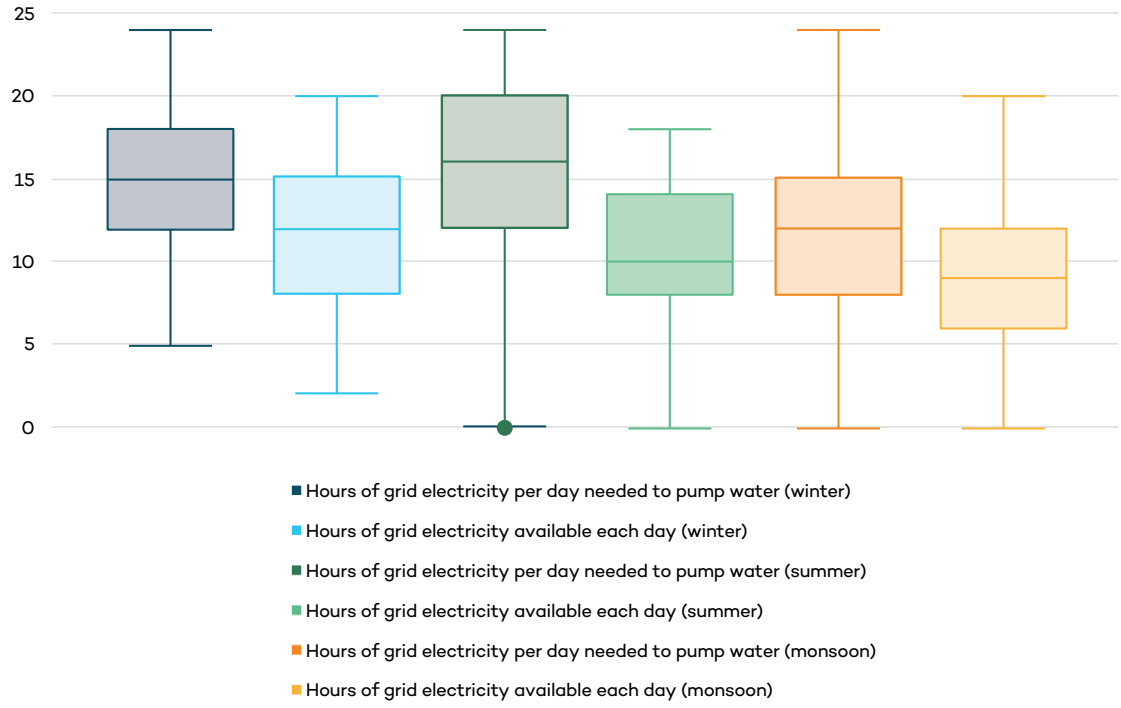


**Figure 45. Available and required hours of grid electricity per day to pump water**

*Note: The lower and upper limits represent the minimum and maximum values (outliers excluded); the box represents 50% of the data (lower limit of box = 1st quartile, upper limit = 3rd quartile, and dividing line = median); dots represent outliers.*

[28] 95% CI Very unsatisfied [18%-33%]; Unsatisfied [10%-23%]; Neutral [5%-16%]; Satisfied [14%-28%]; Very satisfied [19%-34%]

More than half of farmers (53 per cent) report that the current duration of electricity supply causes a loss in farming income. More than two thirds of farmers (68 per cent) say the unpredictable schedule of electricity causes a loss in farming income. If more hours of electricity were available or the schedule was more predictable, roughly half of surveyed farmers would change crops (mostly to vegetables, sugarcane and paddy). In total, also about two thirds of farmers (66 per cent) have experienced pump set failures. 16 per cent of surveyed electric pump owners plan to purchase a solar pump set in the near future. All other electric pump users do not plan to purchase any different pump set. We found a similar conclusion in the interviews.

**Preference for electric pumps:** In-depth interviews revealed that the key reason why farmers buy electric pumps was that they are cheaper than diesel-based pumps. This is partly because diesel pumps have become less efficient with falling ground water tables. Electric pump users that also own a diesel pump use the latter when electricity supply is insufficient.

### 3.5.3 Commercial and Industrial Consumers

**Hours of Supply:** About 85 per cent of consumers face some or the other problem with their electricity supply. Disaggregation by city or discom reveals that consumers in Lucknow face the fewest supply-related problems, followed by Agra and Noida. In Moradabad and Varanasi, almost 100 per cent of consumers have reported having problems (see Figure 22).

**Quality of Supply**: commercial and industrial consumers reported receiving 21.4 hours of electricity supply daily across all seasons (see Tables 14 and 15). Since there is slight variation in the responses, results presented are the positional average (Median) instead of mean/average. There is a slight variation in median hours of daily power supply (from grid) all seasons. Median hours of daily power supply (from grid) are higher and stable across all three seasons in Lucknow and Agra compared to the other three cities covered under the study. Respondents shared that there are fewer unscheduled outages, and the hours of supply have significantly improved over the last 3 to 4 months.

Among the types of problems reported (see Figures 46 and 47) unscheduled blackouts (73 per cent) were reported as the most common problem across all cities/discoms. The highest proportion of such respondents were in Moradabad (92 per cent) followed by Noida (82 per cent) and Lucknow (75 per cent). Frequent supply disruptions are noted during monsoons and in summers.

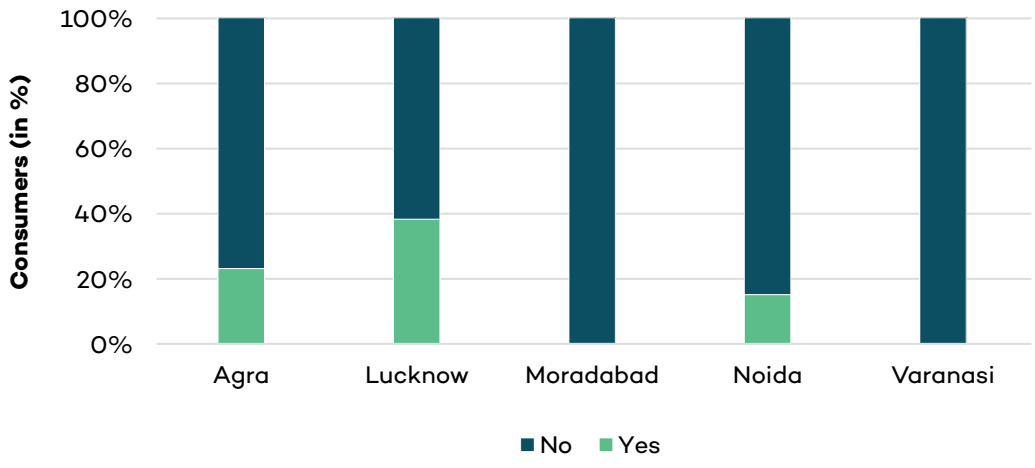


**Figure 46. Consumers experiencing problems with electricity supply disaggregated by location (in %)**

**Table 14. Hours of daily grid electricity supply based on connection category (median in hrs/day)**

| Type of Connection | Winter | Summer | Monsoon |
|---|---|---|---|
| **Commercial** | 22.5 | 20.5 | 20.5 |
| **Industrial** | 22.5 | 21.25 | 21.5 |

**Table 15. Hours of daily grid electricity supply (median in hrs/day)**

| Location | Winter | Summer | Monsoon |
|---|---|---|---|
| **Agra** | 23 | 23 | 22.8 |
| **Lucknow** | 23.5 | 23.5 | 23.5 |
| **Moradabad** | 20.5 | 19.5 | 19.0 |
| **Noida** | 22.5 | 20 | 20.0 |
| **Varanasi** | 22.25 | 21.5 | 21.5 |

Consumers believe Lucknow enjoys better power supply by virtue of being the state capital, whereas in Agra reliable power supply is attributed to efficient management of distribution by the private discom, Torrent Power. According to all the respondents from Agra, since discom operations were privatized there has been a drastic improvement in duration of daily supply, complaint resolution and the reduction in frequency of unscheduled outages. Industrial and commercial consumers of Moradabad have expressed dissatisfaction toward their discom, Pashchimanchal Vidyut Vitaran Nigam Limited (PAVVNL). In PAVVNL the median supply during winters is around 20.5 hours per day, 19.5 hours during summers and 19 hours during monsoon.

