

State of Electricity Access in India

Insights from the India Residential Energy
Survey (IRES) 2020

Shalu Agrawal, Sunil Mani, Abhishek Jain, and Karthik Ganesan

Executive Summary | October 2020





Electricity access is fundamental to achieving multiple developmental goals ranging from education to health to employment generation. Children going to school in Vizianagaram, Andhra Pradesh.



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The Council's major contributions include: The 584-page *National Water Resources Framework Study* for India's 12th Five Year Plan; the first independent evaluation of the *National Solar Mission*; India's first report on global governance, submitted to the National Security Adviser; irrigation reform for Bihar; the birth of the Clean Energy Access Network; work for the PMO on accelerated targets for renewables, power sector reforms, environmental clearances, *Swachh Bharat*; pathbreaking work for the Paris Agreement, the HFC deal, the aviation emissions agreement, and international climate technology cooperation; the concept and strategy for the International Solar Alliance (ISA); the Common Risk Mitigation Mechanism (CRMM); critical minerals for *Make in India*; modelling 222 scenarios for India's low-carbon pathways; India's largest multidimensional energy access survey (ACCESS); climate geoengineering governance; circular economy of water and waste; and the flagship event, Energy Horizons. It recently published *Jobs, Growth and Sustainability: A New Social Contract for India's Recovery*.

The Council's current initiatives include: A go-to-market programme for decentralised renewable energy-powered livelihood appliances; examining country-wide residential energy consumption patterns; raising consumer engagement on power issues; piloting business models for solar rooftop adoption; developing a renewable energy project performance dashboard; green hydrogen for industry decarbonisation; state-level modelling for energy and climate policy; reallocating water for faster economic growth; creating a democratic demand for clean air; raising consumer awareness on sustainable cooling; and supporting India's electric vehicle and battery ambitions. It also analyses the energy transition in emerging economies, including Indonesia, South Africa, Sri Lanka and Viet Nam.

The Council has a footprint in 21 Indian states, working extensively with state governments and grassroots NGOs. It is supporting power sector reforms in Uttar Pradesh and Tamil Nadu, scaling up solar-powered irrigation in Chhattisgarh, supporting climate action plans in Gujarat and Madhya Pradesh, evaluating community-based natural farming in Andhra Pradesh, examining crop residue burning in Punjab, and promoting solar rooftops in Delhi and Bihar.



India has witnessed extensive electrification over the past decade extending to remote villages. Shot in Rohidi, Barmer district, Rajasthan.

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Read the complete report here:
<https://www.ceew.in/publications/state-electricity-access-india>



To support the clean energy transition, India needs to institutionalise residential energy surveys to inform future policies and programmes. CEEW's Shalu Agrawal with a respondent.



Image: CEEW/Market Xcel

Executive summary

As one drives across different parts of rural India, it is heartening to see the electric wires lining the landscape as far as one can see. They carry not just power but hope to the millions who use electricity to meet their lighting, cooling, life and livelihood needs. With the aggressive implementation of *Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya)* since September 2017, 26.3 million households were given grid-electricity connections at subsidised rates or free of cost (Ministry of Power 2019). As per the *Saubhagya* dashboard, all ‘willing’ households in India are electrified, as of 31 March 2019.

In 2015 and 2018, the Council on Energy, Environment and Water (CEEW) conducted two rounds of energy access surveys (Access to Clean Cooking energy and Electricity—Survey of States [ACCESS]) in rural households across six of India’s energy-poor states—Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal. As rapid electrification sweeps over the country, it is desirable to have a survey across the nation to find answers to questions such as: (i) Once electrified, do all households also have seamless access to electricity supply? (ii) Has India delivered on the dream of ‘24x7 power for all’? and (iii) importantly, how do consumers respond to supply disruptions from the grid?

Providing reliable electricity services is linked to the ability of power distribution companies (discoms) to collect commensurate revenue from the consumers. However, most Indian discoms are under severe financial distress, in part due to gaps in metering, billing, and collection (MBC) (Ganesan, Bharadwaj, and Balani 2019). With many new households wired to the grid, it is essential to know how has the needle moved on the MBC front. India is at the cusp of a new decade of change and growth in the power sector. An independent assessment of the state of electricity access in the country and identifying gaps in that access therefore becomes necessary.

