The framework used for understanding the customer-utility touchpoints and identifying interventions for transformation of customer experience is provided in Figure 2. The key elements of the framework include analysis of each of the key utility-customer touchpoints with respect to the existing utility processes, understanding the expectations of stakeholders, identifying interventions to enhance customer experience, and suggesting nudge techniques to accelerate adoption of proposed digital interventions.

Figure 2: Customer experience framework
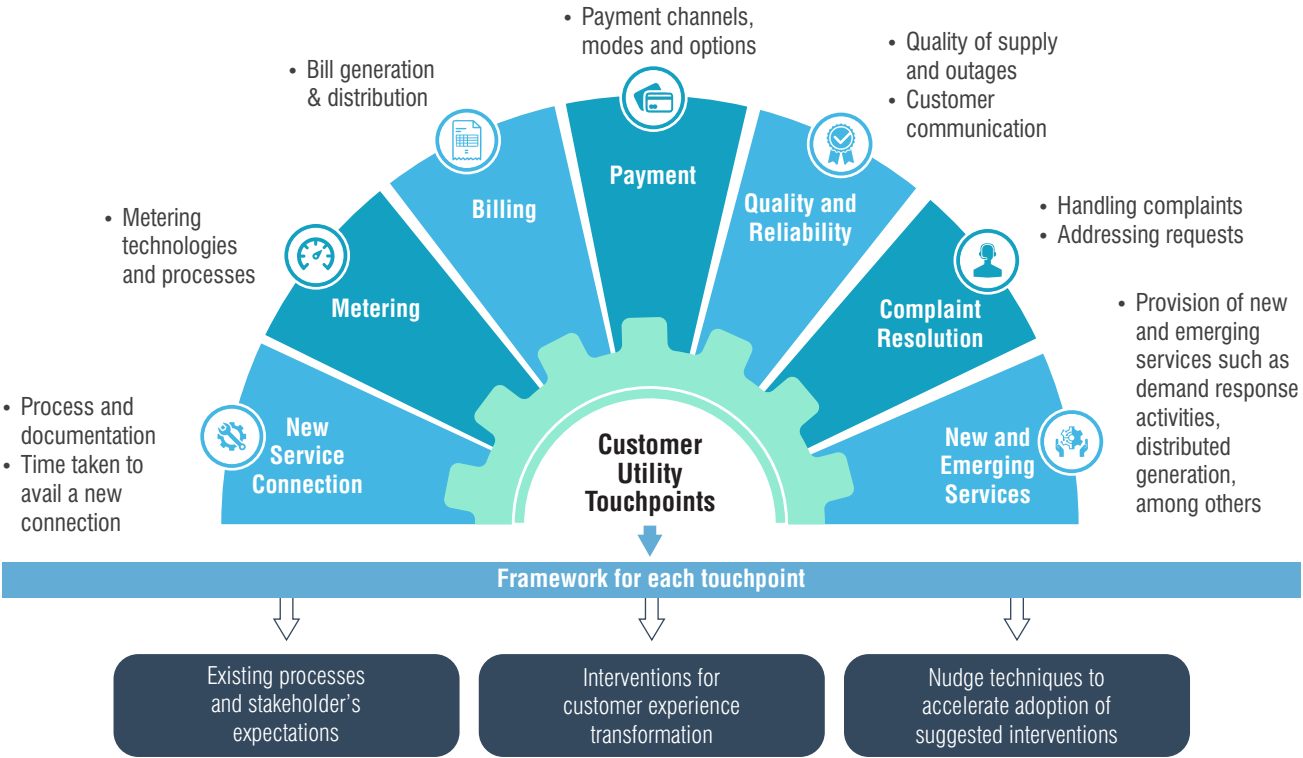
1. **Understanding existing processes across touchpoints and stakeholders' expectations**
   A touchpoint can be defined as a medium through which a potential or existing customer comes into contact with the utility. For instance, a customer accesses the utility website for a new service connection or calls the utility call center to register a complaint or receives monthly electricity bill through e-mail. These touchpoints can be broadly classified into seven categories:
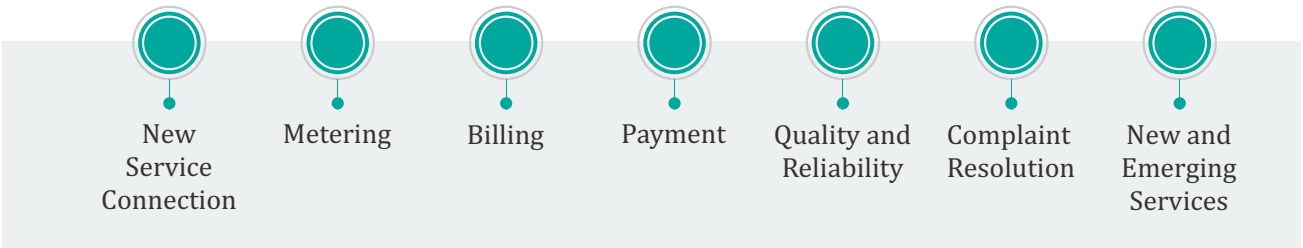
The first component of the framework includes assessment of existing processes involved in the touchpoints to understand a typical customer's journey. The second component includes identifying stakeholder expectations to ascertain the desired quality and level services required to enhance customer satisfaction. To aid these assessment/identification processes, the USAID SPARC Program team held discussions with utility officials and select customers in the states of Delhi, Telangana, and U.P.

2. **Interventions for customer experience transformation**
   The team did a comprehensive mapping of stakeholders' expectations and existing utility processes (across each utility-customer touch point) to identify gaps and interventions required for customer experience transformation. Analogies from different sectors (such as telecom, banking, aviation, etc.) at the national as well as global scale were also included to further strengthen the identified interventions.