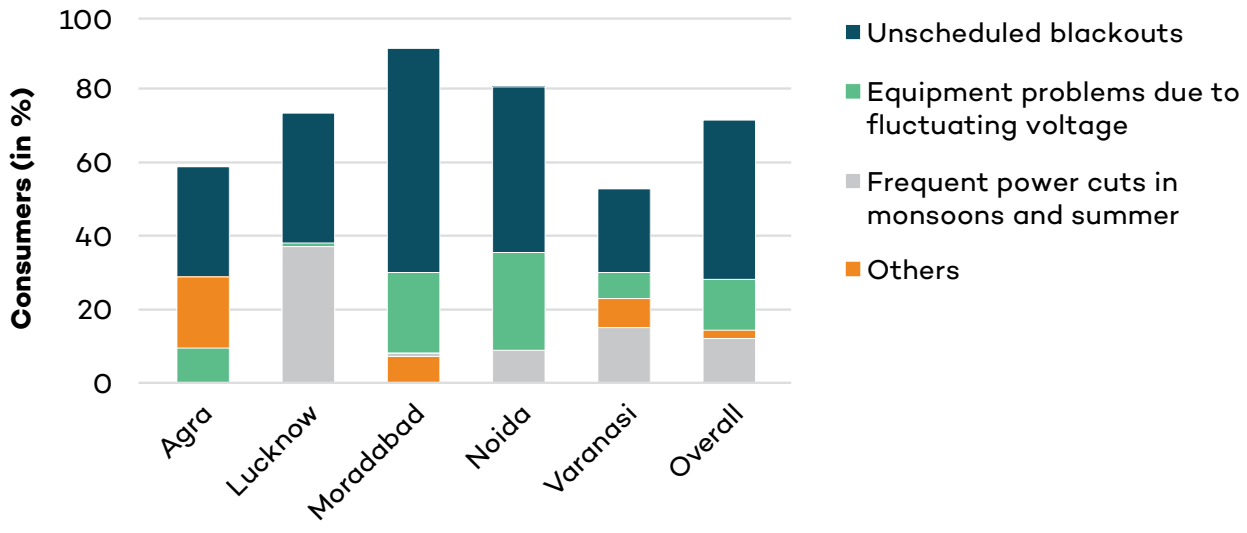


**Figure 47. Type of problems faced by consumers**

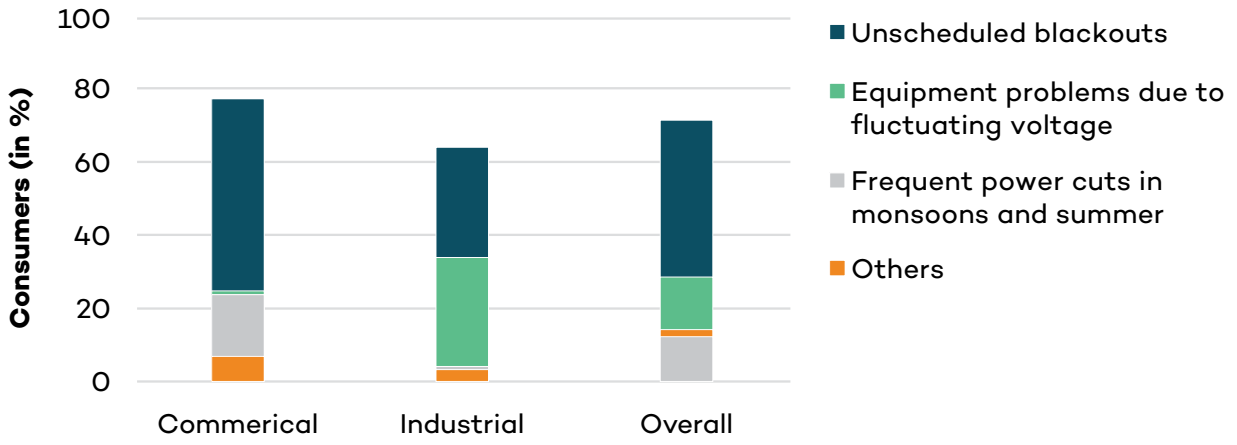


**Figure 48. Type of problems faced by consumers disaggregated by consumer category (in %)**

**Use of other fuel sources:** Grid and diesel generators are the two major sources of electricity for industrial and commercial consumers in U.P. For 43 per cent of respondents, more than 90 per cent of their electricity demand is met though grid supply, while the remaining is met through diesel generators (see Figure 49). The data reveals that there is a significant variation in the trends across the five cities covered under the study. In Lucknow and Agra, over 90 per cent of electricity demand of more than 62 per cent of the respondents is met through grid electricity. In Moradabad, only 8 per cent of respondents reported drawing over 90 per cent of their total electricity requirement from the grid. It appears that these trends are reflective of reliable electricity supply. In cities like Agra and Lucknow where electricity supply (hours of supply) is better compared to other cities in the state, a higher proportion of total demand is being met through the grid.

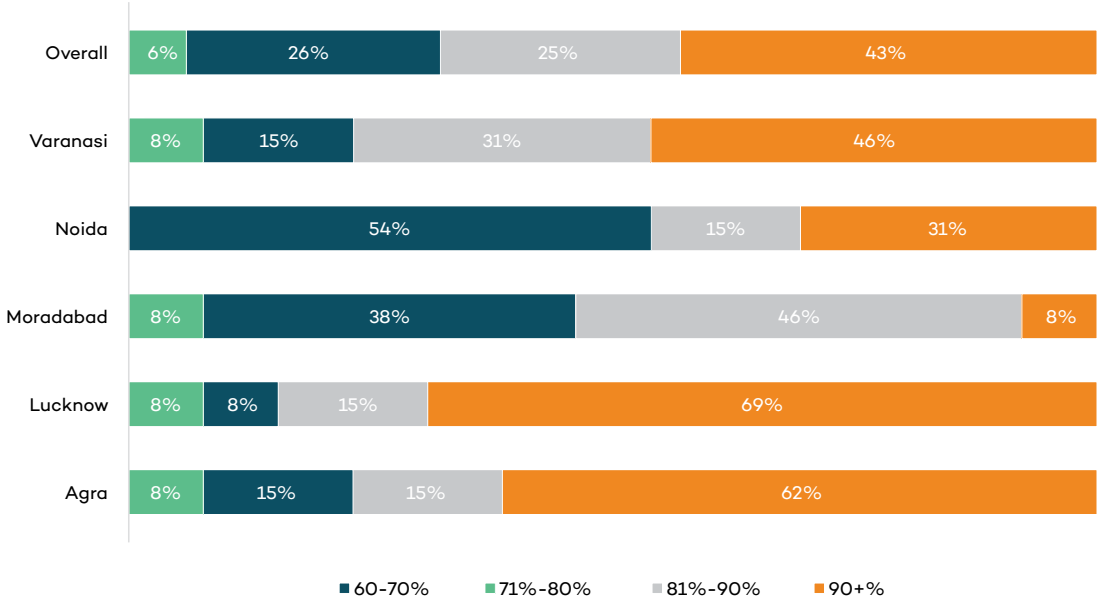


**Figure 49. Percentage of electricity demand met through grid electricity (in %)**

Disaggregation reveals that for about 53 per cent of commercial consumers, over 90 per cent of electricity demand is met through grid electricity compared to 32 per cent of industrial consumers (see Figure 50).

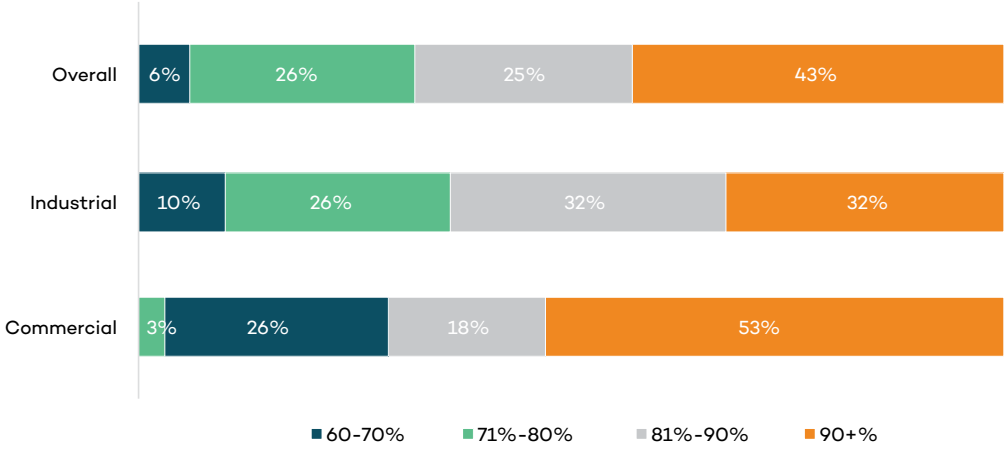


**Figure 50. Percentage of electricity demand met through grid electricity disaggregated by consumer category (in %)**

## 3.6 TRUST

### 3.6.1 Residential Consumers

The main source of information for the overwhelming majority of rural (66 per cent) and urban (77 per cent) households is TV, followed by reading the newspaper (about 20 per cent each). These are also the sources they trust the most to receive information. Radio, internet and social media are generally neither the main source of information nor the most trusted.

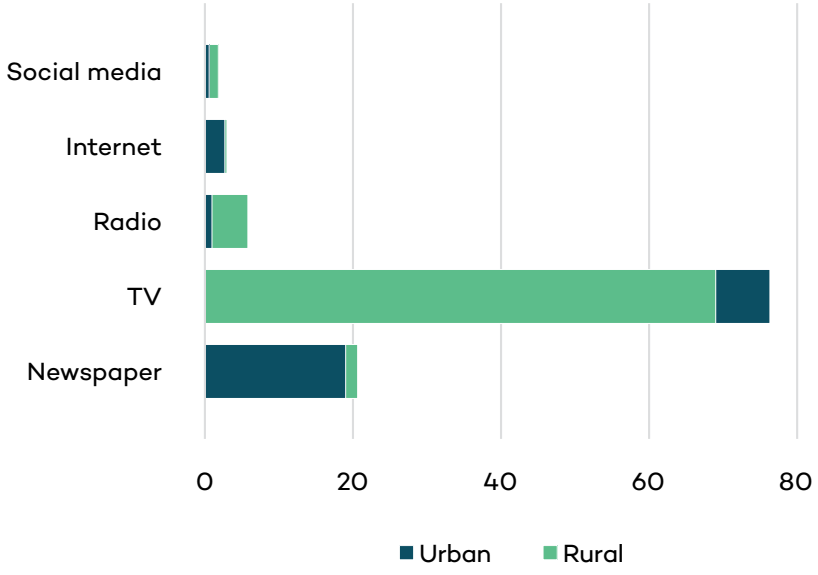


**Figure 51. Most trusted source of information**

*Note: Sample size rural 960/960; Sample size urban 957/957.*

Trust in the state government is high. Three quarters of both the urban and rural population trust the state government, and almost half of both populations "strongly trust" the state government. Only around 16 per cent of both populations distrust the government. That said, few people believe local and state governments actually understand their concerns, as a general principle. Interestingly,

where about 75 per cent trust the state government, also about 75 per cent of residential respondents think governments do not understand the concerns of households. This shows that confidence in government, while present, may be shaky. It is easy to see how electricity tariff reform could ultimately affect trust in the state government. Around 17 per cent and 24 per cent of rural and urban respondents, respectively, had already complained to the local or state government about electricity supply in the last year.

This suggests that government communication campaigns should focus more on the usefulness of reforms for people directly, rather than indirectly, e.g., via the discoms' financial health. It is good to know, however, that people trust discoms. Around 75 per cent of both rural and urban households trust discoms, while only roughly 15 per cent distrust them. Trust in utilities mainly depends on the quality of electricity service, which should be put forward as a priority of any reform. That said, for about two thirds of rural and three quarters of urban households, the method of bill collection (respectively 67 per cent and 76 per cent), communication with utility employees (respectively 67 per cent and 74 per cent) and the good management of the utility (respectively 64 per cent and 76 per cent) are important factors as well.

More than two thirds of rural households believe excessive demand and theft are key problems for supply. Slightly fewer households believe infrastructure maintenance is a problem, and less than half of rural households thinks the problem is a lack of government investment. The picture is different for the perception of urban households. More than 75 per cent believe that poor supply is linked to theft, and around 70 per cent believe it is linked to maintenance. Two thirds link excessive demand to supply problems as well. Like rural households, it is striking that less than half believe supply problems are related to a lack of government investment. A communication campaign should therefore not only focus on developing a new norm (e.g., that costs should be covered by consumers), but primarily on a better understanding of electricity subsidies and how they affect supply by carving out investment potential that is necessary to improve electricity.