Study objectives

To understand the state of access to electricity, we undertook a nationally representative survey covering nearly 15,000 households spread across 21 states of India. The survey, which we call the India Residential Energy Survey (IRES), was conducted in collaboration with the Initiative for Sustainable Energy Policy (ISEP) and covers different dimensions of energy use in households. In this report, we answer the following questions:

1. With the Ministry of Power’s Saubhagya portal showing universal electrification of willing households, does the ground assessment sufficiently back this claim?
2. What is the state of quality and reliability of supply, and consumer satisfaction with the electricity services across the country?
3. How are the discoms handling the metering, billing, and payment collection (MBC) process across households?

We present the results of the IRES 2020 survey and based on our assessment, we propose strategies to fill the remaining gaps to realise the goal of universal, affordable, and reliable electricity access in India.



The India Residential Energy Survey (IRES) captures the state of energy access and use in Indian homes

India Residential Energy Survey (IRES)

Survey specs



6
researchers

MAR/19-
JUN/19

Research Design

- Research focus
Energy access and use
- Sampling strategy
Multi-stage stratified
- Questionnaire design
35-minute long



21 STATES
covering 97% population



20
field managers



152 DISTRICTS
Cluster sampling



40
supervisors

JUL/19-
SEP/19

Survey Preparation

- Vendor selection
Market Xcel
- Questionnaire translation
10 languages
- Pilot studies
3 states
- Questionnaire coding
SurveyToGo