3.   **Nudge techniques to accelerate the adoption of suggested interventions**
Nudge techniques can be defined as actions for influencing the behavior of an individual or a group of individuals in a predictable way without forbidding any options or significantly changing their economic incentives. For example, DISCOM can increase the adoption of digital payment by making digital electricity bills as a default option (i.e. customers need to opt for receiving physical bills). This study also identified the appropriate nudge techniques that can help enhance the uptake of suggested digital interventions.
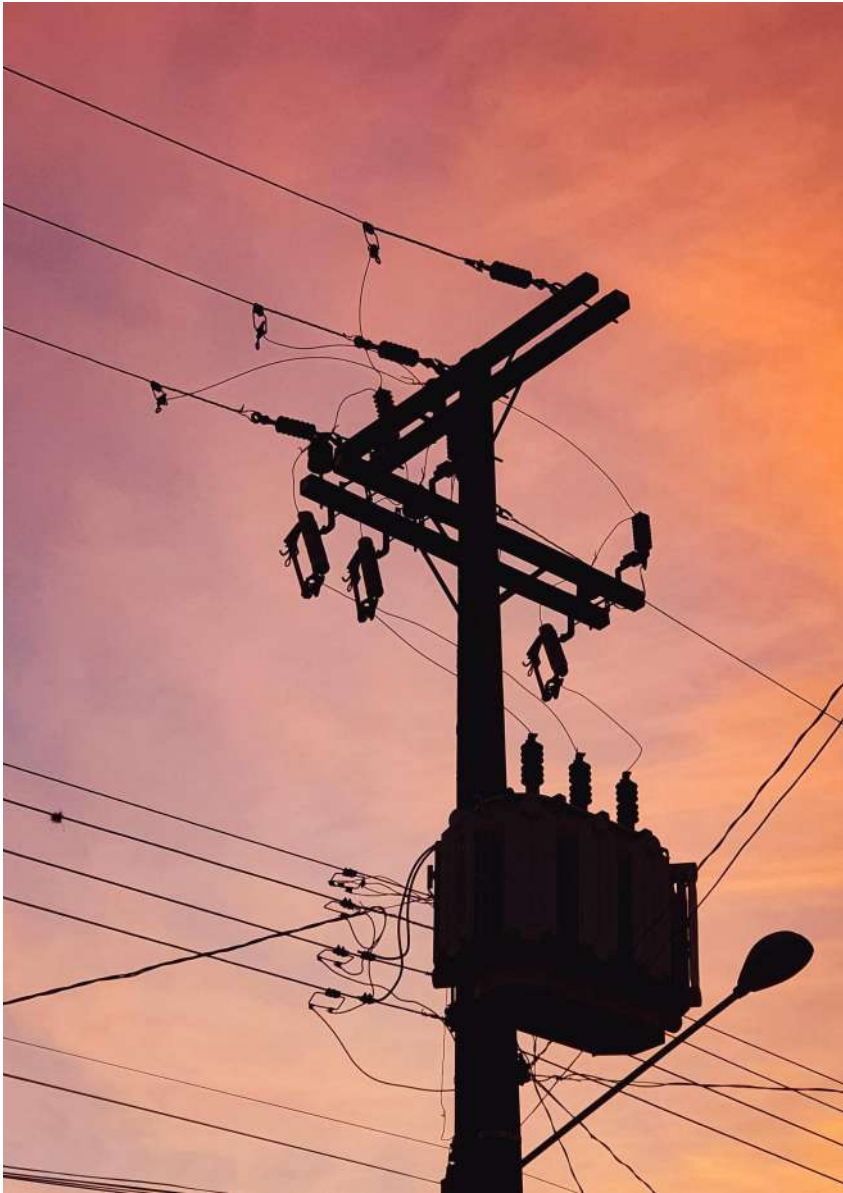
NEW SERVICE
CONNECTION

Abstract

Availing a connection is the first step for customers to join the electricity supply value chain. The process generally includes submission of an application form, inspection from utilities (to assess feasibility), payment (as per prevailing regulatory norms), external and internal wiring related work and installation of meters. This section provides a brief snapshot of existing processes, stakeholders' expectations and key interventions required to enhance customer experience. This includes suggestions related to simplifying the application form, training DISCOM officials on customer relationship aspects and better planning to reduce time taken for issuing new service connections. Additionally, nudge techniques (such as the use of social norms, default options, etc.) which can be adopted for simplification of the process have also been identified.

Customers take the first step into the electricity supply value chain by availing a connection. The process generally includes submission of an application form, inspection from utilities (to assess feasibility), payment (as per prevailing regulatory norms), external and internal wiring related work and installation of meters. Similar processes are being followed in case the customer intends to change the sanctioned load. The complexity of the procedure, time and cost required is directly related to the ease of living and ease of doing business.

Various sectors (such as telecom, banking, insurance, aviation among others) have revised the process of enrolling customers by adopting digitization and enhanced use of technology. For instance, leading telecom service providers such as Airtel and Vodafone provide free home delivery of SIM cards. The SIM is delivered at a time slot convenient to the customers and the complete onboarding process takes place within one-two hours. Similarly, the Kotak Mahindra Bank offers a fast, convenient and secure way to open a bank account online. Customers can create an instant account online eliminating multiple steps. The process is completely paperless—removing significant paperwork and enabling "anytime and anywhere" account opening. Aegon N.V.[11], a leading life insurance firm, provides online calculators, uses social media log-in and links existing databases to pre-fill the application form to enhance ease and convenience for its customers.

World Bank's "Ease of Doing Business" Index

The World Bank's Ease of Doing Business index compares economies across a range of parameters in ten major "Doing Business"-related topics i.e. getting electricity, paying tax, enforcing contracts, registering property, etc. Key parameters considered for "Getting Electricity" are average cost of availing an electricity connection, number of days, and steps required to get an electricity connection. Due to continuous efforts by electric utilities in India, India's ranking on "Ease of Getting Electricity" parameter of the World Bank's "Ease of Doing Business" index has increased to 22nd in 2019, up from 137th in 2014. Some of the key observations from "Getting Electricity" rankings are:

- Average time taken for availing an electricity connection (for businesses) in India (average of Delhi and Mumbai) was 53 days—much lower than some of the developed economies like Australia (73 days); Japan (81 days); Norway (66 days) and Canada (137 days) among others.

- Average cost of availing a new electricity connection (expressed as percentage of per capita income) in India was 28%—significantly lesser than developed economies like Canada (116%); Spain (93%); New Zealand (67%) and Bahrain (57%).

Electric utilities have undertaken multiple initiatives to streamline the process and reduce the cost and time for availing electricity connections. This includes digitizing the process of submission of applications, waiving off the inspection requirements for few high voltage customers, etc. However, there is significant scope for further improvement to meet customer expectations. The following sections highlight key suggestions to enhance customer satisfaction.

While digitization may increase efficiency, it is important to review existing rules to understand whether they are increasing customer's convenience or not. In many instances, the existing rules may need to be
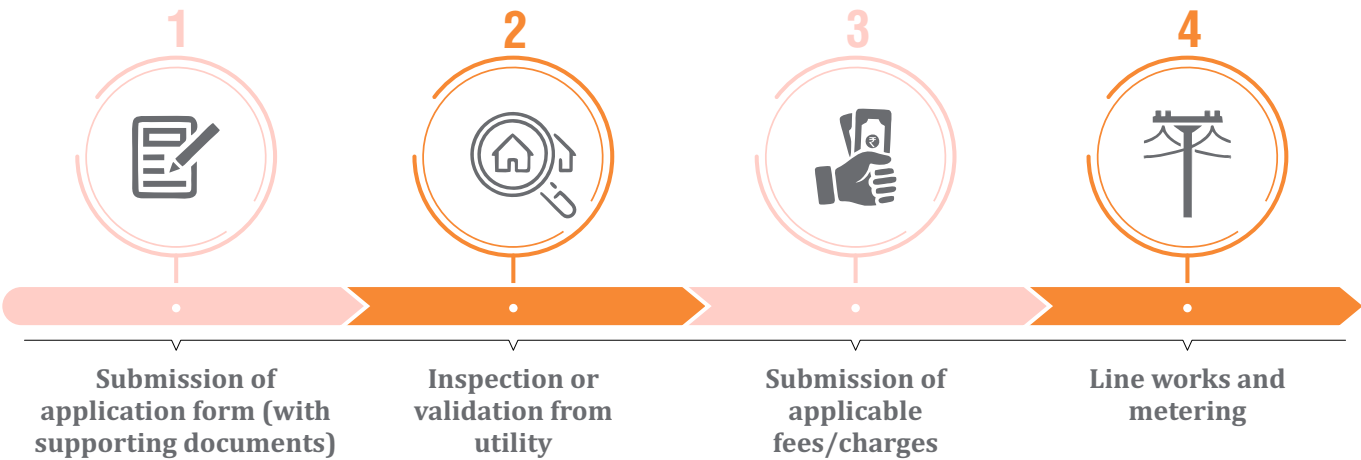
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[11]https://www.aegonlife.com/calculators, last accessed on 3rd January 2020

changed. For example, until 2012, passengers were required to show printed copies of airline tickets to enter the airports. Later, the Bureau of Civil Aviation Security issued an order to accept digital copies of tickets as a valid document, making it convenient for the customer[12]. Similarly, in electricity sector, the rules related to information required for issuing new connections may also need to be re-examined to eliminate inefficiencies (if any).