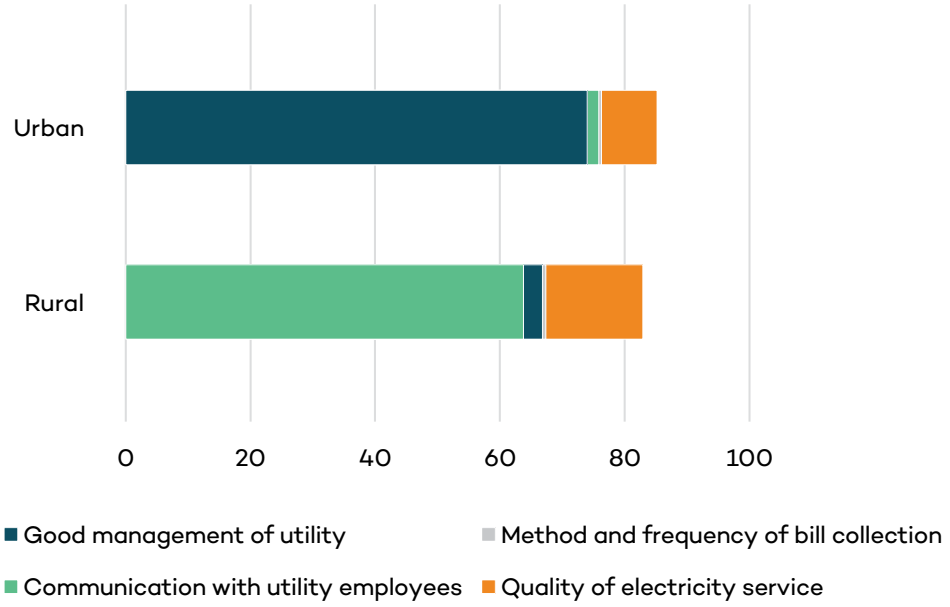


**Figure 52. Determinants of trust in utility**

*Note: Sample size rural 744/960 (those without grid electricity not surveyed); Sample size urban 890/957 (those without grid electricity not surveyed).*

### 3.6.2 Agricultural Consumers

Most pump owners mainly trust information from conventional sources such as TV and newspapers. Almost 80 per cent of electric pump set owners have trust in government to pursue smart economic reforms, with most of the remainder having little trust that this will happen. This is very similar for diesel pump owners.

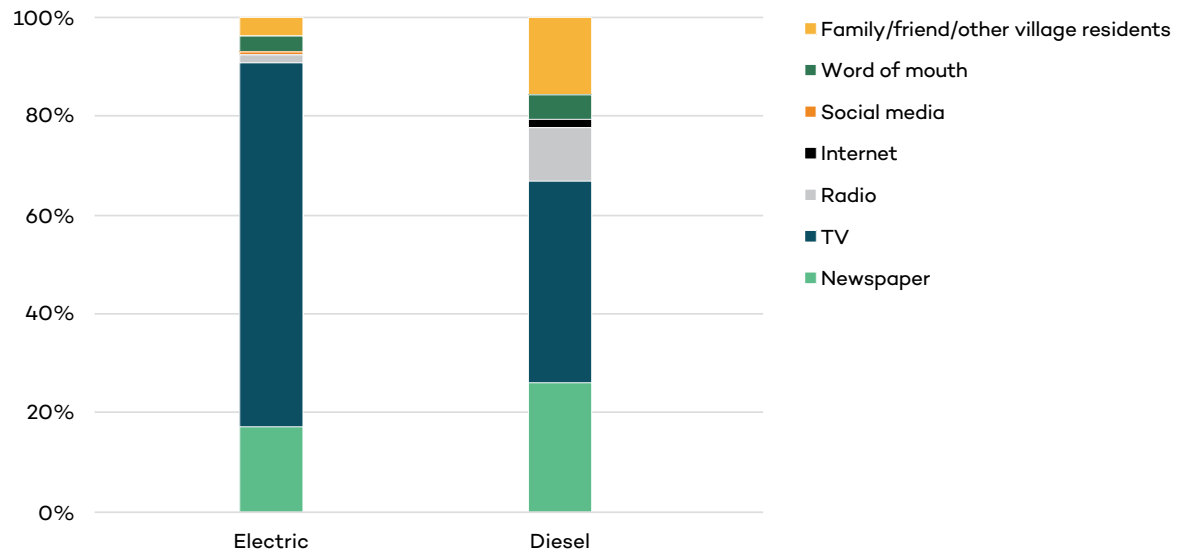


**Figure 53. Most trusted source of information**

*Note: 95% CI[29]; Sample size diesel 284/284; Sample size electric 129/129.*

About 35 per cent of surveyed electric pump owners have filed a complaint to their local or state government about electricity supply in the last year. None, however, went as far as forming a group to file a complaint in Lucknow. Interviews revealed that the most common complaints were to junior engineers, rather than policy-makers. Furthermore, most electric pump set users were not part of a farmer association. Logically, the quality of electricity service is the most important determinant for trust in the utility. Around 60 per cent of surveyed pump owners also think communication with utility employees and the good management of the utility are determinants for their trust in the utility.

### 3.6.3 Commercial and Industrial Consumers

Over 62 per cent of commercial and 77 per cent of industrial consumers reported mobile phone (including WhatsApp) as the most reliable, trusted and accessed source of information on energy and the economy. This was followed by newspapers.

Over 80 per cent of consumers have themselves registered complaints with the utility companies, while in the remaining 20 per cent cases someone else from their organization or firm has made complaints. Consumers said that in most cases their complaints are not resolved without monetary enticement to utility staff. Consumers find it economical to offer monetary enticements in comparison to expenditure on diesel generators, as a backup to grid electricity. In some cases, consumers have also reported that they ended up providing resources to utilities to fix their

[29]95% CI Diesel Newspaper [21%-31%]; Diesel TV [35%-47%]; Diesel Radio [7%-14%]; Diesel Internet [2%-3%]; Diesel Word of mouth [2%-8%]; Diesel Family/friend [12%-20%]; Electric Newspaper [11%-24%]; Electric TV [66%-81%]; Electric Radio [0%-4%]; Electric Social media [0%-2%]; Electric Word of mouth [0%-6%]; Electric Family/friend [1%-7%].

complaints faster. These resources included tractor trolleys for transportation of transformers; cables and cranes for installation, and labour for manual work.

Industry representatives have met the Chief Minister and other ministers, both at state and central levels at various forums, and have discussed the issues currently faced by their businesses. However, they feel that meeting politicians and bureaucrats does not yield any results.

**Table 16. Summary of main survey findings:**

| **Metering and Billing** | | |
|---|---|---|
| **Households** | **Agricultural Consumers** | **Commercial & Industrial Consumers** |
| Around 25 per cent of rural households have a meter installed compared to 85 per cent of urban households. 92 per cent urban households and 10 per cent rural households paid for grid electricity based on meters. Under discom PAVVNL, only about 10 per cent of rural households were found to have meters, while under discom PUVVNL only 75 per cent of urban households were metered. | Between 1 per cent and 8 per cent of electric pump users have a meter installed that measures agricultural electricity consumption for pump sets. | Roughly 66 per cent of industrial and commercial consumers do not face any issue with electricity billing. Of those who did, high fixed charges, incorrect meter reading and billing were the major faults reported. These consumers believe that discom officials have made artificial obstacles that force them to approach commission agents. |
| Almost 85 per cent of urban households but only about 22 per cent rural households receive monthly bills. | 53 per cent of the surveyed electric pump users never received an electricity bill. | Feeder separation is also a major concern among industrial consumers, as they strongly believe that having a separate feeder for industries would aid reliable and uninterrupted power supply. |

| **Perception of Subsidies** | | |
|---|---|---|
| **Households** | **Agricultural Consumers** | **Commercial & Industrial Consumers** |
| No generalized sense of entitlement to free electricity. 80 per cent of rural and urban households believe that poor households should get free electricity. Roughly 65 per cent of urban households agree for free electricity for farmers with 30 per cent of them explicitly disagreeing. | More than 80 per cent of diesel pump owners believes poor households and farmers should get free electricity, compared to respectively 49 per cent and 73 per cent of electric pump users. | Industrial consumers (52 per cent) are more in favour of providing subsidies to farmers and poor households compared to commercial consumers (35 per cent). |
| Around 27 per cent of the population believe that discoms covers their costs through customer fees only, indicating that this share of the population is not aware of the existence of subsidies and current levels of government support to discoms. | Only 7 out of 67 farmers interviewed were aware that electricity tariffs for farmers were subsidized, indicating a need for better communication of subsidies and support to utilities. Around 32 per cent of pump owners believe discoms cover their costs through customer fees only and no government support. | Approximately 81 per cent of industrial and 68 per cent of commercial consumers are not in favour of continuing the current trend of cross-subsidy, while 68 per cent of consumers are unaware of how discoms cover their costs. |

**Attitudes to Tariff Reform**

An overwhelming majority in all consumer groups—households, farmers, commercial and industrial consumers—believe that tariffs are likely to increase. Each consumer group described different coping mechanisms to increased tariffs. The following reactions were observed among the different consumer groups.

| Households | Agricultural Consumers | Commercial & Industrial Consumers |
|---|---|---|
| When faced with increased tariffs, only 45 per cent of households said they were likely or very likely to switch fuels.<br><br>Around 60 per cent of households thought they would maintain expenditure by consuming less electricity in combination with decreasing expenditure elsewhere. | When faced with higher tariffs, farmers using electric pumps said they are unlikely to switch crops.<br><br>Roughly two thirds would keep using the same pump. And half of the remaining third would consider purchasing a solar pump set. | Absorbing the increased costs resulting from tariff hikes is the only coping mechanism for commercial and industrial consumers because of locked-in production cycles.<br><br>About 22 per cent of consumers suggested tax exemptions or offset tax credit on electricity bills. |
| In terms of quantum of tariff hikes, 75 per cent of urban respondents and 59 per cent of rural respondents preferred a one-time immediate increase as opposed to monthly hikes. But higher-earning urban and rural households prefer a one-time increase. | In terms of quantum of tariff hikes, about 70 per cent of electric pump set-using farmers see an immediate increase of their electricity bill, rather than monthly hikes. | Around 80 per cent of consumers prefer a tariff hike every 2-3 years, while a small subset of consumers (6 per cent) prefer an annual increase at the start of the new financial year. |
| About 60 per cent and 70 per cent of urban and rural households, respectively, would be willing to pay more for electricity under a range of conditions: a doubling of hours of supply; grievance services; immediate redress of grievances; the provision of energy efficient light bulbs; assistance with other public services; and the delivery of the subsidy through bank transfers. | Over 70 per cent of respondents think it is not reasonable to pay higher tariffs for the utility to better cover its costs. Messaging strategies should take this into account as it would be in the interest of the government to primarily highlight the direct advantages to farmers when passing a tariff hike. | Commercial consumers are more inclined toward paying more for improved duration and quality of supply compared to their industrial counterparts. |

# 4.0 Interim review of UDAY implementation

## 4.1 OVERVIEW

In order to revive the power sector and to provide affordable and accessible "Power for All", and to rework the INR 4.3 trillion (~ USD 65 billion)[30] debt of discoms (Lighting, 2017), the Ministry of Power, GoI launched Ujwal Discom Assurance Yojana (UDAY) on November 5, 2015. The scheme was launched with the objective of:

- Improving the financial health of discoms
- Improving operational performance of discoms by
  - Increasing demand for power
  - Improving access to capital
  - Reducing stressed assets by improving plant load factor (PLF) of generating plants
- Developing the renewable energy sector

The government has bailed out ailing discoms in the past, but such schemes did not succeed, as they did not improve discoms' operational performance. However, UDAY is a revival plan for discoms rather than a bailout package, as discoms are obliged to meet certain milestones to improve their financial and operational performance such as reducing interest cost, reducing cost of power purchase and enforcing financial discipline etc. By issuing state bonds, the government will cover the deficit of discoms, but the principal debt taken over will not be included in the fiscal deficit of the states. The interest, however, would be serviced within limits set by the Fiscal Responsibility and Budget Management Act. The functioning of UDAY is detailed out in Figure 54.