**1210 VILLAGES
& 614 URBAN
WARDS**
Cluster sampling



154
enumerators



**14,850
HOUSEHOLDS**
8 from each village/ward

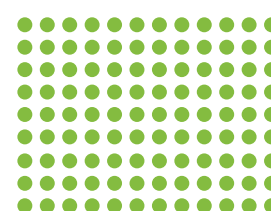


300
days

OCT/19-
APR/20

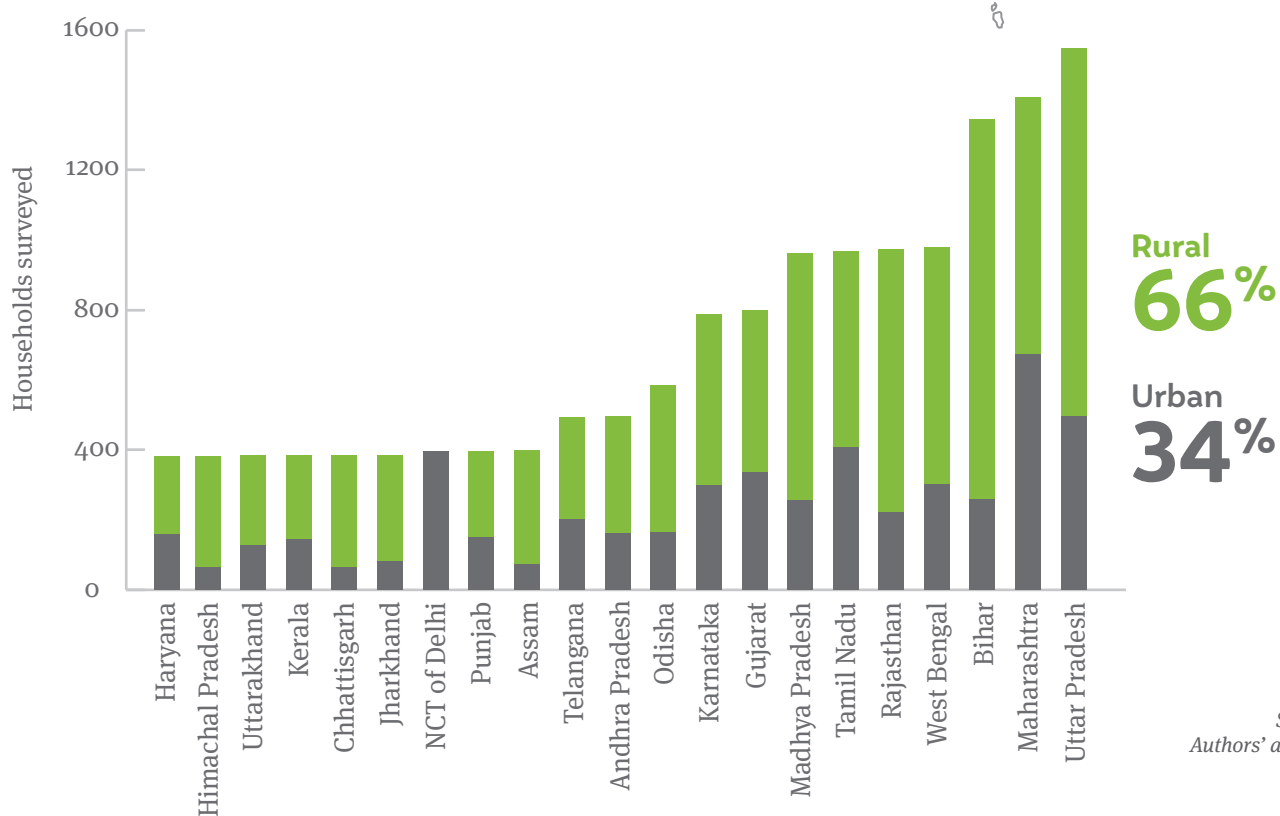
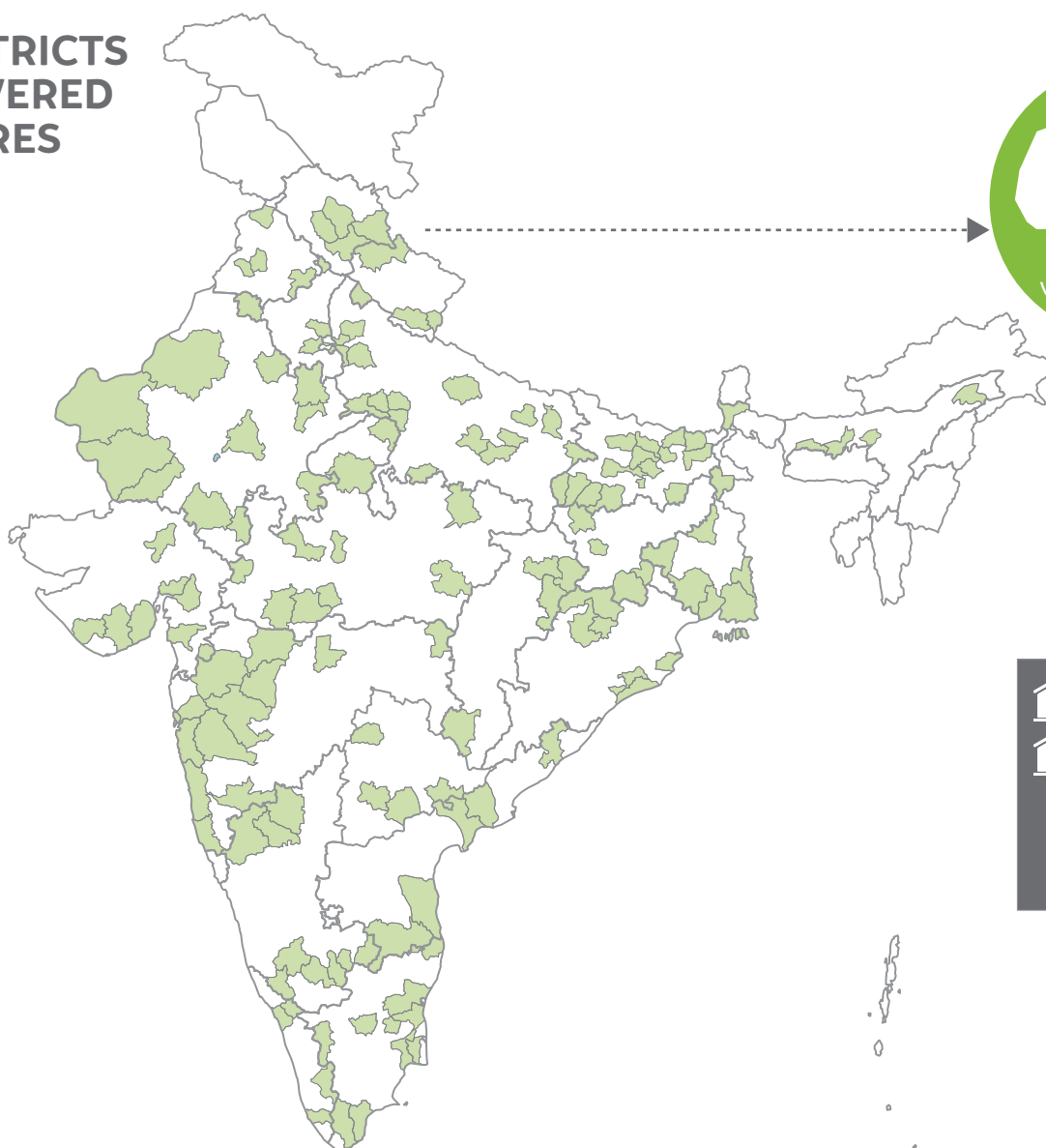
Survey Execution

- Enumerator trainings
9 locations
- Data collection
Nov 19- Mar 20
- Data monitoring and cleaning



**4 MILLION
DATA POINTS**

DISTRICTS COVERED IN IRES



Source:
Authors' analysis

Key findings

As per IRES 2020, nearly 97 per cent of Indian households are electrified. India has made a commendable effort on household electrification, as 96.7 per cent of Indian households are now connected to the grid, with another 0.33 per cent relying on off-grid electricity sources. However, 2.4 per cent of Indian households still remain unelectrified (Figure ES1). Most of the unelectrified households are concentrated in the rural areas of Uttar Pradesh, Madhya Pradesh, Rajasthan, Haryana, and Bihar (Figure ES2).