3.1 Existing processes

Accessibility of infrastructure services is one of the most important parameters, which directly impacts economic growth, productivity and customer satisfaction. Key factors which determine the ease of getting electricity connection are (i) ease of process, (ii) number and type of documents required, (iii) connection fees, (iv) number of days taken by utilities to process the request, and (v) number of approvals required to be taken by customers (as applicable), among others. Figure 3 shows the standard processes followed by most electric utilities in India.

Figure 3: Processes involved in new service connection

1	2	3	4
Submission of application form (with supporting documents)	Inspection or validation from utility	Submission of applicable fees/charges	Line works and metering

The key steps involved in availing a new service connection include:

1. **Submission of application form along with supporting documents**
    Customers can submit their application for a new service connection either online at the consumer portal or through offline mode at the DISCOM's office by submitting the prescribed form(s). In addition, customers need to submit several supporting documents (such as house number and ownership documents, tax bill, No-Objection Certificate (NOC) in case of a joint holder, NOC from the owner if rented, etc.), and the applicable registration fees.

Waiver on submission of proof of residence in Madhya Pradesh
As per the details provided in the electricity supply code issued by Madhya Pradesh Electricity Regulatory Commission (MPERC), customers can avail a waiver on submission of proof of ownership documents in the state during issuance of a new connection in lieu of additional security deposit (paying for cost of average consumption for 90 days instead of 45 days).[13]

2. **Inspection or validation from utility:** Once the application has been successfully submitted, the utility officials conduct a technical survey of the site where a new connection is sought by the customer. After this, the utility provides a cost estimate to the customer which includes service line/line charges and security deposit.

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[12]https://www.huffingtonpost.in/rahul-tongia/overruled-why-maximum-gov_b_9234308.html, last accessed on 4th January 2020
[13]Source: Madhya Pradesh Electricity Supply Code, 2013, http://www.smartbijlee.mpez.co.in/design/310813-Supply_Code__2013_english.pdf, last accessed on 31st March 2020

3. **Submission of applicable fees/charges:** At this stage, the consumer needs to make the payment of applicable fees/charges either online at the consumer portal (in case of online application) or offline at the utility office through cash/cheque (in case of an offline application).

4. **Line works and metering:** On receipt of the payment from the customer, the utility commences the line works and installs the meter and any other external wiring as per the requirement. During the online application process, the consumer has the option to check the status of the application at the consumer portal. In the case of an offline application, all enquiries have to be made directly at the utility's customer care center.

Figure 4 highlights the procedures, time, and costs that customers in Delhi, India have to undergo for getting electricity, including submission of application form, external site inspection by the utility, and meter installation. When compared to the best in class, Dubai, UAE, which tops the World Bank ranking for ease of getting electricity, it can be seen that a customer in Dubai can avail electricity connection in just over seven days[14], however it will take nearly 27 days[15] for a customer in Delhi to get a new connection (Figure 4). Further, the cost of availing electricity connection in India is also high as compared to Dubai. For instance, typical cost of availing a new electricity connection for a warehouse in Delhi is ~INR. 64,500 (USD 850)[16] whereas the same can be availed without any charges in Dubai.

Figure 4: Comparison of processes involved in issuance of new connection

TATA Power Delhi Distribution Limited (TPDDL), India (Rank 22)	Days	Cost
Submit application to Tata Power Delhi Distribution Ltd. and await site inspection	3 Calendar days	
External site inspection from Tata Power and await demand note	3 Calendar days	Rs. 64,521
Connection, meter installation and electricity flow	21 Calendar days	
	Time taken 27 days	**Total Cost Rs. 64,521**

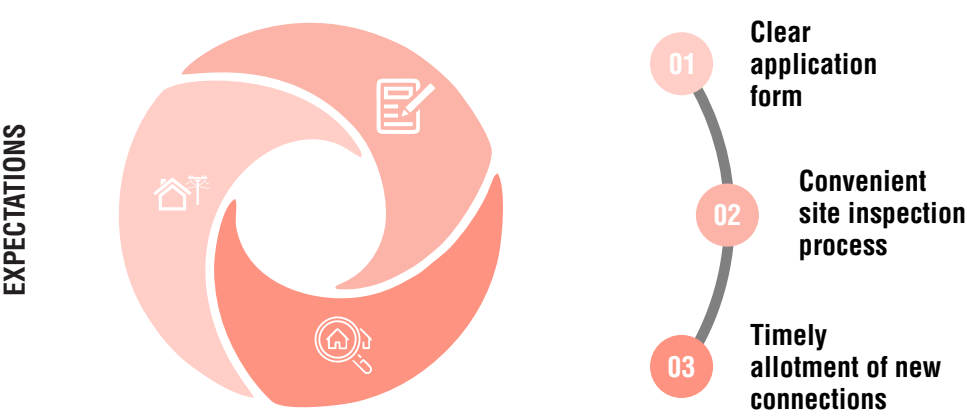| Dubai Electricity and Water Authority (DEWA), UAE (Rank1)	Days	Cost
Submit application to Dubai Electricity and Water Authority (DEWA)	2 Calendar days	AED 0
Inspection, external connection works and meter installation	5 Calendar days	AED 0
	Time taken 7 days	**Total Cost AED 0**

3.2 Stakeholder expectations

The study analyzed existing processes for releasing new connections across few electric utilities and identified major customer expectations as shown in Figure 5. Information was collected from the utility website, stakeholder consultations and various online platforms. These expectations need to be addressed to ensure customer satisfaction.

[14] https://www.doingbusiness.org/en/data/exploreeconomies/united-arab-emirates#DB_ge, last accessed on 10th January 2020
[15] https://www.doingbusiness.org/en/data/exploreeconomies/india#DB_ge, last accessed on 10th January 2020
[16] These costs include obtaining RoW permit, laying of Service cable, installation of meters and wiring within the meter board. The electricity connection is a permanent, three-phase, four-wire Y connection with a subscribed capacity of 140-kilovolt- ampere (kVA) having a length of 150 meters. The cost assumes works that involve the crossing of a 10-meter wide road (by excavation, overhead lines) on public land

Figure 5: Customer expectations in provisioning of new service connection

EXPECTATIONS

01 Clear application form

02 Convenient site inspection process

03 Timely allotment of new connections

a.   Clear application form

Analysis of application forms (for availing new service connections) revealed that too much information is sought from customers—some of which can be avoided. For example, it is difficult for a new customer to provide details related to nearest pole/DT/feeder number, rating of end-use appliances, estimated load, etc. In many cases, customers need assistance in filling the application forms. Hence, utilities should consider simplifying the existing application form required for availing a new connection.