**Figure 54. Milestones and impact under the UDAY scheme**

*Source: MoP, 2015, & authors' analysis.*

[30]Using an exchange rate of 1 USD = INR 65.71

Since its launch in November 2015, 26 states and the union territory of Puducherry have joined the scheme. While most states (16) have entered into memorandums of understanding (MoUs) for both financial and operational improvement, other states have signed MoUs for only operational efficiency. The map below provides details of the states that have signed MoUs under the UDAY scheme as of September 2017.

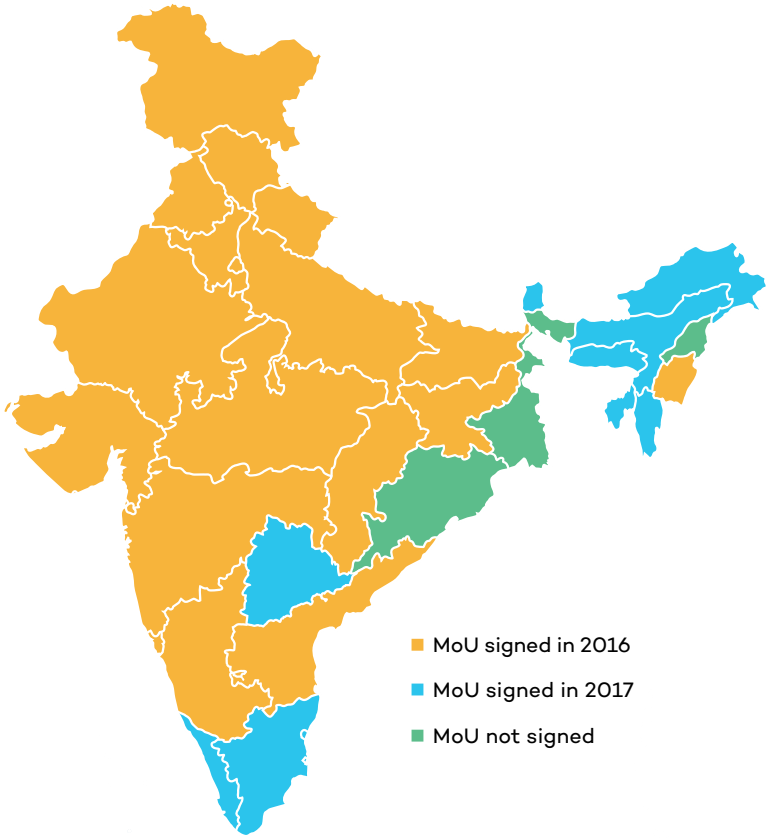


**Figure 55. States that have signed an MoU under UDAY scheme (as of September 2017)**

*Source: UDAY 2017 & authors' analysis.*

Some of the discoms have already started reaping the benefits of the scheme through a reduction of interest costs, which is channelled into infrastructure investments (such as feeder meters, distribution transformer (DT) metering, smart meters and GIS mapping) leading to further financial savings and improved operational efficiency. However, many states joined UDAY in 2017 and are yet to implement the scheme fully. For such states, the impact has to date been negligible.

As per the Reserve Bank of India (RBI) report on State Finances (RBI, 2017), outstanding liabilities of states increased by 1.5 percentage points of GDP in 2016 over 2015 and by 0.7 percentage point in 2017 over 2016 on account of UDAY. Also, for 8 states[31] that signed UDAY in 2015–2016, the ratio of consolidated state gross fiscal deficit to gross domestic product (GFD-GDP ratio) has been moderated by 0.7 percentage points during 2015–16, falling to 2.9 per cent from 3.6 per cent in the previous year. However, based on an empirical evaluation, the report concludes that current fiscal policies are sustainable in the long run. This is despite the short-term deterioration of the debt position of state governments in 2015–2016 and 2016–2017, due to their participation in the financial and operational restructuring of state power distribution companies through UDAY.

[31]The eight states are Bihar, Chhattisgarh, Haryana, Jammu & Kashmir, Jharkhand, Punjab, Rajasthan and Uttar Pradesh.

## 4.2 TRACKING THE PROGRESS OF UDAY IN THE STATE OF UTTAR PRADESH

The success of the UDAY scheme depends upon states' willingness and ability to adhere to key operational and financial milestones. This requires reducing the overall costs of power by sourcing power through an optimal mix of generation sources, moving to a cost-reflective tariff regime, lowering cross-subsidization in power tariffs, timely payment of subsidies, resolution of other critical issues such as accurate determination and reduction of aggregate technical & commercial (AT&C) losses. Further, the state needs to strengthen infrastructure by building adequate intrastate transmission and distribution network capacity.

The Uttar Pradesh government entered into a tripartite MoU with the Ministry of Power (MoP) and Uttar Pradesh Power Corporation Ltd. (UPPCL) to receive the benefits of UDAY scheme and revive the distressed power distribution companies with their finances (for details of MoU see Appendices 3 and 4). The state has issued bonds of INR 39,133 crores (USD 5.9 billion) and another INR 10,714 crores (USD 1.6 billion) worth of bonds has been issued by discoms at end of March 2017. The state has saved interest costs of INR 3,323 crore (USD 506 million) (MoP, UDAY, 2017) by joining the scheme. However, as per the provisional data, the annual loss for the state discoms is INR 6,320 crore (USD 962 million) in FY 2016, after accounting for subsidy of INR 8,724 crore (USD 1.3 billion) (GoUP, 2017).

A comparison of Uttar Pradesh with other states on two important factors—AT&C losses and the ACS-ARR gap—reveals that the state currently has one of the highest technical and commercial losses in comparison to other states and all India average (see Figure 56), thus widening the gap between cost of supply and the revenue recovered from the end consumers. The state needs to invest in infrastructure (such as installation of meters and feeder segregation) while simultaneously rationalizing tariffs and reducing the cost of power purchase to reduce losses.

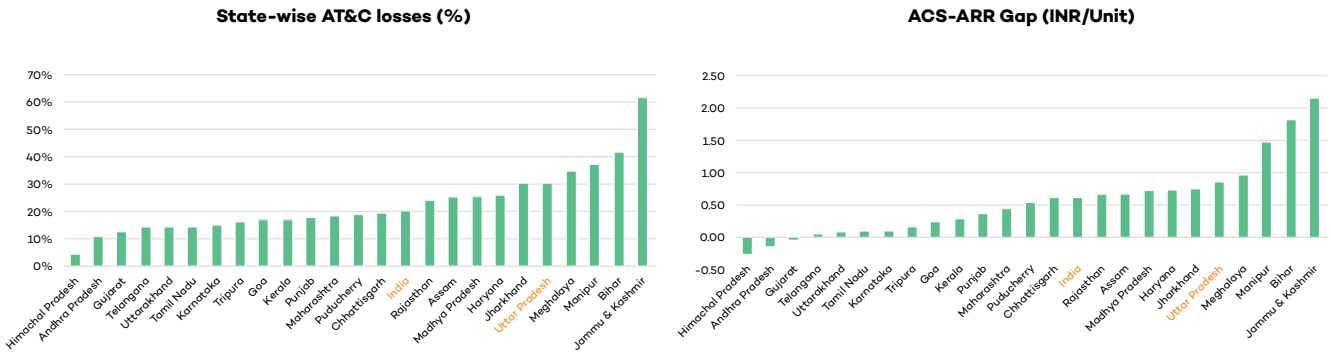


**Figure 56. State-wise AT&C losses (%) and ACS-ARR gap (INR/unit)**

*Source: Chakraborty, Chakraborty, Gupta, & Kauret, 2017.*

The stakeholder consultation revealed that the monitoring committee of UDAY in the last meeting (held in October 2017) reported that there is a discrepancy in AT&C and ACS-ARR gap figures arrived by Power Finance Corporation (PFC) as per audited accounts of discoms for FY 2016 and the values entered by discoms on the UDAY portal. As per the PFC report, the national ACS-ARR gap is INR 0.68 per kWh and the AT&C loss is 23.32 per cent, while the UDAY portal reports a gap of INR 0.60 per kWh and AT&C loss of 21.14 per cent. The states have thus been requested to check the accuracy of the data submitted on the UDAY portal. Nevertheless, in spite of this small mismatch, the information on the UDAY portal is a good indicator of the achievements made under the scheme so far.

Under the UDAY scheme, in order to make discoms financially sustainable, the government has laid out a pathway to achieve both operational and financial efficiency, but the implementation and enforcement in Uttar Pradesh has so far been slow. However, the state is progressively picking up speed to achieve the scheme's stated milestones. The progress made so far by Uttar Pradesh's distribution sector (combining the performance of different discoms) on total targets set against UDAY key parameters is summarized in Table 17.

**Table 17. Progress against Uttar Pradesh UDAY targets**

| Milestones | Status (Success based on overall target) |
|---|---|
| **Operational Parameters** | |
| Feeder metering | As of June 2017<br>Urban – 1,375 meters installed (100%)<br>Rural – 4,101 meters installed (100%) |
| Distribution Transformer (DT) metering | As on September 2017<br>Urban – 10,020 meter (13%)<br>Rural – 7,456 meter (1.47%) |
| Audit of rural feeders | Audit done for 2,515 feeders as on March 2017 (40%) |
| Smart metering above 200 and up to 500 kWh | No progress (0%) |
| Feeder segregation | No progress (0%) |
| Consumer indexing | No progress (0%) |
| GIS mapping of losses | No progress (0%) |
| Electricity access to unconnected HHs | 23.2 lakh HHs electrified as against the target of 184.37 lakhs as on Sep 2017 (12.5%) |
| Distribution of LEDs | 187.76 lakhs LEDs distributed as of Sep 2017 (more than 100%) |
| **Financial Parameters** | |
| Reduction in AT&C losses<br>FY 2016 – 32.36%<br>FY 2017 – 28.27%<br>FY 2018 – 23.63%<br>FY 2019 – 19.36%<br>FY 2020 – 14.86% | Reduced from 37% in FY 2016 to 34.36% in FY 2017 against the target of 28% |
| Reduction in gap between ACS & ARR to zero by 2018–2019 | INR 0.83 per kWh as on June 2017 |
| Quarterly tariff revision, particularly to offset fuel price increase, to be permitted | As per the latest tariff order filing for 2017–2018, tariff hike proposed is<br>Unmetered rural domestic consumers – 260%–350%<br>Metered rural domestic consumers – 150%<br>Unmetered tubewell– 60%<br>Unmetered rural domestic consumers – 260–350%<br>Domestic consumers – 12%<br>Commercial consumers – 15%<br>However, tariff order has not been issued |

*Source: State Health Card, U.P. (UDAY) 2017; HT, 2017.*

Target Achieved, On Track  Some progress made  Little or no progress made

The state has made tremendous progress on feeder metering both in urban and rural areas and in distribution of LEDs as part of energy conservation measures. This progress is tracked against annual milestones of rural feeders and electricity access to unconnected households. However, little or no success has been achieved against other milestones. Overall, the achievements thus far have not improved financial performance, as AT&C losses and the gap between ACS and ARR still remain high.