A majority of the unelectrified households cited their inability to afford grid-connection as the reason for not having a connection. Given the availability of free-connection under *Saubhagya* scheme, some of households were likely not aware of the scheme, not able to access it, or were deterred by the recurring monthly expenditure of paying electricity charges. Most of these households are multidimensionally poor, characterised by reliance on labour activities for sustenance, life in a *kachha* house, non-ownership of a motorised vehicle, and use of traditional biomass as the primary cooking fuel. Other reasons for households not having access to electricity are lack of grid supply in the neighbourhood, refusal of connection due to inadequate documents, and application under process.



As per IRES 2020, nearly 97% of Indian households are electrified

Figure ES1

With only 2.4 per cent of households lacking access to electricity, India is close to achieving universal electrification

Source: Authors' analysis

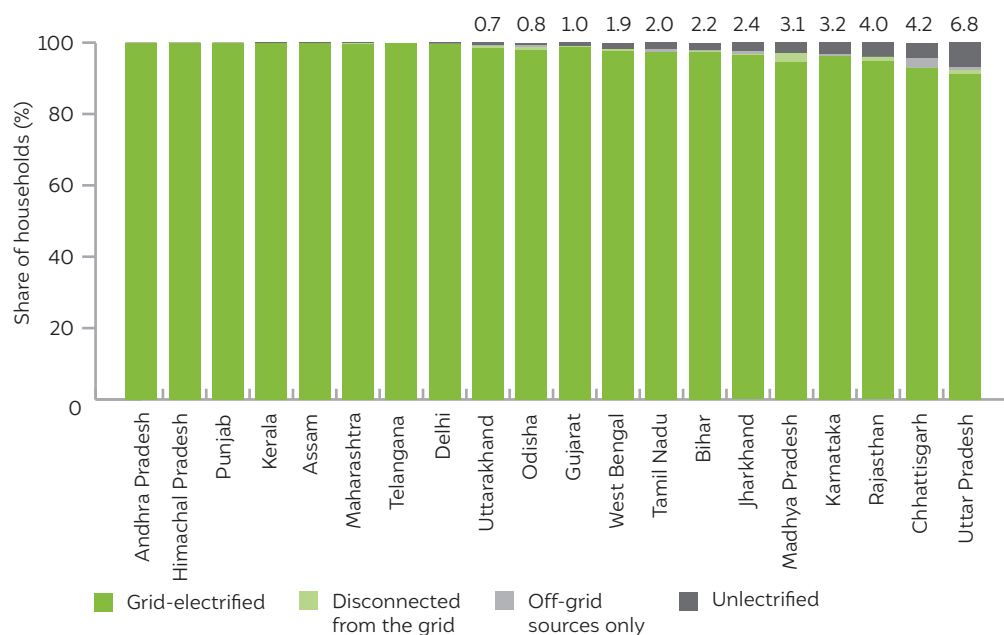


Figure ES2

A few north-central states have a majority of the unelectrified households

Source: Authors' analysis

An average Indian household receives 20.6 hours of power supply from the grid. The average daily supply in urban areas (22 hours) is longer by a couple of hours than in rural areas (20 hours). Delhi, Kerala, and Gujarat are the top states, maintaining slightly over 23 hours of average supply in both urban and rural areas. In contrast, households in Uttar Pradesh, Jharkhand, Haryana, Assam, and Bihar face the longest power outages, with rural households in these states facing six or more hours of daily outages (Figure ES3).