70 parameters for a new service connection form in Indian utilities

An analysis of application forms required to be submitted for a new service connection was carried out for six states. It was observed that customers need to provide information related to 50-70 parameters (varies from state to state), some of which can be avoided. For e.g. in a few cases, information related to the nearest customer ID[17], occupation, nearest pole and DT number, load requirement (kW) or information on the number of appliances to be used, etc. is included in the form. Many customers (who do not understand the technical terms) are not able to provide this information without seeking help from utilities.

Similar analysis for international utilities (i.e. Duke Energy and British Gas) reveals that only basic information, related to 20-30 parameters, is required from customers.

Innovation and disruption in customer onboarding experience

Door-step Assistance by Telecom Companies

In telecom sector, service providers such as Airtel and Vodafone provide door-step assistance to their customers for availing new service connections.

Interventions by Public Sector

Seven Delhi government departments have rolled out the Door-step Service Delivery (DSD) to home-deliver 40 key services. Under the scheme, the resident needs to contact a 24x7 helpline, where the call center provides information about the mandatory documents and the charges to be paid. After an appintment is booked, a facilator carrying a biometric device and a camera visits the resident's premise to initiate the process.

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[17] https://www.tsecl.in/webdynpro/resources/nerapdrp.gov.in/home~tseclnwconn/TseclNwConn#, last accessed on 15th March 2020

b.   Convenient site inspection process

One of the key process requirements for releasing a new connection is site inspection to assess feasibility. It is generally carried out by the utility officials competent to assess technical feasibility for releasing new service connection. However, these officials receive limited or no training on customer relationship management and customer satisfaction. It is critical to impart adequate training to utility officials before they are asked to carry out site visits and interact with customers. This will facilitate a seamless site inspection process. Site inspection in countries such as Germany and Spain are carried out by certified professionals[18]. Also, in times when COVID outbreak has necessitated the need for social distancing, the staff needs to be well trained on health and safety measures as well. In addition, other methods of assessing the load requirement such as benchmarking with similar customers in the neighborhood, virtual site inspection, etc. may also be considered.

Customer experience at an airport

Orlando Airport in the U.S. is known for its hospitality and customer services. The airport was ranked highest in its class in the J.D. Power 2018 North America Airport Satisfaction Study[19]. The study measures overall traveler satisfaction by examining six factors: terminal facilities; airport accessibility; security check; baggage claim; check-in/ baggage check; food, beverage and retail. The Orlando airport authorities regularly organize training programs for all their employees on key aspects of customer satisfaction and relationship management. It was observed that simple gestures like looking people directly in the eye and smiling, picking up trash and focusing on customer safety have resulted in high level of satisfaction among travelers.[20]
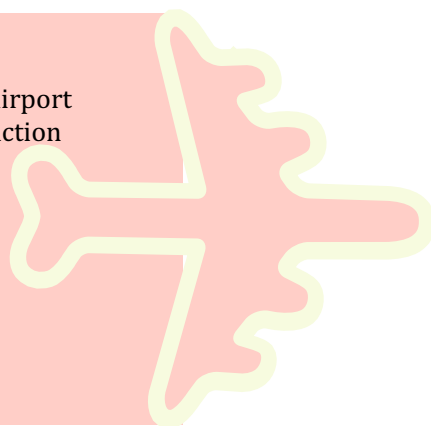
c.   Timely issuance of new connections

Customers expect that new service connections should be issued at the earliest once the application is submitted. Time taken to issue a new connection is also an important parameter in the World Bank's "Ease of Doing Business" index. It was observed during stakeholder interactions that delays in issuing a new connection are largely due to: (a) lack of adequate infrastructure/distribution network capacity (i.e. distribution transformers, external wiring and poles or sub-station capacity), and (b) lack of adequate human resources to conduct site inspection or carry out the meter installation related works. The utilities and regulatory commissions should try to minimize the time taken (and the number of visits) to issue a new service connection by addressing these issues. Further, the guidelines on maximum allowable time for issuing a new service connection also varies from state to state (refer Table 2) depending on availability of distribution infrastructure, type of customer and type of connection. Respective SERCs should also revisit the regulations and reduce the maximum allowable time for issuing a new service connection.

Table 2: State-wise time taken for issuing new connection

S.No.	State	Time-taken for communicating estimated cost of issuing a new connection	Time-taken for issuing new connection after receiving the application fees[21]	
			If grid extension/ augmentation is not required	If grid extension/ augmentation is required
1	U.P.	On the Spot	7 Days	45-300 Days
2	Haryana	7-25 Days	13 Days	57-142 Days
3	Punjab	7-30 Days	7-15 Days	30-90 Days
4	Kerala	7-40 Days	37 Days	45-90 Days

[18]In such economies, only certified professionals are required to undertake internal wiring works and are held responsible for the same.
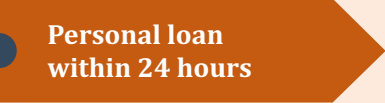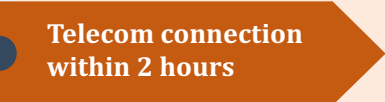[19]https://www.orlandoairports.net/press/2018/09/19/ranked-1-again/, last accessed on 28th May 2020
[20]How customer experience takes flight at the Orlando airport, February 2017, Mckinsey & Company
[21]Standard of Performance and Supply Code Regulation of respective SERCs

The transition to instant services across sectors
In many other sectors (banking, telecom, etc.) customers can avail services within few minutes. Some relevant examples are as follows:

Personal loan within 24 hours

HDFC Bank, Bajaj Finserv, and ICICI Bank (leading financial institutions in India) offer the fastest personal loans - with disbursal in under 24 hours. They also offer instantaneous credit cards with immediate application status to the customer.

Digital Bank Account within 2 minutes

Kotak Mahindra Bank offers an instant savings bank account that can be set up by downloading the Mobile Banking App or by visiting the website. The customers need to upload general identification proofs and can start using the account immediately.

Telecom connection within 2 hours

Along with door-step assistance to its customers, telecom providers such as Airtel and Vodafone provide a prepaid new connection with an activation time of around 1-2 hours.

3.3 Key interventions to enhance customer satisfaction

Based on the review of the current processes and stakeholder consultations, a set of interventions have been identified to enhance customer experience. These include:

1. **Simplification of application form**
    The application form required for availing a new connection needs to be simplified. The information which can be presumed or deciphered by utilities (i.e. nearest pole/DT number, load requirement, etc.) may need to be removed. For instance, load requirements (in kW) can be estimated based on customer category, location and number of family members or rooms. Utilities may re-design the application form and conduct pilot testing, to seek feedback from customers before re-launching it. This process might be repeated once in a year or two.