An analysis of achievements by discoms against overall targets for different milestones as observed through June 2017 is summarized in Table 18.

**Table 18. Discom progress for different milestones**

| Milestones | DVVNL | KESCO | MVVNL | PAVVNL | PUVVNL |
|---|---|---|---|---|---|
| AT&C losses (%) | 26.55% (0%) | 32.7% (0%) | 39.51% (0%) | 33% (0%) | 39.76% (0%) |
| ACS-ARR Gap (INR per kWh) | 0.56 (100%) | -1.12 (100%) | 0.78 (0%) | 0.85 (0%) | 1.35 (0%) |
| Feeder Metering - Urban | 52.5% | 100% | 100% | 100% | 100% |
| Feeder Metering – Rural | 52% | 100% | 88% | 100% | 100% |
| DT Metering - Urban | 10.6% | 67% | 0% | 100% | 0% |
| DT Metering – Rural | 0% | 0% | 0% | 0% | 3% |
| Electricity Access to Unconnected HHs | 10.5% | 53% | 12% | 33% | 9% |
| Smart Metering | 0% | 0% | 0% | 0% | 0% |
| Feeder Segregation | 0% | 0% | 0% | 0% | 2% |
| Feeder Audit | 0% | 0% | 0% | 100% | 0% |
| Distribution of LEDs | 55% | 100% | 100% | 78% | 100% |

*Source: State Health Card, U.P. (UDAY), 2017.*

The analysis of progress at discom levels reveals that revenue gap (ACS-ARR gap) is negative for KESCO and ~0.50 INR per kWh for DVVNL. Other discoms will have to make more efforts to reduce this gap by rationalizing their power purchase costs and increasing the tariff for various consumer categories. All discoms have made reasonable progress in feeder metering, distribution of LEDs and providing electricity access to unconnected households as per their annual targets. However, they are falling short of their targets for DT metering, smart metering, feeder segregation and feeder auditing.

To achieve its goal of universal electricity access through the 24X7 Power for All (PFA) initiative (GoUP, 2017), the state government, in consultation with the central government, has set out an action plan that identifies the requirements for achieving this target. The action plan for universal electrification aligns with UDAY objectives and identifies the need to work on the following key areas:

- **Feeder Segregation:** Under the Deen Dayal Upadhyaya Gram Jyoti Yojana scheme, the state has received approval to carry out widespread feeder separation for 28 (out of 75) districts, and partial feeder separation for another 11 districts. The work is scheduled to be by FY 2019. However, early implementation of feeder separation in all the districts will help reduce and manage peak demand effectively.
- **Metering:** In FY 2017, out of a total of 1.7 crore registered domestic consumers, 0.68 crore (~40 per cent) are still unmetered, and another 0.84 crore are required to be formalized and metered. The state has taken steps to convert these connections to metered ones, but more work needs to be done.
- **AT&C losses:** The action plan under PFA for Uttar Pradesh has taken the trajectory of AT&C loss reduction as per the UDAY agreement, but in order to achieve these targets, the state should pursue implementation of various other ongoing arrangements like the Integrated Power Development Scheme (IPDS), Restructured Accelerated Power Development and Reform (RAPDRP), Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), and Vidyut Chori

Roko Abhiyan (VICRA). Loss reduction would further require installation of prepaid meters, defective meter replacement, checking power theft, replacement of mechanical meters, and metering of unmetered connections.

- **Strengthening of T&D network:** To meet the expected growth in demand of existing (as well as future) consumers, the transmission and distribution networks have to be strengthened. This requires enormous expenditure, assistance and loans from financial institutions, such as REC, PFC and the World Bank.
- **Clean Energy Initiatives:** The state has issued solar power policy and Renewable energy Purchase Obligation (RPO)-compliance regulations, which should promote more clean energy generation in the state. The policy of RPO targets needs strict enforcement and; to enable achievement of targets, the state can apply for financial assistance from the central government as the Cabinet has approved higher aggregate capacity of solar parks from 20 gigawatts (GW) to 40 GW.
- **Energy Conservation and Efficiency:** The state should adopt more demand-side measures like replacing old pump sets used for agriculture with more energy efficient pump sets. Also, it should organize an awareness campaign to promote greater use of LED bulbs under the Unat Jyoti by Affordable Lighting for All or UJALA scheme.

As part of its recent initiative, the Uttar Pradesh Power Corporation (UPPCL) has formed a task force by engaging an external agency, Rural Electrification Corporation Transmission Projects Company Limited (RECPTCL) to conduct an extensive energy audit on all the 14,000 feeders (9,000 rural and 5,000 urban) in the state. This will involve the feeder-tagging exercise, wherein energy flow to each of the feeders would be measured by installing meters on all the feeders and transformers to check power input and output. Every feeder will be assigned a junior engineer (JE) who would have to ensure that all the consumers attached to the feeder are metered.

## 4.3 FINDINGS FROM STAKEHOLDER CONSULTATION

GSI-IISD organized meetings and structured interviews with officials at UPPCL and other discoms to assess if there is any mid-course action required to achieve the targets laid down under the UDAY scheme. Discussion with officials revealed that though UDAY was signed in January 2016, implementation only began in early 2017. Therefore, officials currently find it too early to comment on the progress made, as the right tools and investment to meet these milestones have only recently been put in place. It is expected that these actions will yield positive results in the next 2 to 3 years. Officials said that some slippages are expected, and milestones may not be achieved by FY 2020, as at times the pace of implementation has not been in line with what was initially planned. Discussions revealed that AT&C losses were identified as the key problem area. This has made meter installation and measurement of consumption the focus area for the state. However, officials recognize that these steps alone may not reduce losses unless coupled with proper billing and collection. Still, they are hopeful that metering will initiate change in behaviour, and households will consume electricity more efficiently.

Stakeholder consultations identified key problems along with suggestion for improvement. These are summarized in Table 19.

**Table 19. Summary of reported problems and suggested improvement areas**

| Problem Areas | Course of Action Taken / Asks |
|---|---|
| Timelines<br>• **Stringent timelines.**<br>• More time is required to achieve targets in rural areas. | • With the expanding consumer base, timelines to be revisited and **discoms to be given more time** to achieve the stated objectives under the UDAY scheme.<br>• **Different timelines** for rural and urban areas |
| Infrastructure /Network Strengthening<br>• **Infrastructure set up is very weak.**<br>• **Installation of meters not only for new customers but replacement of faulty meters for existing customers.**<br>• Low capacity vis-à-vis demand.<br>• Improper planning and execution.<br>• Substations getting 18 to 24 hours supply but consumers receiving supply for less duration of hours. | • Lack of funds. **Need more funds** for infrastructure development<br>• **Better planning** required—identify priority areas where feeders should be placed in order to reduce losses, instead of just achieving the numbers (in terms of installation),<br>• Better coordination of activities rather than a lackadaisical approach.<br>• **Investment in technology** is required such as cloud billing for rural areas. |
| System losses<br>• **AT&C losses high.**<br>• Large number of unmetered consumers.<br>• Power theft is rampant.<br>• Losses will increase with demand increasing from agricultural consumers and more HHs getting electrified under Power for All scheme.<br>• While hours of supply have increased in rural areas, billing and collection are poor. | • Prioritize investment to **control theft first**.<br>• More efforts should be made to measure input and output of energy at feeder level.<br>• Current focus is on rural **metering. Focus to further improve billing and collection.**<br>• *Bijli thana* (imprisonment for electricity theft) in future to act as deterrent for consumers to steal power.<br>• Underground metering to be done to control theft.<br>• Rural areas to be transformed into revenue generating model by increasing supply, rationalize tariff and then ensuring billing and collection. |
| High power purchase cost | • **Rationalize power purchase cost** using coal linkages and swaps.<br>• Benchmarked operational efficiency.<br>• Independent power procurement by each utility, rather than buying power at a centrally pooled cost from UPPCL. This will incentivize better-performing utilities to reduce losses.<br>• Explore options through a mix of long-term and short-term contracts, especially for peaking power.<br>• **Rationalize tariffs.** |
| Performance Monitoring & Accounting<br>• No energy accounting.<br>• No standard of performance. | • Feeder segregation.<br>• Concept of feeder manager to be introduced.<br>• Consumer to be compensated for poor delivery of power.<br>• Enforce compliance of SoP. |
| Human Resource<br>• Shortage of manpower<br>• Lack of required technical skills<br>• Loss of productivity and efficiency<br>• Increase in manpower cost | • Restructure manpower.<br>• Provide optimum strength with definite vision.<br>• **Increase technical capability of staff.**<br>• **Recruit more staff at junior level.** |

*Source: Authors' interviews with officials.*

## 4.4 POTENTIAL ACTIONS TO HELP ACHIEVE UDAY MILESTONES

Successful implementation of UDAY remains vital for the financial health of discoms. The state has initiated efforts to monitor and manage performance of the feeders. Further, a feeder improvement program to strengthen and optimize the network is underway. However, to achieve all the milestones laid down under the UDAY scheme, there are areas where discom officials require further support. These areas and requests are based on consultations with discom officials and are summarized below.

**Revision of Timelines and Separate Targets for Different Areas**

- Infrastructure strengthening is required to provide a reliable and quality supply of power to existing consumers. The state also needs to invest in installation of meters, feeder segregation and distribution of LEDs to control losses and theft. In addition, a large consumer base is being added under the PFA scheme. Given that the consumer base is being expanded in the state, discoms would need additional funds and more time to achieve the milestones under the UDAY scheme. Thus, the timelines for achieving milestones under the UDAY scheme needs to be revisited and made more realistic—it should also be integrated with the government scheme of providing 24X7 power to all households.
- The state is currently reeling under huge losses, and, with the rapid expansion in the rural consumer base, achieving timelines as laid out under the UDAY scheme is difficult. Thus, targets could be segregated based on different geographical areas or loss levels. For example, different timelines for achieving the milestones for urban and rural areas could be assigned.
- Identify the areas where the losses are highest and earmark them as emergency or red zones, then prioritize such areas and invest in system improvements to control leakage.

**Technical & Implementation Support**

- Technical support from implementation agencies through competitive bids can help discoms reduce losses.
- More implementation agencies should participate in tenders and help discoms in meter installations. Such companies should also be required to take ownership of additional responsibilities like billing and collection.
- While cost is an important factor in procuring products and services, quality of products should also be important. Low-quality products have huge implications in terms of replacement at regular intervals. Discoms should be allowed to procure quality products that meet standards and specifications laid down by the regulator.
- Discoms need to strengthen the technical capability of staff and hire more junior-level staff. With the expansion in the consumer base, engineers are required at each feeder level to undertake functional responsibility and also be held accountable for providing reliable service to the consumers. UPPCL has already initiated some efforts to address this problem; however, the engineers will have to be properly trained.
- Government should invest in solutions like underground metering or smart meters to control theft, rather than investing in technology and infrastructure that may not give desired results. Ultimately, the government will have to decide on such solutions, so spending on inferior products and technology can be avoided.
- The state needs technical support for increasing the integration of renewable energy into the grid.