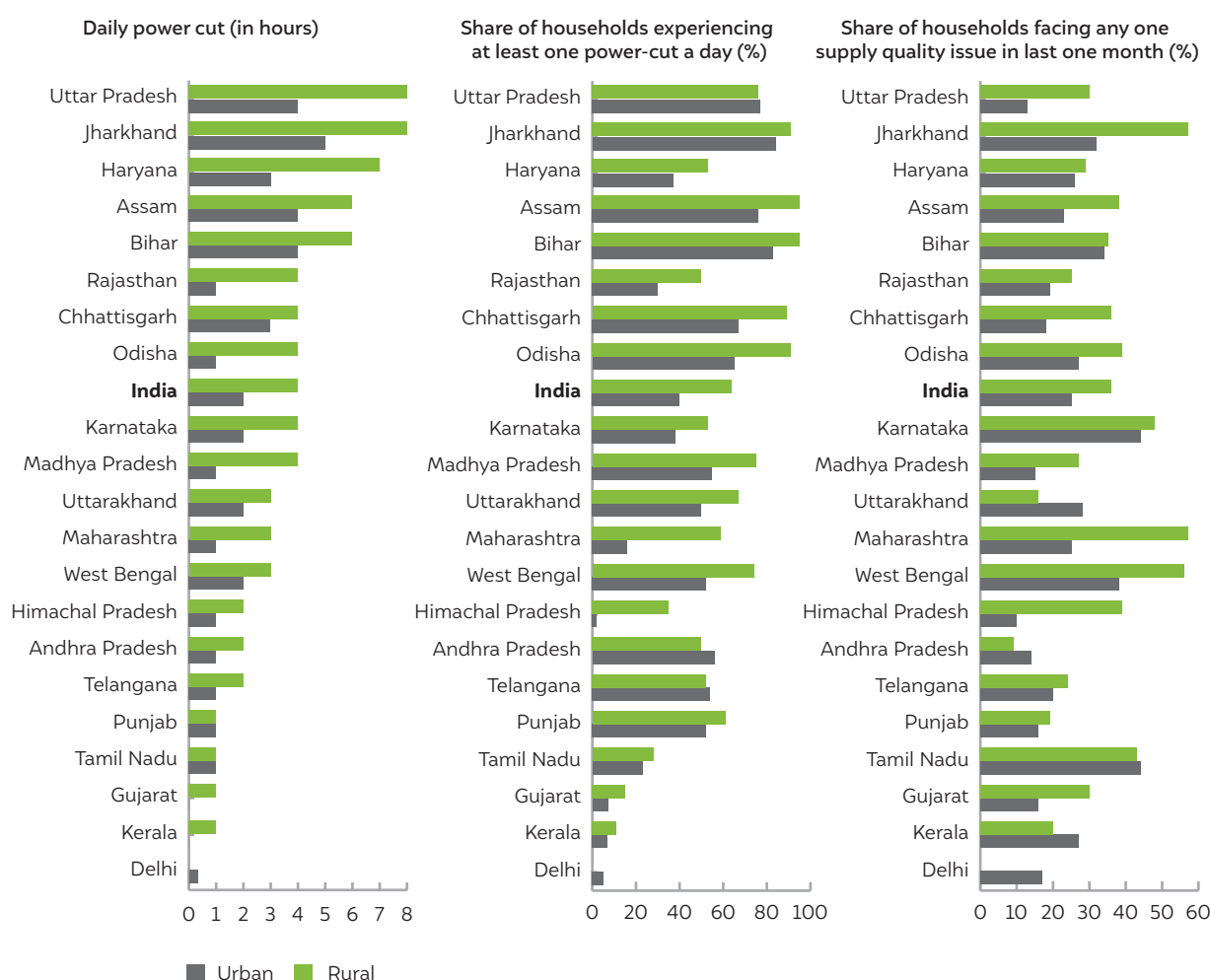
However, the current supply situation has significantly improved in rural India, especially in the six ACCESS states (Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal), where daily power supply to rural households is around 18.5 hours in 2020 compared to 12.5 hours in 2015 and 15 hours in 2018.

Most households faced unanticipated supply interruptions (76 per cent). Two-thirds of rural and two-fifths of urban households face outages at least once a day. Power outage duration and frequency are higher in Uttar Pradesh, Jharkhand, Assam, Bihar, and Haryana (Figure ES3). A third of households also faced at least one of the three supply quality issues—long blackouts, low voltages, or appliance damage due to voltage fluctuations—during the month preceding the survey. Only six per cent households reportedly registered a complaint in the past six months, indicating high consumer inertia or low awareness about their rights as electricity consumers.



An average Indian household receives 20.6 hours of power supply from the grid

Figure ES3 Power cut duration, frequency, and gaps in supply quality vary across Indian states



Source: Authors' analysis

Of all grid-electrified households in India, 93 per cent have metered connections and 91 per cent are billed regularly. Metering and regular billing is critical for revenue collection and financial health of discoms. While most ACCESS states have improved metering rates over the past five years, with a six-fold improvement in Uttar Pradesh, the issue of unmetered connections and dysfunctional meters is more pronounced in rural areas (Figure ES4), particularly in Jharkhand and Madhya Pradesh. Further, metering gaps are higher in the case of households electrified over the past three years (20 per cent). A respondent from Kharagpur village of Palamu district of Jharkhand stated that, “the meter is kept in the house but has not been installed”.