International Case Study: Online application process for a new service connection

Details required for 22 parameters

Instant application status

British Gas[22] (UK-based utility)
For applying a new service connection with British Gas (BG), the customer needs to provide details for only 22 parameters. Default values are automatically populated in several parameters which is suitable for most applicants, making the application process simple and convenient from a customer's perspective. For example, for residential connections, customers provide information related to (i) geographical area, (ii) number of people living in the house and (iii) number of rooms, expected connected load automatically populated by the software. Once the application is submitted, an estimated quote is generated instantly based on inputs provided by the customer such as locality, number of occupants and house size. Also, there is no 'status' applicable for application—the request for connection is instantly confirmed or denied based on the information provided by the customer.

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[22]British Gas: https://www.britishgas.co.uk/GetAQuote/#/new/quote-details, last accessed on 23rd December 2019

Details required for 29 parameters

Pre-filling of the form

Duke Energy[23] (U.S.-based utility)
In the case of Duke Energy, a customer is required to provide details for 29 parameters for applying for a new service connection. As a result, the online application process becomes convenient, simple and quick for the customer. The parameters in the form are populated with default values which aid the customer in easily completing the application form.

2. **Training of utility officials**
The ability to deliver high-quality services and achieve the desired level of customer satisfaction requires continuous training of the workforce on critical aspects of customer relationship management, customer behavior, inclusion and communication. It is thus imperative to ensure that utility officials responsible for conducting inspections may undergo rigorous training on these aspects on a regular basis. Further, in view of the social distancing norms being followed across the country, training may also be provided on aspects of maintaining hygiene and social distance during the site visits. Utilities may develop/revise the standard operating procedures incorporating new norms for health and safety.

Training of Income Tax officials - implementation of GST
The Central Board of Indirect Taxes and Customs, Ministry of Finance, GOI organized training programs for nearly 2 million officials for effective implementation of tax reforms – Goods and Services Tax (GST). The topics covered during the training program also included subjects related to customer centricity, grievance redressal, marketing etc. apart from others like GST Law, Rules, and Systems & Procedures.[24]

3. **Reduce the time to issue a new service connection**
In some cases, the customer needs to wait for several days before he/she gets the power supply connection from the utility. One of the key reasons for this delay is limited visibility of the network and inadequate network planning. As a result, availing a new connection gets delayed even if the utility has surplus power, leading to potential revenue loss. Therefore, the utility might enhance its planning capabilities and increase network visibility so that timely decisions can be taken for network augmentation and optimization. For building such capabilities, utilities need to deploy end-to-end AMI technologies that facilitate real-time monitoring and control across the power distribution network.

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[23]Duke Energy: https://www.duke-energy.com/home/start-stop-move#startStop, last accessed on 23rd December 2019
[24]http://economictimes.indiatimes.com/articleshow/57466359.cms?from=mdr&utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst, last accessed on 12th December 2019

'No missed trips': Expediting the passport issuance process
Under the "Tatkal" scheme, citizens of India can obtain a passport within one to three days of submission of required documents (by paying an additional fees). The police verification of documents is carried out post issuance of the passport. The print queue is also separate thus ensuring faster print of Tatkal passports.
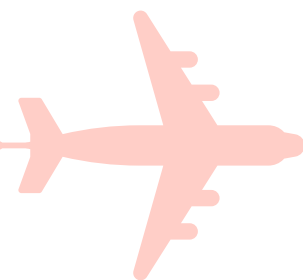
3.4 Nudge techniques

Recent advancements in behavioral sciences have spurred interest in the power distribution sector. Also, the India Economic Survey 2019 specifies the adoption of the right tools such as nudges, mandates, etc. for influencing customer behavior. Such influences or nudges can not only deliver better value to the customer but also enhance the overall experience of dealing with utilities. The appropriate nudge techniques for simplifying the application form to enhance customer experience include:

- **Increase convenience to fill application form**
  The utility could consider the following nudges to improve the ease and convenience of accessing application form for a new connection.

- **Default options for general information**
  Availability of default choice is the most effective method for inducing compliance (Keller et al, 2011).[25] Customers may be provided with default options for general information such as connected load, contract demand, and supply type, among others. This information can be based on customer profile (e.g. domestic, commercial, industry, etc.) and geographical location. Once the customer has provided this information, default options for general applicant details may be provided for the customer to choose from. As mentioned above, British Gas (an electric utility in the UK) provides default values for several parameters, making the application process simple and convenient from a customer's perspective. For example, the expected connected load is populated automatically for residential customers, based on information provided by the customers related to geographical area, number of people and number of rooms in the household.

- **Door-step assistance**
  Simplification of the enrollment process has a positive effect on enrollment increasing the number of applicants (Chimento et al., 2003).[26] The additional step of filling details in the application form could deter customers from applying for a new connection. To further simplify the application process, utilities may offer help in the form of door-step assistance for filling and submission of application forms. This assistance could be offered to customers at their homes and time convenience and provide them an option to avoid queues at the utility center.

- **Introduce periodic reminders**
  Reminders[27] sent to people have a boosting effect on success in achieving behavior change goals (Pirolli, et al, 2017).[28] To expedite customer action during the application process, utilities may send periodic reminders to the customers regarding document submission, payment of fees, meter installation date, etc.[29]. These reminders should be consistent with the regulatory requirements e.g. 'Utility is mandated to install meter within seven days of application submission. Do you plan to pay the application charges?' Such reminders will help customers to fulfill any shortcomings in the application at the earliest and plan ahead for any process that may require their involvement.

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[25]Keller et al. (2011), Enhanced active choice: A new method to motivate behavior change, Journal of Consumer Psychology
[26]Simplifying Medi-Cal Enrollment: Opportunities and Challenges in Tight Fiscal Times, Lisa Chimento, Moira Forbes, Joel Menges and Anna Theisen
[27]Specific plans regarding how and when to enact behavior
[28]Implementation Intention and Reminder Effects on Behavior Change in a Mobile Health System: A Predictive Cognitive Model, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5730820/, last accessed on 1st December 2019
[29]The availability heuristic is a mental shortcut that relies on immediate examples that come to a given person's mind when evaluating a specific topic, concept, method or decision.

METERING

Abstract

Customer metering is the lifeline of the electricity supply business. It directly impacts the revenue stream and operations of the utilities. This section provides a brief snapshot of the key metering technologies used in India, key issues faced and expectations of stakeholders and suggests interventions required to enhance customer satisfaction. This includes suggestions for establishing a mechanism to avoid disconnection in case of complaints regarding meter accuracy; provision of options for availing pre-paid and post-paid connections to customers and enabling remote meter reading. In addition, nudge techniques (such as simple process to switch to pre-paid meters, regular reminders and promotion of current customer adoption data of pre-paid meters) which can be adopted to enhance uptake of pre-paid services have also been identified.

Customer metering, the lifeline of the electricity supply business, directly impacts the revenue stream and operations of utilities. It provides useful information to estimate electricity consumption; measure network losses and instantaneous/maximum demand, monitor supply quality; design demand-side management programs, distribution network planning, etc. Modern metering devices (i.e. smart meters) also provide flexibility to communicate with the customers, enable time of day or time of use pricing, remote connect/disconnect and even remote control over end-use appliances. (Refer Figure 4).