### Independent Functioning of the Discoms

- Each distribution utility should be allowed to independently procure power through a mix of long-term and short-term contracts. This will incentivize better performance, as more competitive discoms will not be weighed down by less-efficient discoms.
- Tariffs should be rationalized and reflect true costs. Government should develop a registry of identified beneficiaries, and subsidies should be transferred directly to their bank accounts
- Discoms should be allowed to pass on increased costs to consumers in terms of regular tariff hikes and fuel supply adjustment charges.

### Financial Support to Improve Efficiency

- The U.P. government has prioritized prevention of rampant power theft. To control theft better, the government should invest money in infrastructure strengthening, like underground wiring and installation of smart meters. Savings from improvement in billing and collection could then be channelled into system strengthening and improvement.
- The central government should provide support in phasing out old inefficient plants that do not meet environmental standards. Such aging plants produce 4 GW of U.P.'s power, and they need to be phased out based on a cost-benefit analysis and with some support from the central government.
- State should gain from the aegis of other schemes like National Smart Grid mission to provide smart meters and 24x7 Power for All program.
- Government should develop a complete solution. For example, purchase and installation of smart meters alone will not solve the problem of theft unless accompanied by supporting infrastructure like IT and training of staff.

### Consumer Awareness Campaign to Support Reform Process

- Consumers are at the centre of the reform process. An awareness campaign is needed to build understanding about the true cost of power, the reliable supply of power and energy efficient appliances as part of demand-side measures.

# 5.0 Conclusion and Recommendations

This study aims to assist state governments in achieving universal household electrification in a financially sustainable manner. Currently, the cost of consumption-based electricity subsidies is significant for state governments, and competes directly with the financial viability of discoms, further impacting grid extension and the hours and quality of supply. However, political pressure often prevents adjustments to electricity tariffs, while efforts to improve discom performance in other areas such as metering, billing and efficiency often fail to achieve much progress. This research aims to address these issues by identifying new primary data on energy use, billing, perceptions and preferences with respect to tariff reform. It also provides an initial review of the progress of the UDAY scheme, which provides debt relief to discoms in return for improvements in their service against targets in a range of areas. The resulting insights and analysis reveal strategies that can be used to design tariff hikes and communication strategies for their acceptance.

## 5.1 ADJUSTING TARIFFS: FINDINGS ON STAKEHOLDERS AND CONSUMER ENERGY USE, BILLING, PERCEPTIONS AND PREFERENCES

A "power mapping" exercise identified three key categories of stakeholders: government and parliamentary bodies, supply-side actors, and consumers and consumer representatives (see Table 20).

The stakeholders with the greatest level of influence on tariff reform are those directly involved in tariff-setting: discoms, who submit an annual estimate of revenue requirements and make proposals on tariff revisions; the Uttar Pradesh Electricity Regulatory Commission (UPERC), which receives these estimates and approves any tariff revisions; and the state government, which has various means by which it can indirectly influence the tariff-setting process. At the same time, central government bodies are typically pushing for states to improve discoms' finances, but with low levels of direct influence, while non-governing political parties tend to support politically popular low tariffs.

The next most important stakeholders are the consumers of electricity, who may influence tariff setting through links with political parties, collective associations or through narratives developed by the media. Different types of consumers pay different electricity tariffs, so this same broad categorization was used to disaggregate consumers into four key groups: households, farmers, commerce and industry.

**Table 20. Summary of power mapping: Level of support and influence on tariff reform**

| Stakeholder | Level of Support and Influence |
|---|---|
| **Government and parliamentary bodies** | |
| State Energy Department | Currently, since the leadership is shared between discoms and the state department, this stakeholder also has high levels of support and influence. |
| Political Parties | The current government through the BJP has the most influence in shaping tariff reform. Different parties follow different popular strategies but except for BJP most do not support tariff reform at the risk of irking their political vote banks. |
| Central Agencies | Ministry of Power has high levels of support but little influence on tariff revisions. NITI Ayog and Ministry of Finance have high levels of support but channel medium influence for tariff revisions. |
| **Supply-side actors** | |
| Discoms | Have a high level of support for tariff revisions since they are motivated financially and high levels of influence to demand higher tariffs from UPERC. |
| UPERC | Has the highest level of support and influence on tariff reform. |

| Consumers and consumer representatives | |
|---|---|
| Households | Low level of support for tariff reforms, but rural households have higher influence on tariff revisions. Rural household tariffs were not revised for two consecutive years in 2014 and 2015 but urban household tariffs were raised. |
| Farmers | Farmers have low levels of support and influence on tariff reform. |
| Commercial Consumers | Low level of support but high influence on tariff reform through their active associations. |
| Industrial Consumers | Low level of support but high influence on tariff reform through lobbying and active associations. |
| Media | The media has low levels of support and influence on tariff designs. But it has high influence in shaping the narrative of tariff revisions. |

A key influence on consumer attitudes to tariff changes is the price that they pay already. Uttar Pradesh, like most states in India, has a system of cross-subsidies, where households and farmers receive net subsidies; while commerce and industry pay a net surcharge, which helps to cover the cost of the low rates charged to households and farmers. This is illustrated in Table 21, which shows the average tariff paid by different consumer groups supplied in FY 2016, as well as the estimated average cost of supply of electricity in the same year. Figure 9 provides insights into the relative costs and benefits of this under-pricing and surcharging by showing the share of total consumers that each consumer group makes up.

**Table 21. Average tariffs across different consumer categories**

| Consumer Category | INR per kWh in 2017 |
|---|---|
| BPL households | 3.46 |
| All households | 4.63 |
| Farmers | 1.7 |
| Commercial | 8.32 |
| Industrial | 8.15 |
| **Average cost to supply electricity** | **INR per kWh in 2017 (all discoms)** |
| Average cost of supply (ACS) | 6.35 |

*Note: Average tariffs calculated by authors based on data from PAVVNL. Tariffs across discoms are harmonized so this can be taken as representative for state-owned discoms.*

*Source: UPERC, 2017.*

In order to identify more information about consumers, a series of surveys and interviews were conducted to generate new primary data. Findings from this primary data are summarized below.

## Households

Around 85 per cent of households in Uttar Pradesh were found to have a grid electricity connection: 93 per cent in urban areas and 78 per cent in rural areas. Most households with a connection are satisfied with the supply that they receive. Satisfaction is higher in urban areas, where consumers enjoy more hours of electricity per day. On average, urban households have 17 hours in winter, 18 hours in summer and 14 hours during monsoon; while rural households have only 13 hours, 12 hours and 10 hours, respectively. As a result, 10 per cent of urban households report that they are dissatisfied with supply, compared to 27 per cent of rural households. It was also found that the large

majority of rural households (75 per cent) do not have electricity meters installed, and of those with meters, only 40 per cent of bills were based on the meter. This means that the large majority of rural households pay only a low fixed charge for electricity, regardless of consumption. By contrast, only 25 per cent of urban households lacked a meter, and 92 per cent of metered households had a bill based on the meter.

The most common uses of electricity are for lighting, fans, cell phones and TV or radio, and, in urban areas, refrigeration. There is strong consensus that electricity is important for welfare: 67 per cent of urban and 72 per cent of rural households indicate that poor supply has caused problems for education and health.

There seems to be no generalized sense of entitlement to free electricity: 60 per cent and 80 per cent of rural and urban households believe that electricity should not be provided free of charge to all. Yet there is strong consensus among both groups (> 80 per cent) that the government should provide free electricity to the poor. There are also strong views on electricity theft: 68 per cent of households believe it is unacceptable for poor people to have an illegal connection. At the same time, there is a modest degree of misunderstanding about energy subsidies and how utilities cover costs. Around 40 per cent believe that discoms are already covering their costs solely through consumer fees, while 60 per cent believe it is a combination of consumer fees and government support.

In terms of frequency of tariff hikes, 75 per cent of urban and 59 per cent of rural respondents prefer a one-time immediate increase instead of monthly hikes. This opinion appeared to be linked to income, as higher-earning urban and rural households generally prefer a one-time increase more than lower-earning ones. About 60 per cent and 70 per cent of urban and rural households, respectively, reported that they would be willing to pay marginal tariff increases under a range of conditions: a doubling of hours of supply; grievance services; immediate redress of grievances; the provision of energy efficient light bulbs; assistance with other public services; and the delivery of the subsidy through bank transfers. Responses to survey questions on willingness to pay may be negatively or positively biased, either due to suspicion that answers will be used to justify higher prices, or inadvertent discounting of future and imagined costs—but it is reasonable to suppose that tariff adjustments will be more acceptable if service also improves.

In terms of influence—unlike their urban counterparts, who often participate in representative associations—rural households have fewer means of exerting influence over tariffs. Rural households may, however, be more likely to vote collectively, influenced by village heads who try to gain certain public goods from candidates in return for support from their communities. The newly formed BJP government, for example, has promised free electricity to poor households (Live Mint, 2017b).

### Agricultural Consumers

More than 40 per cent of electric pump-owning farmers were found to be dissatisfied with their electricity supply, with higher levels of dissatisfaction among larger landholdings. On average, farmers were found to experience 4, 3 and 5 blackout days per month during summer, winter and monsoon seasons respectively, while requiring 5, 4 and 3 more hours of electricity per day during the same seasons. For more than two thirds of farmers (68 per cent), the unpredictable schedule of electricity caused a loss in income.

Farmers mainly use electricity to power pumps for irrigation or to sell water to other farmers for irrigation. The majority of farmers, however, still irrigate using diesel-powered, not electric, pumps. Thus, electricity is a key input for only a subset of farmers. Nonetheless, as electricity supply improves, it is expected that electric pump irrigation will grow. Electricity supply also influences the

crops that are grown. If more hours of supply were available, or the schedule were more predictable, roughly half of surveyed farmers reported that they would switch crops (mostly to vegetables, sugarcane and paddy).

Opinions on subsidy entitlement varied between electric and diesel pump users. Farmers that use electric pumps were less inclined to argue in favour of free electricity to various groups, including themselves. In contrast, most farmers using diesel pumps believed that poor households and farmers should get free electricity. This may reflect a general stance of solidarity between farmers, or the fact that diesel pump-using farmers may want prices to remain low as they are considering switching from diesel to electric pumps. The majority of electric pump-using farmers (63 per cent) did, however, believe that some degree of subsidization was appropriate, stating that utilities should cover costs through a combination of government support and customer fees. Awareness about the extent of subsidies was low: only 7 out of 67 interviewed farmers owning electric pumps were aware that their electricity tariffs were subsidized.

In terms of frequency of tariff hikes, about 70 per cent of electric pump set-using farmers prefer an immediate increase of their electricity bill, rather than monthly hikes. Over 70 per cent of respondents think it is unreasonable to pay higher tariffs for the utility to better cover its costs. However, 55 per cent of farmers said that a tariff hike will be acceptable if it is directly linked to an increase in hours of supply and a more stable voltage, if the revenue from higher tariffs can help supply power to other farmers or villages.

None of the farmers surveyed and interviewed in this research reported being part of any association. The small share of farmers using electric pumps in U.P. suggests that such users may have a relatively small voice. This may change, however, if electric pump usage grows.