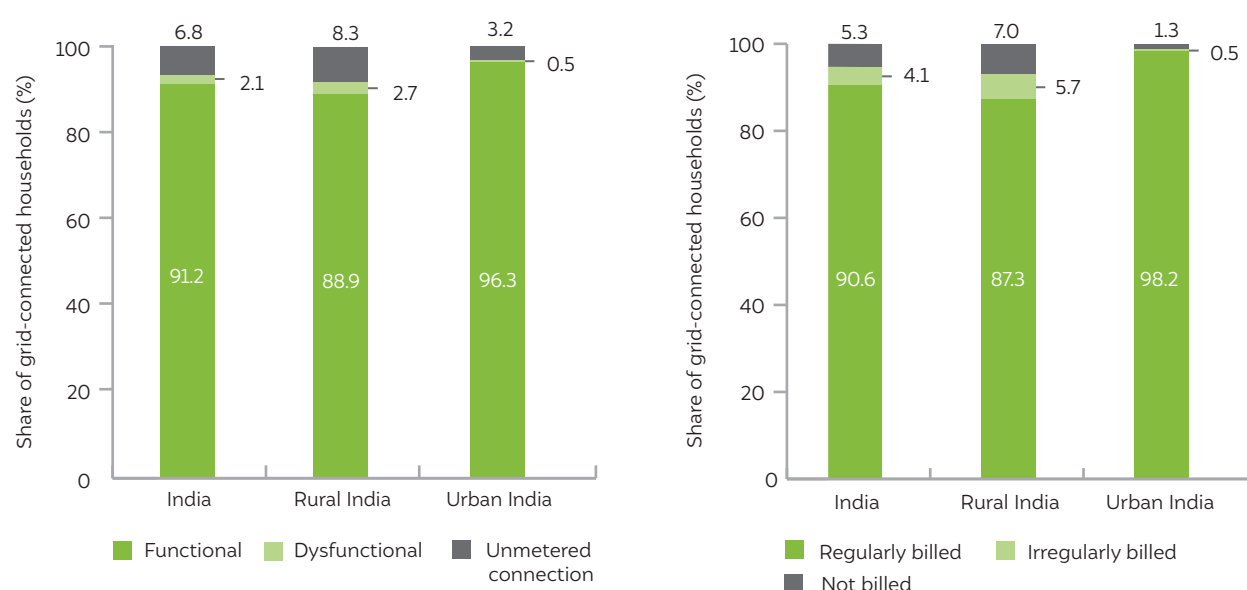
While four per cent of grid users receive bills irregularly (few times in a year or once in a few years), another 5 per cent of grid users have never seen a bill, though most of these households have been electrified for more than a year. Billing issues are pronounced in rural areas, mainly due to the high transaction cost and absence of an adequate billing mechanism. Jharkhand has the lowest share of grid users billed regularly (55 per cent), followed by Bihar (64 per cent). Billing irregularities are high in Assam, Uttar Pradesh, and Madhya Pradesh as well.

Discoms face losses in many states in India due to low collection efficiency. While we did not investigate payment compliance (due to problem of desirability bias), we assess payment modes used by households. Most households in India pay their bills in cash through discom payment counters and collection agents. Only 17 per cent of billed consumers pay their bills digitally (27 per cent in urban India and 12 per cent in rural India). This is despite the fact that 70 per cent of Indian households have a smartphone.



Of all grid-electrified households in India, 93% have metered connections and 91% are billed regularly

Figure ES4 More than 10 per cent of rural households do not have a functional electricity meter



Source: Authors' analysis

More than three-fourths of the grid users are satisfied with their electricity situation. In the six ACCESS states, the satisfaction levels among rural consumers increased from 23 per cent in 2015 to 55 per cent in 2018 to 73 per cent in 2020, which is in tandem with the consistent improvement in supply hours. This is a reason to celebrate. Yet, there remain several gaps in electricity service and these partly explain the existing gaps in consumer satisfaction (Figure ES6).