Monitoring of consumption has improved in the last few years across sectors. For instance, telecom customers receive updates on the amount of data consumed on a daily basis and during the month. The customers also have the option to choose an upper limit on the daily data consumption exceeding which they would receive an alert to restrict usage. Figure 6 provides screenshots for data usage for a day and the monthly trend.

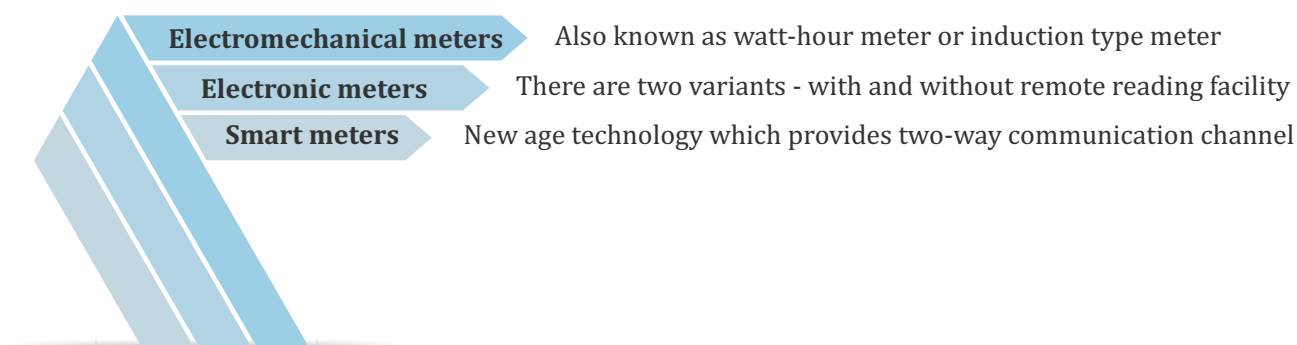**Figure 6: Monitoring of mobile data consumption in telecom sector**

Various initiatives are being taken up by the electricity utilities in India to enhance customer experience with respect to metering. The GOI has set a target of converting all meters to smart pre-paid meters by 2022[30]. With smart pre-paid meters, customers will get the flexibility to use and pay for electricity as per their requirements, instead of paying the full electricity bill at one go.

4.1 Existing processes

Electric utilities use different types of meters for different customer categories (industrial, residential, commercial, agriculture, etc.). At the basic level, all meters provide an output related to the amount of electricity passing through it. The more sophisticated meters provide additional information related to demand tracking, power quality parameters, defects, theft alert, and use various communication channels for data transfer. Broadly these meters can be classified into three categories: (i) Electromechanical; (ii) Electronic, and (iii) Smart meters (Refer Figure 7).

[30]https://pib.gov.in/Pressreleaseshare.aspx?PRID=1557203, last accessed on 21st April 2020

Figure 7: Types of meters

Electromechanical meters — Also known as watt-hour meter or induction type meter

Electronic meters — There are two variants - with and without remote reading facility

Smart meters — New age technology which provides two-way communication channel
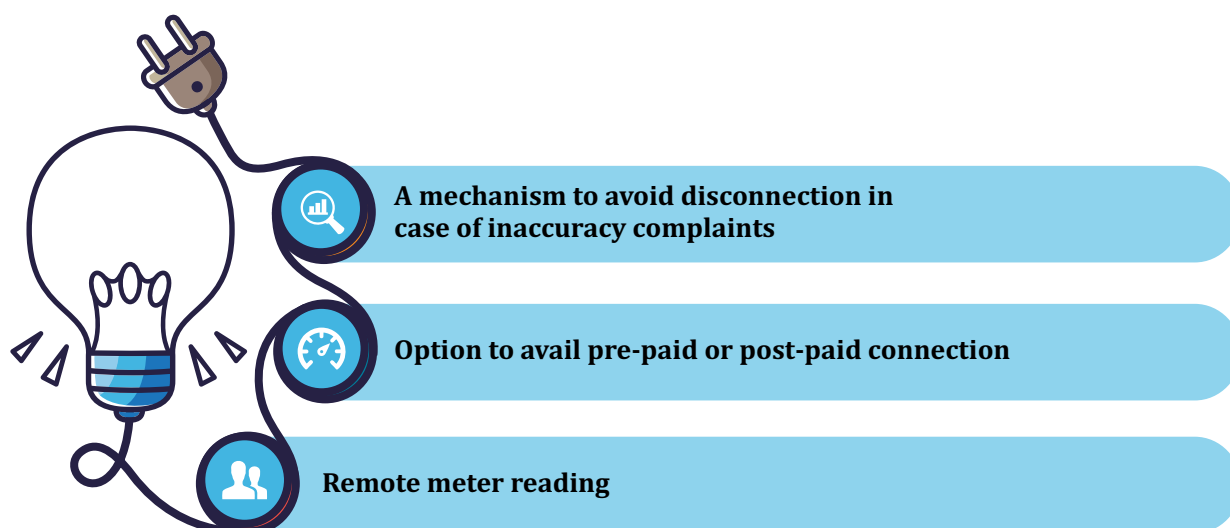
4.2 Stakeholder expectations

Meter installation is generally a customer's first experience with the utility. Subsequently, the customers interact with utilities when utility officials visit for meter reading or when customers have any complaint regarding the functioning of the meter. It is important for utilities to ensure a seamless process across these stages to ensure customer satisfaction. The key expectations of customers and utilities from metering perspective include:

a.   **Accuracy**
Customers expect accuracy in meter reading. However, they sometimes face issues of inaccurate meter readings due to faulty meters, inability of utility officials to record meter reading (due to unavailability of consumers), meter burn out, and other technical faults. In such an instance, electricity consumption is estimated based on average historic consumption, which sometimes leads to inaccurate electricity bills.

b.   **Meter reading**
The meter-related operational cost for distribution utilities includes meter reading and data punching. Cost of meter reading, especially in sparsely populated rural areas and remote areas, is significantly higher than that of urban areas. Remote reading or customer-enabled meter reading may be institutionalized to reduce the operational cost of utilities. Further, the outbreak of COVID-19 has shown that remote meter reading infrastructure is critical to build a resilient electricity supply network.

c.   **Periodicity**
In most utilities (where smart meters have not been installed), information regarding daily or hourly electricity consumption is not available. Meters should provide information on a real-time basis so that both the customer and the utility can understand the consumption pattern and take appropriate measures to reduce electricity consumption.

d.   **Disconnection**
As per the existing process (in many utilities) even if a customer registers a complaint regarding meter accuracy, they have to pay the entire bill amount or the amount based on average consumption of past 3-6 months (whichever is lower) to avoid disconnection. Additional charges or adjustments, if any, are adjusted during subsequent billing cycles.

4.3 Key interventions to enhance customer satisfaction

Based on the review of the current processes and stakeholder consultations, a set of interventions have been identified to enhance customer experience.