### Commercial & Industrial Consumers

Although most commercial and industrial interviewees reported receiving electricity for more than 20 hours per day, about 85 per cent experienced problems with their supply, particularly in Moradabad and Varanasi. The most common problem was unscheduled blackouts, followed by damage to equipment due to voltage fluctuations disruptions were worst in monsoon and summer. Interviewees from industry were more likely to have access to a non-grid supply of electricity, though a significant share of both consumer categories (just under 50 per cent) relied on at least some form of backup capacity. Many consumers also complained about problems with getting a new connection, believing that approval delays and high cost estimates seemed intended to force them to use the services of commission agents. A significant proportion of consumers (31 per cent) reported that problems with electricity supply caused financial losses worth up to 5 per cent of their total operational costs.

Attitudes of these consumers to tariff changes appear to be strongly influenced by the impacts of current tariffs, unscheduled blackouts and quality of supply on their production cycles and profits. A large percentage of both commercial and industrial interviewees were not in favour of continuing the current trend of cross-subsidy where commercial and industrial consumers pay higher tariffs to keep agriculture and household tariffs lower, and many object in particular to high fixed charges. But there were differences in opinion between commercial and industrial respondents on subsidy entitlement. An overwhelming majority of commercial consumers believed that no one is entitled to electricity subsidies. More industrial consumers (52 per cent) were in favour of targeting subsidies to farmers and poor households compared to commercial consumers (35 per cent). Despite strong awareness of cross-subsidies, 77 per cent of industrial and commercial interviewees stated that they were not actually aware of the average cost of supplying electricity. They also exhibited a lack of awareness about tariff setting: 34 per cent of commercial and 18 per cent of industrial respondents did not know

about UPERC and its tariff-setting mechanism, believing it to be non-transparent.

Both commercial and industrial consumers appear to be strongly opposed to any future hikes but believed that tariff hikes will nonetheless take place. In terms of frequency of tariff increases, 80 per cent of respondents preferred a tariff hike every 2-3 years, while a small subset of consumers (6 per cent) preferred an annual increase at the start of the new financial year. Commercial respondents were more inclined toward paying more for improved duration and quality of supply compared to their industrial counterparts. Most interviewees from industry argued that it is the discoms' responsibility to provide uninterrupted power supply to their consumers and that tariff hikes on account of improved supply (longer duration of supply and stable voltage) are not justified. Interestingly, only 8 per cent of all respondents responded positively to increasing the predictability in tariff hikes. This is because an overwhelming majority of consumers believe that absorbing the costs borne out of tariff hikes is their only coping mechanism, as they cannot pass higher costs on to their consumers.

In terms of influence, many commercial consumers are fairly small and may have little to no influence individually. However, through a wide number of associations (many of which are headquartered in the state capital, Lucknow) commercial consumers can hold press conferences, protests, gatherings and demonstrations to gather the attention of the media and communicate their points of view. Despite this means of leverage, it can be inferred that their effective influence is relatively low, as such activities have not been successful in engineering rollbacks of tariff hikes in the past.

Industrial consumers typically lobby for longer periods of tariffs. This helps them predict their product costing and safeguard profit margins. Industrial consumers can exert significant levels of influence, though it may not yield favourable results. For example, representatives of individual industrial houses and their associations can routinely access senior government officials and different government agencies to communicate their views on tariffs.

## 5.2 ADJUSTING TARIFFS: RECOMMENDATIONS

These findings create several points of guidance for the state government to consider when planning tariff increases. First, some form of communication strategy, informed by data on political attitudes to reform, can help increase the acceptance of change. Second, and linked to this, the findings on energy use, billing and attitudes to reform suggest a number of steps that could be taken to ensure that any reform plan is well aligned with improvements in service and steps to protect the most vulnerable consumers.

### Insights for a Communication Strategy

Attitudes to electricity pricing are sensitive, and communications can play a key role in building the political space that enables reform. This may need to include a long-term strategy focused on awareness raising, along with short-term strategies focused on specific initiatives to alter pricing.

Data from this review of attitudes highlight several key principles that can inform such strategies:

- **Trust in the government and discoms is high**, implying that official spokespeople can play an important role in conveying the rationale for reforms.
- **Most people rely on television and newspapers for information**. For agricultural and residential consumers, the most important and trusted sources of information are television and, to a lesser extent, newspapers.
- **Communication campaigns should focus on what is important to consumers, rather than the financial health of discoms**. This can only be effective if the reform plan includes

clear steps to improve service and protect the vulnerable. Among households, for example, more than two thirds of rural and urban households indicate that electricity supply problems have impacted education and health. Addressing such issues may help to increase acceptance of change. Among farmers, problems with supply and reliability in rural areas are a key issue. Among commercial and industrial consumers, improvements in service—particularly progress under the UDAY scheme—may help to promote the case for change.

- **Awareness raising is key**. Many consumers are unaware of the extent of electricity subsidies, the problems that they cause and the existing mechanisms for ensuring that tariff adjustments are reasonable. Key information about subsidies could be communicated through billing, in addition to general messaging in news media. Lessons can be learned from other discoms (such as BSES Rajdhani Power Ltd) that explain the cost of distributing electricity to consumers on the back of the monthly bills.

### Insights for Designing a Reform Plan and Protecting the Vulnerable

Data from this review identifies several issues which, if addressed, could help to strengthen any attempt at tariff reform.

- ***Improve metering and billing for rural households and farmers.*** Most rural households and farmers remain unmetered and billed at a low fixed charge. Tariff adjustments will be insufficient if metering and billing are not improved. In Odisha, meter reading is outsourced to local women's groups to reduce the costs of monitoring remote meters. Similar schemes could be explored in Uttar Pradesh.
- ***Consider future demand scenarios in setting agricultural tariffs.*** As the state moves toward 24x7 electricity supply, more farmers may consider purchasing electric pumps for irrigation, increasing the cost of subsidized tariffs for farmers. In determining agricultural tariffs, UPERC should consider the role that low tariffs may play in driving electric pump ownership and locking in costly patterns of energy demand.
- ***Provide feeder segregation.*** Providing independent feeders for bulk consumers can help address significant dissatisfaction among commercial and industrial consumers linked to unscheduled blackouts and voltage fluctuation.
- ***Take public steps to reduce red tape for new connections.*** Many commercial and industrial consumers feel that there are unnecessary obstacles to gaining a new connection. Addressing these claims will improve their satisfaction with supply.
- ***Prepare compensation measures.*** Vulnerable households may struggle to afford electricity and will mainly decrease consumption or spend less on other items if prices rise. It is advised to investigate targeting or compensation mechanisms like cash transfers. For farmers, the Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) could explore the possibility of launching a solar irrigation scheme, where electricity could be sold back to discoms under U.P.'s net metering scheme launched in 2015. A similar scheme called "Surya Raitha" is run by the state of Karnataka. For commercial and industrial users, this might include incentives for investing in energy efficiency, discounts for advance bill payment or developing solar power capacity to support operations.

## 5.3 FINDINGS AND RECOMMENDATIONS ON INTERIM EVALUATION OF UDAY

The UDAY scheme was launched in late 2015 to improve the financial health and operational performance of discoms.

As of end-March 2017, since joining the scheme, the government of Uttar Pradesh had issued bonds worth INR 39,133 crores (USD 5.9 billion), while discoms had issued another INR 10,714 (USD 1.6 billion) crores worth of bonds. The state reported interest cost savings of INR 3,323 crores (USD 506 million) by joining the scheme. However, as per provisional data, annual loss for state discoms was INR 6,320 crore (USD 962 million) in FY 2016, after accounting for subsidy of INR 8,724 crore (USD 1.3 billion).

This review found that progress to date has been limited. The state has made significant progress with its targets linked to feeder metering, the distribution of LEDs and electricity access to unconnected households. Little or no progress, however, has been made against other milestones, such distribution transformer metering, smart metering, feeder segregation, consumer indexing, GIS mapping of losses and reductions in technical and commercial losses. In particular, the gap between the average cost of supply and the average revenue requirement remains high, and no progress has been made with the commitment for a quarterly tariff revision.

Through a series of interviews, officials at UPPCL and other discoms reported that although UDAY was signed in January 2016, implementation did not begin until midway through 2017. This implies that slippages should be expected and that some targets will not see results for another 2 to 3 years.

Based on these same consultations, officials argued that a number of additional efforts could be introduced to help achieve milestones, as summarized below.

### Revision of Timelines and Separate Targets for Different Areas

- Officials reported that as the state is currently reeling under huge losses and with the rapid growth of the rural consumer base, achieving timelines as laid out under the UDAY scheme is difficult. Thus, targets should be segregated based on different geographic areas or loss levels, and different timelines assigned for achieving the milestones in, for example, urban and rural areas.
- Officials report that areas where the losses are highest should be identified and earmarked as emergency/red zones. Discoms should prioritize such areas and invest in system improvement in these areas to control leakage.

### Technical and Implementation Assistance for Discoms

- Discoms reported that they would like technical support from implementation agencies, with such support won through competitive bids and with quality standards specified by a regulator. Agencies are required to take ownership of functional responsibility for putting up meters, measuring consumption, generating bills and undertaking their collection. In addition, they reported that technical support for integrating renewable energy is required, so that renewable energy plants do not lose out on account of integration issues.
- Discoms reported a need to train and hire more staff to manage the expanding consumer base. In particularly, they would like to recruit engineers for each feeder, responsible and accountable for the correct measurement of energy, billing and collection.
- Discoms reported that government should move away from its careless approach and avoid wasteful use of financial resources. It should invest in solutions like underground metering or smart meters to control theft, rather than investing in ineffective technology and infrastructure.

### Financial Support

- Officials reported that Government should prioritize theft prevention and channel funds to control theft first. The savings from improvement in billing and collection should then be earmarked for system strengthening and improvement.
- While the centre and the state are running different schemes in Uttar Pradesh to enhance energy access and improve the operational and financial performance of state utilities, there is scope for aligning some of the milestones set out under the UDAY scheme to gain from other government programs like National Smart Grid mission, and thereby leverage existing financial resources.
- Officials report that central government assistance is required in order to phase out old inefficient plants and replace them with new capacity.
- Officials reported that Government needs to develop a complete solution, like purchase and installation of smart meters alone without the required supporting infrastructure (IT, training of staff etc.) will not solve the problem of theft.

### Independent Functioning of the Discoms

- Officials reported that each distribution utility should be allowed to independently procure power through a mix of long- and short-term contracts. In this way, more competitive utilities will not be weighed down by less-efficient utilities, and this will incentivize better performance.
- Officials reported that discoms should be allowed to pass on the increased cost to consumers in terms of regular tariff hikes and fuel supply adjustment charges.
- Tariffs should be rationalized and made cost-reflective. Government should develop a registry of identified beneficiaries and subsidies to be transferred directly to their bank accounts.

### Consumer Awareness

- Consumers lie at the centre of the reform process. Officials noted that an awareness campaign is needed to build understanding about the true cost of power, the reliable supply of power and energy efficient appliances as part of demand-side measures.