As many as 87–97 per cent of grid users in Delhi, Odisha, Andhra Pradesh, Himachal Pradesh, Maharashtra, Punjab, and Gujarat are very highly satisfied with electricity service, as typically power outages are less than two hours per day on average in these states, barring Odisha and Maharashtra. In contrast, more than 25 per cent of grid users are not satisfied with electricity services in Assam, Madhya Pradesh, Jharkhand, and Uttar Pradesh.

A major driver of household satisfaction is the duration of power supply, with reliability of supply and voltage stability also being significant factors. Regular billing is also associated with satisfaction among rural households. Our analysis underscores the importance of providing uninterrupted and reliable power supply to consumers along with regular billing.



More than three-fourths of the grid users are satisfied with their electricity situation

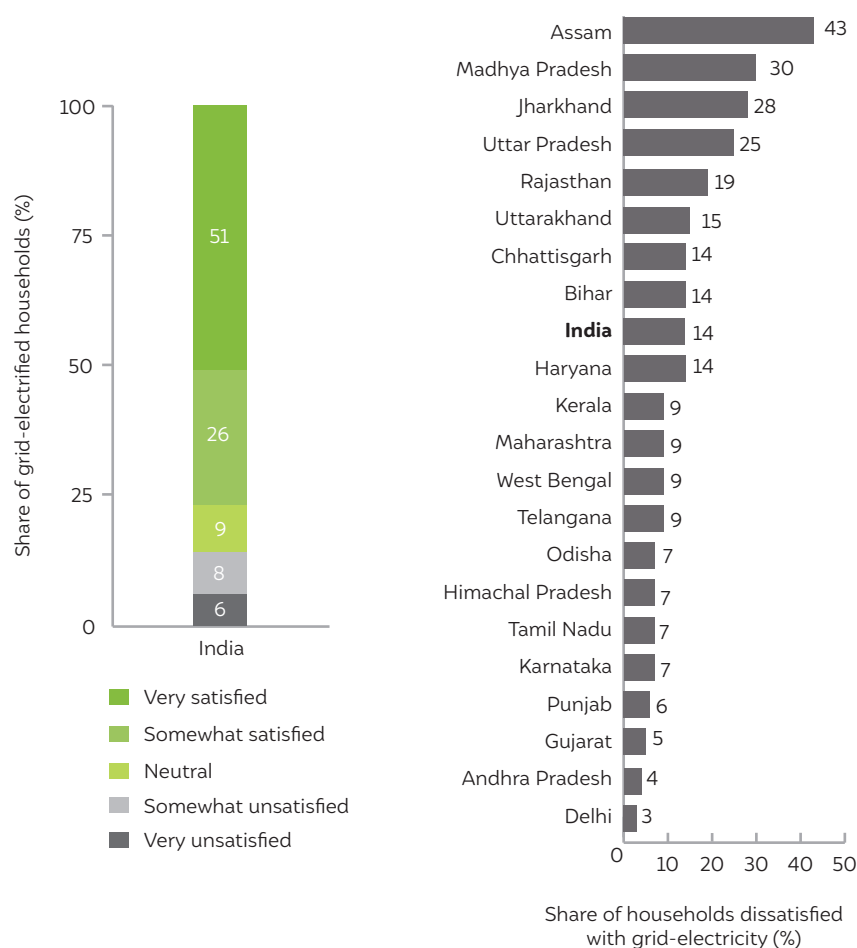


Figure ES5
Majority of the dissatisfied households are in northern and eastern India

Source: Authors' analysis

Concluding remarks and way forward

When our team was conceptualising the survey, in the summer of 2019, India had already achieved a milestone that was celebrated widely—electrifying nearly all households across the length and breadth of the country. Our study confirms the progress that India has made in terms of enabling access to electricity to its people. The share of households using electricity as the primary source of lighting has risen from 26 per cent in 1980 to 97 per cent in 2020. Over the past two decades alone, successive government schemes have brought nearly 800 million Indians out of darkness.