Figure 8: Interventions for enhancing customer satisfaction

A mechanism to avoid disconnection in case of inaccuracy complaints

Option to avail pre-paid or post-paid connection

Remote meter reading

1. **A mechanism to avoid disconnection in case of complaints linked to inaccurate bills:**
   In India, customers have to pay the entire electricity bill amount, or the amount based on average consumption of past three to six months (whichever is lower) to avoid disconnection even if they have disputed the accuracy of the bill. In some cases, the current electricity consumption of the customer may not be commensurate with the historical consumption due to various factors such as varying industrial demand, seasonal variations (especially for agriculture customers), etc. In other sectors, for example in banking, credit card charges are reversed until the complaint is resolved. Hence, utilities should devise a mechanism wherein they do not disconnect their customers until the complaint regarding meter accuracy is resolved.

Favorable laws to protect consumer rights
Customers in the U.S. can question the validity of a transaction applied to their credit card, in case they experience erroneous charge. These transactions can happen for reasons including unauthorized or fraudulent charges, failure by the merchant to deliver merchandise, double swiping and billing errors. In such cases, customers can report the transaction to the credit card company's creditor department along with copies of receipts or other evidence and request them to carry out inquiries with regard to the billing statement. The dispute should be sent out to the department within 60 days after the erroneous bill is received by the customer. Generally, the company reverts minor disputed charges (up to USD 25 or less) immediately. As per the Fair Credit Billing Act, the company cannot collect the amount that is in dispute or the interest on that charge, although the customer will need to pay the part of the bill that is not under investigation. During the investigation, the company is not allowed to close the account or report the customer to the credit bureaus for failing to pay the disputed charge[31]. The creditor must resolve the dispute within two billing cycles and not more than 90 days after receiving the complaint.

2. **Remote meter reading**
   One of the major issues faced by the utilities is the inability to record meter reading due to various reasons such as unavailability of customers at the time of reading, location of meters (mounted at a

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[31]https://www.cesisolutions.org/2015/07/credit-card-dispute-what-happens-after-you-dispute-a-charge/, last accessed on 05th February 2020

certain height or inaccessible basement), inability to read display due to dirt or cracks, etc. Deployment of AMI infrastructure to enable remote meter reading may help in dealing with such issues. Utilities might consider deployment of AMI infrastructure for all customers. Meanwhile, they may also provide the self-meter reading option to its customers. These readings can be verified physically or by conducting random visits or periodic audits. With the outbreak of the recent pandemic, remote meter reading has assumed significant importance. Due to lack of remote meter reading capabilities, utilities have resorted to average/estimated billing based on past consumption and this has significantly impacted their revenues. The Energy Efficiency Services Limited (EESL) has installed about 1.2 million smart meters across 4 states (Bihar, Delhi, Haryana and U.P.). This has enabled DISCOMs to generate around 95% of billing efficiency by using smart meters amid this lockdown.

Self-billing service
TPDDL has introduced a self-meter reading service which allows customers to submit meter readings along with photographs on a dedicated WhatsApp number. The readings shared by the consumers are marked as Consumer Brought Reading and the bill is treated as provisional. However, only two provisional bills can be generated using this service—the subsequent third bill must be as per readings captured from the site. In order to promote self-meter reading during the ongoing pandemic of COVID-19, the DERC has announced an additional rebate of INR 20 (USD 0.26) per bill given the meter-reading is submitted by the customer.

Increasing investments on utility modernization projects may also help in economic recovery and job creation. During the financial crisis of 2008, the U.S. Government introduced American Recovery and Reinvestment Act (ARRA) to boost economic growth and create jobs. As a part of this initiative about USD 4.5 billion of public funds were provided for utility and grid modernization projects. Subsequently, a study conducted in 2013 by the U.S. Department of Energy (DOE) showed that smart grid projects funded through the ARRA created nearly USD 7 billion total economic output, 47,000 jobs, and over USD 1 billion in government tax revenue[32].

3. **Option to avail pre-paid or post-paid connection**
    Once the utility starts installation of smart meters, it can provide customers with an option to opt for pre-paid services similar to that in the telecom sector. The telecom sector provides a choice to customers to avail pre-paid or post-paid connection during sign-up and the option to switch the existing pre-paid to post-paid connection and vice versa. Several utilities in India (Bihar, U.P., Assam, etc.) have provided such options to some customers. The GOI has also set a target to convert all meters to smart pre-paid meters by 2022[33].

Pre-paid meter installation program in Manipur
In 2011, the Manipur State Power Distribution Company Limited (MSPDCL) implemented a pilot pre-paid metering program covering nearly 18,000 customers. The objective of this program was to reduce the cost of meter reading and billing (especially in hilly areas) and enhance end-use energy efficiency. Owing to the positive response from its customers, MSPDCL implemented a state-wide pre-paid metering program, which helped the utility in reducing its aggregate technical and commercial losses from 77% in 2010-11 to 50% in 2016-17 and reducing its peak demand from 180 MW (in 2010-11) to 100 MW (in 2016-17).

Pre-paid meter installation in the U.S.
In the U.S., about 200 electric utilities are either offering, piloting or planning to introduce pre-paid service connections. This includes public and investor-owned utilities, cooperatives and municipal utilities. As per the research conducted by "quid research", AMI meters used for pre-paid electricity services may increase from 0.6 million (in 2017) to 2.6 million in 2021.

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[32]https://cleantechnica.com/2013/05/03/doe-smart-grid-funds-created-6-8-billion-economic-boost-47000-jobs/, last accessed on 10th March 2020
[33]https://pib.gov.in/Pressreleaseshare.aspx?PRID=1557203, last accessed on 21st December 2019

4.4 Nudge techniques

Among the suggested interventions above, increasing uptake of pre-paid smart metering may require behavioral change and customer sensitization. Appropriate nudge techniques which can be adopted by the utilities include:

- **Simplify the process to switch to pre-paid metering:** The easier the purchase-decision journey for customers, the more likely they are to repurchase the brand (Freeman, 2012)[34]. Simplification of process to shift from status-quo to a new service can help in increasing its adoption. Utilities may provide options to customers by switching from post-paid to pre-paid services by sending a simple SMS or by a single click on their website or by simply submitting a request at the call center.

- **Leverage herd instinct:** The herd instinct bias refers to our tendency to replicate others' actions, even if this implies overriding own beliefs. Professionals are heavily influenced by the behavior of their peers (Gould and Lawes, 2016). Utilities may leverage this bias to increase adoption of pre-paid services by providing information related to number of customers who opted for pre-paid services to its customers (e.g., "over 3,000 customers have installed pre-paid meters in your neighborhood in the past 12 months"). This may help in dealing with the status-quo bias due to which customers may prefer to maintain post-paid services.

- **Educating the customer for knowledge dissemination:** Educating customers about service features and applications can help increase adoption (Page and Luding, 2003). Utilities must initiate smart meter informational programs where customers learn about the importance of smart meters and conserving energy through specially designed resources. This campaign could be initiated across different customer categories with relevant messaging for school children, industrial customers, and rural households.

- **Positive installation experience:** A report released by Smart Energy GB revealed that customers with a positive installation experience are more likely to use their smart meters and continue to modify their energy usage and behavior in the future[35]. Hence, to enhance installation experience, utilities may send a teaser package containing informational brochures, energy saving ideas and a selection of offers or free gifts a few days before the scheduled installation. The idea leverages enhanced commitment during the point of installation for triggering the formation of new habits.