# Appendix 1: Shortlisted States

## Methodology for Shortlisting of States

This study has twin objectives – (1) identification of tariff reform opportunities among consumer groups (2) interim review of UDAY. A state that has implemented UDAY then becomes the leading factor in determining state selection.

Therefore, a state will be selected from those that have signed the MoU for UDAY. Till Jan 2017, the following states have signed the MoU for UDAY; hence, the final state will be selected from this list.

**Table A1. List of 20 states that have signed an MoU for UDAY through January 2017**

| | |
|---|---|
| Andhra Pradesh | Karnataka |
| Assam | Madhya Pradesh |
| Bihar | Maharashtra |
| Chattisgarh | Manipur |
| **Goa** | **Puducherry** |
| Gujarat | Punjab |
| Haryana | Rajasthan |
| Himachal | Tamil Nadu |
| J&K | Uttar Pradesh |
| Jharkhand | Uttarakhand |

In addition, the following criteria have been selected for ranking state-level distribution utilities from the above listed states.

**Table A2. Criteria for ranking state-level distribution utilities**

| Parameter | Scoping Variable |
|---|---|
| **Financial Parameters** | Loss of State Discoms w/o subsidy |
| | Loss of State Discoms w subsidy |
| | Average Cost of Supply |
| | ARR |
| | Gap (ACS-ARR) after subsidy received |
| | Revenue from Sale of Power |
| | O&M, Interest Cost and Cost of Fuel |
| **Regulatory Parameter** | Tariff Orders Issued |
| **Operational Parameters** | T&D Losses |
| | AT&C Losses |
| | Collection Efficiency |
| **Other** | Ratio of Installed Capacity to Demand |
| | Energy Deficit |
| | Peak Deficit |

Ranking the 20 states on the above listed parameters, we observe:

- Five states are consistently posting the highest losses with and without subsidy (see figure below)
- Therefore, these states will be shortlisted for further study of other parameters
- **These states are Uttar Pradesh, Tamil Nadu, Rajasthan, Madhya Pradesh and Haryana**

**Table A3. Ranking of states based on losses incurred by discoms in various years**

| Top five states with highest losses (without subsidy) | | Top five states with highest losses (with subsidy) | |
|---|---|---|---|
| 2014-15 | 2013-14 | 2014-15 | 2013-14 |
| Uttar Pradesh | Uttar Pradesh | Uttar Pradesh | Uttar Pradesh |
| Tamil Nadu | Tamil Nadu | Rajasthan | Rajasthan |
| Rajasthan | Rajasthan | Tamil Nadu | Tamil Nadu |
| Madhya Pradesh | Madhya Pradesh | Madhya Pradesh | Madhya Pradesh |
| Haryana | Haryana | Jharkhand | J&K |

## Ranking of States

This section explains the methodology used for selecting U.P. from among the five short listed states:

- Uttar Pradesh
- Rajasthan
- Haryana
- Madhya Pradesh
- Tamil Nadu

1. Each state is ranked from 1(best performer)→ 5 (worst performer).
2. Totalling scores will reveal better-performing states with lower scores.
3. The final state selected can be either the best performer from the sample set of worst ranking states.
4. There are other parameters that can impact final state selection:
   a. Elections
   b. History of working in the state
   c. Political willingness of state to make reforms

A decision matrix was created using these steps. The data for this decision matrix was extracted from the reports of Power Finance Corporation and Central Electricity Authority for various years.

**Table A4. Decision matrix**

| Scoping Variable | | Haryana | Rajasthan | U.P. | M.P. | T.N. |
|---|---|---|---|---|---|---|
| Financial Parameters | Loss of State Discoms w/o subsidy | 1 | 4 | 5 | 2 | 3 |
| | Loss of State Discoms w subsidy | 1 | 3 | 5 | 2 | 4 |
| | Average Cost of Supply | 2 | 4 | 3 | 1 | 5 |
| | ARR | 3 | 2 | 5 | 4 | 1 |
| | Gap (ACS-ARR) after subsidy received | 1 | 5 | 3 | 2 | 4 |
| | Revenue from Sale of Power | 5 | 3 | 2 | 4 | 1 |
| | O&M Costs | 1 | 3 | 5 | 2 | 4 |
| | Interest Costs | 2 | 5 | 3 | 1 | 4 |
| | Fuel Cost | 5 | 4 | 2 | 3 | 1 |
| **Total Score on Financial Parameters** | | **21** | **33** | **33** | **21** | **27** |

| Scoping Variable | | Haryana | Rajasthan | U.P. | M.P. | T.N. |
|---|---|---|---|---|---|---|
| Operational Parameters | T&D Losses | 5 | 2 | 3 | 4 | 1 |
| | AT&C Losses | 4 | 2 | 5 | 3 | 1 |
| | Collection Efficiency | 4 | 2 | 5 | 3 | 1 |
| Others | Ratio of Installed Capacity to Demand | 4 | 2 | 5 | 1 | 3 |
| | Energy Supply Deficit | 1 | 3 | 5 | 1 | 4 |
| | Peak Demand Deficit | 1 | 1 | 5 | 3 | 4 |
| **Total Score** | | **40** | **45** | **61** | **36** | **41** |

The scores reveal that in terms of financial parameters, U.P. and Rajasthan are the worst performers. However, in overall poor performance, U.P. leads the pack followed by Rajasthan. Therefore, based on the score Uttar Pradesh was selected for the study.

# Appendix 2: Sampling Method for Rural Residential Consumers

### GOAL

Avoid use of sampling weights.

### STEP #1: Create Four Geographic Groups

Organize districts in Uttar Pradesh into four groups: east, west, south, north.

- The groups are arranged such that the total number of rural households—as per the 2011 Census of India—of each group is approximately identical.
- The districts in each group are contiguous and roughly correspond to east-west-north-south.

### STEP #2: Choose Districts

Within each group, three districts are randomly sampled. The probability that a district is chosen is the district rural households divided by total group of rural households.

### STEP #3: Choose Villages

In each of the 12 districts, rank villages by total number of households and create two groups: "small" and "large" villages.

- The total rural households of the "small" and "large" groups should be as close as possible. That is, keep adding villages to the "small" group until there is about the same number of households in each group. In practice, this means there are many more villages in the "small" than in the "large" group.
- Within "small" and "large" groups, sample four villages in each. The probability that a district is chosen should be the village households divided by total group households.

### OUTCOME

The probability that a household is surveyed is now identical for every household in Uttar Pradesh: no need for survey weights.

# Appendix 3: Sampling Method for Urban Residential Consumers

### GOAL

Maximize urban representativeness within the 12 districts.

### STEP #1: Create Four Geographic Groups

This step is based on the rural survey. Survey focuses on the same 12 districts.

### STEP #2: Choose Districts

This step is based on the rural survey. Survey focuses on the same 12 districts.

### STEP #3: Choose Urban Wards

1. Order urban areas (towns) according to population size.
2. Number of wards (total of 120) drawn from each urban area allocated proportionally based on population size of urban area, round to the nearest whole ward.
3. Selection of wards within the urban areas—selection is weighted by the in-town proportionality of ward population over total town-wide population.

The result is a random sampling of wards in all urban areas in the 12 districts under study, with the more populous areas getting more wards within it that are sampled.

### STEP #4: Sampling Within Wards

Within the sampled ward, the survey team employed one of the two following strategies. The team will be sampling in-person and conduct the survey in-person. The two strategies are:

Selecting the sixth household from random starting point in each ward (Systematic Random Sampling).

Choosing odd household numbers to ask for permission to conduct survey.

### OUTCOME

The urban sample is representative within the 12 districts, but not across U.P. because the districts were selected based on rural population shares. The survey team will construct and include sampling weights for users interested in representativeness at the state level.

# Appendix 4: Support Received From Government Under UDAY Scheme

**Table A5. Support received from government under UDAY scheme**

| Parameters | Deadline |
|---|---|
| Debt | |
| State to take over 50% of debt | 2015–2016 |
| States to take over 25% of debt<br>If states can't absorb the interest burden of the entire grant immediately, transfer of grant can be spread over 3 years i.e., 25% in each of 3 years: 2015–2016, 2016–2017 & 2017–2018 | 2016–2017 |
| Issue bonds for 25% | |
| Amount transferred as loan (Interest rate to not exceed RoI on the bonds issued by the state) | |
| **Losses[32] (Previous year discom losses to be taken over by state)** | |
| 0% of the loss of 2014–2015 | 2015–2016 |
| 0% of the loss of 2015–2016 | 2016–2017 |
| 5% of the loss of 2016–2017 | 2017–2018 |
| 10% of the loss of 2017–2018 | 2018–2019 |
| 25% of the loss of 2018–2019 | 2019–2020 |
| 50% of the loss of 2019–2020 | 2020–2021 |

[32]Current losses after October 1, 2015, if any, shall be financed only up to the extent of loss trajectory finalized by MoP with the state, and such financing will be done through state-issued bonds or bonds issued by discoms backed by state guarantee, to keep borrowing within limits and cost of borrowing low. For working capital Banks/Fis shall lend to discoms only up to 25 per cent of discoms' previous year's annual revenue, or as per prudential norms.

# Appendix 5: Milestones for Tracking Implementation of UDAY Scheme

**Table A6. UDAY milestones**

| Parameters | Deadline as per UDAY Scheme |
|---|---|
| Compulsory feeder and Distribution Transformer (DT) metering by States | Feeders – June 30, 2016<br>DTs – June 30, 2017 |
| Consumer Indexing & GIS Mapping of losses | September 30, 2018 |
| Upgrade or change transformers, meters etc. | December 31, 2017 |
| Smart metering of all consumers consuming above 200 kWh/ month | Consumption above 500 kWh/month – December 31, 2017<br>Others – December 31, 2019 |
| Demand-Side Management (DSM) which includes energy efficient LED bulbs, agricultural pumps, fans & air conditioners and efficient industrial equipment through PAT | March 31, 2019 |
| Reduction of AT&C loss to 15% in 2018–2019<br>– Loss reduction trajectory of the state | March 31, 2019 |
| Faster completion of transmission lines and adequate transmission, mostly through competitive bidding | March 31, 2019 |
| Improving efficiency of state generating units for which NTPC would handhold. | |
| Quarterly tariff revision, particularly to offset fuel price increase, to be permitted | Necessary changes in tariff policy by 31 December 2015 |
| Comprehensive IEC campaign to check power theft | One-year awareness program jointly with states up to December 31, 2016 |
| Assure increased power supply in areas where AT&C losses reduce | March 31, 2018 |
| Reduction in gap between ACS & ARR to zero by 2018–2019 | March 31, 2019 |
| Increased Supply of domestic coal | |
| Coal linkage rationalization | |
| Coal swaps from inefficient plants to efficient plants and from LC to pit head plants to minimize cost of coal transportation | |
| Coal price rationalization based on GCV | |
| CIL to supply 100% washed coal for G10 grade and above | October 2018 |
| CIL to supply 100% crushed coal | April 2016 |
| Additional coal linkages at notified prices | |
| Low-cost power from NTPC and other Central Public Sector Undertakings (CPSUs) | |

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