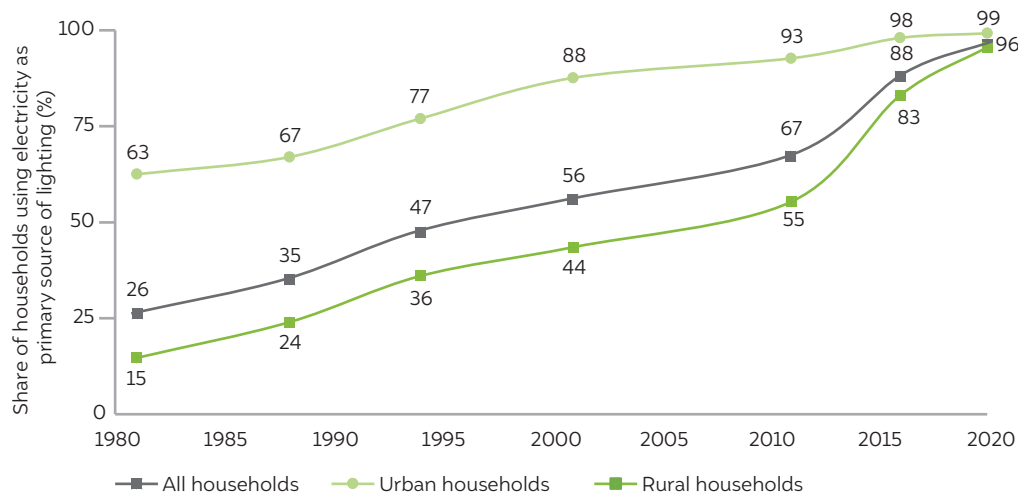


Figure ES6
India's progress on household electricity access (1980-2020)

Source: Authors' compilation based on Census, National Sample Survey Organisation (NSSO) survey, and IRES data

However, India is yet to achieve “access to affordable, reliable, sustainable and modern energy for all” (a subset of Sustainable Development Goal 7 of the United Nations to be achieved by 2030). We make the following recommendations to bridge the gap.



Identify and electrify the remaining 2.43 per cent unelectrified households.

As most unelectrified households are concentrated within the rural areas of a few states, discoms must undertake targeted efforts to address the gap in (i) awareness about government schemes for electrification, (ii) documentation challenges, and (iii) adequate infrastructure to extend a connection.



Review and consistently implement ultra-low tariffs for poor households with lifeline consumption to sustain electricity use in an affordable manner.

We observed that poor households are reluctant to get an electricity connection due to unaffordable recurring costs and electrified households getting disconnected because of their inability to pay the electricity bill (at times due to irregular billing leading to a large outstanding amount). This situation calls for streamlining the billing operations. While all states in India have differentiated power tariffs, there is scope for inter-state learning. We call upon states with relatively higher tariff incidence on low-consumption category to consider implementing ultra-low tariffs and help the poorer households in sustaining their electricity access. More research is required on the principles and definition of a lifeline tariff.



Improve information on real-time supply quality and address bottlenecks.

Nearly 90 per cent of distribution transformers (DTs) in urban India and 64 per cent in rural India are already metered (Ministry of Power 2020). In the absence of direct communication with households, DTs remain

the source of how electricity supply is experienced by households. Discoms can use this data to improve transparency on supply situation, identify areas with losses and plan other technological upgradations.



Strict enforcement of Standards of Performance (SoPs) and empowering consumers to demand mandated service levels. Discoms in India are mandated to follow SoPs related to supply quality, metering, and billing and are required to compensate consumers in case of violations. However, very few consumers register complaints as a result of low awareness about their rights and the complex process of claiming compensation for supply inadequacies. Besides promoting consumer education, electricity regulators must enforce compliance by imposing penalties on discoms for failure to meet the standards. Regulators could also consider a provision for ‘automatic compensation’ to consumers based on independent monitoring of supply quality.



Leverage technology and innovative solutions to ensure universal and timely metering, billing, and collection. Although discoms have achieved a phenomenal increase in metering and regular billing, some gaps remain. In addition to the upgradation of information technology (IT) infrastructure and billing systems, discoms should consider local and context-relevant solutions and create incentives for actors to help achieve the metering and billing targets. Another Achilles heel of discoms, collection efficiency, could be enhanced by offering digital modes of payment for consumers such as provisioning for online payment channels through IT kiosks, microentrepreneurs (local shops/youth), and existing public and private institutions to serve those unfamiliar with direct online payments. Less than one-fifth of consumers pay their electricity bills through online modes though 70 per cent of them have smartphones. Developing user-friendly mobile applications in vernacular languages, financial incentives, and consumer education are also needed to attract more consumers towards direct digital payment modes.

The high levels of consumer satisfaction stand testimony to the sustained efforts made over the last few decades by discoms. Supply duration, reliability, and quality along with bill regularity are important drivers of consumer satisfaction, which also keeps evolving. To sustain consumer trust and satisfaction, discoms need to adopt a proactive approach to resolving any outstanding issues in service delivery besides improving transparency in their overall operations.



To sustain consumer trust and satisfaction, discoms need to adopt a proactive approach to resolving any outstanding issues in service delivery



As India pursues the goal of universal electricity access, this report highlights the remaining frontiers to conquer to achieve affordable and sustainable 24x7 power for all.





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