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[34]https://hbr.org/2012/05/to-keep-your-customers-keep-it-simple, last accessed on 20th January 2020
[35]Smart Energy GB Consumer Engagement Plan and budget 2017

CHAPTER 5

BILLING

Abstract

After meter reading, billing is a critical function in the electricity supply business, impacting customer satisfaction and utilities' revenue stream. The process usually includes bill generation and distribution. This section provides a brief snapshot of billing technologies used in India, key issues faced and expectations of utilities and customers and interventions to enhance customer satisfaction. This includes suggestions related to capturing customer identification details; providing clarity on the constituents of the bill; increased focus on distribution of digital bill and providing flexibility to customers to select their billing period. Additionally, nudge techniques like paperless bills as a default choice and leveraging herd bias which can be used to enhance the adoption of digital bills have also been elaborated.

An electricity bill is an important communication tool between utilities and customers. The bill provides basic information on consumption and payment and ensures accurate financial transactions between utilities and customers. From the utilities' perspective, accurate bill generation and prompt distribution is essential to ensure effective revenue realization. It is, therefore, critical to maintain the quality and accuracy of bills.

The contents of an electricity bill vary amongst states depending on the state regulations. For instance, the Karnataka Electricity Regulatory Commission (KERC) has provided guidelines on constituents of the electricity bill which are highlighted in Figure 9. Utilities such as TPDDL (Delhi)[36] and MSEDCL (Maharashtra) are also using the bill as a medium to enhance ease of payment for the customers by printing a QR code on the bill (snapshot in Annexure) which enables customers to make payment through the mobile application.

Figure 9: An example of bill constituents

Bill constituents specified by Karnataka Electricity Regulatory Commission

- Details of the consumer
- Consumption details (present and history)
- Period covered, type of service and tariff applicable
- Summary of payment methods
- Various charges such as fixed, demand charges etc.
- Last date for payment without penalty
- Essential links for internal grievance redressal
- Wheeling charges and surcharges if applicable
- Outstanding arrears or credits
- Contact details of the CGRF and Ombudsman
- Dates of current and previous readings

5.1 Existing processes

The electricity bills in India are processed depending on the billing cycle defined in the state regulations. The billing cycle usually varies for different customer categories (typically monthly or bi-monthly for residential customers and quarterly for agriculture).

The billing process typically consists of two broad steps: (i) bill generation and (ii) bill distribution. Based on the meter reading, the utility generates and distributes bills using various types of billing techniques varying as per customer category (industrial, residential, commercial, agriculture, etc.). The billing process in India is highlighted in Figure 10.

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[36]https://economictimes.indiatimes.com/industry/energy/power/tata-first-power-utility-to-use-qr-code-for-bill-payment/articleshow/60093712.cms?from=mdr, last accessed on 05th November 2019

Figure 10: Billing process in India
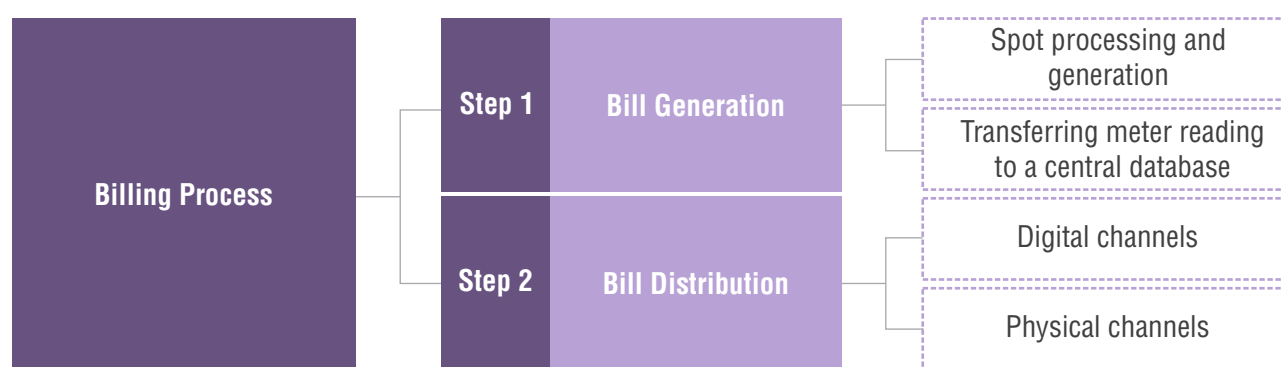
Bill generation

Indian electric utilities use two types of bill generation technologies:

*   Spot processing and generation: This technology has streamlined bill generation and distribution into a single step. Meter data is captured using hand-held devices either manually or through an optical or wireless interface[37]. The in-built billing software processes and generates the bill on the spot with the image of meter reading at the customer premises. Customers can also be intimated about the bill amount through e-mail/SMS/App notification immediately after the meter reading. For instance, MSEDCL sent bills through an SMS to more than two crore customers in FY 2019-20 instantly after their meter was read.[38]

*   Transferring meter reading to a central database: In this case, the meter reading is captured through various techniques such as physical visits by meter reader, remote meter reading, using Meter Reading Instrument (MRI), etc. The data is then transferred to a central database for billing, troubleshooting, and analysis purpose. In the case of data collected by meter readers, the bill generation begins with data punching to a billing software followed by bill printing and distribution. With the installation of AMR meters in states such as Haryana and Delhi, automated bills are being generated by directly downloading the meter reading, thereby minimizing human intervention.

Bill distribution

Indian electric utilities typically distribute bills to customers using the following channels:

*   Digital channels: Utilities provide several digital channels to avail electricity bills. This includes e-mail, mobile app, website, SMS notification and more recently, WhatsApp.[39]
*   Physical channels: This includes distribution of hard copies of the bill. Few states such as U.P. have created billing distribution centers to provide bills to the customers.[40]

5.2 Stakeholder expectations

Generating an accurate bill based on energy consumption data is the first step towards realizing the billed revenue. Several utilities are not able to bill the net input energy leading to low billing efficiencies. The billing efficiency at the national level for the year 2018-19 was 84.3%[41]. Few utilities[42] have reported billing efficiency as low as ~65% for the year. These inefficiencies in billing energy consumption can be partly attributed to factors such as delayed/erroneous readings, delayed delivery of bills, fault in billing software, etc. It can be observed from Figure 11, that increase in billing efficiency from 84.3% to 87% (in FY 2019-20), may have resulted in ~INR 17,200 crore (USD 2.3 billion) of additional revenue realized for DISCOMs. This is ~64% of the total book losses of the distribution utilities for the year (INR 26,956 crore[43]) (USD 3.6 billion) (Refer Figure 11).

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[37]Madhav, Mrinal Mehta, Shivika (Case of Reforms in the Indian Power Distribution Sector: A Move Towards Eradicating Energy Poverty)
[38]Tariff Order issued by MSERC, Maharashtra for FY2017-18
[39]https://economictimes.indiatimes.com/industry/energy/power/now-get-duplicate-bses-bill-on-whatsapp/articleshow/67660614.cms, last accessed on 20th April 2020
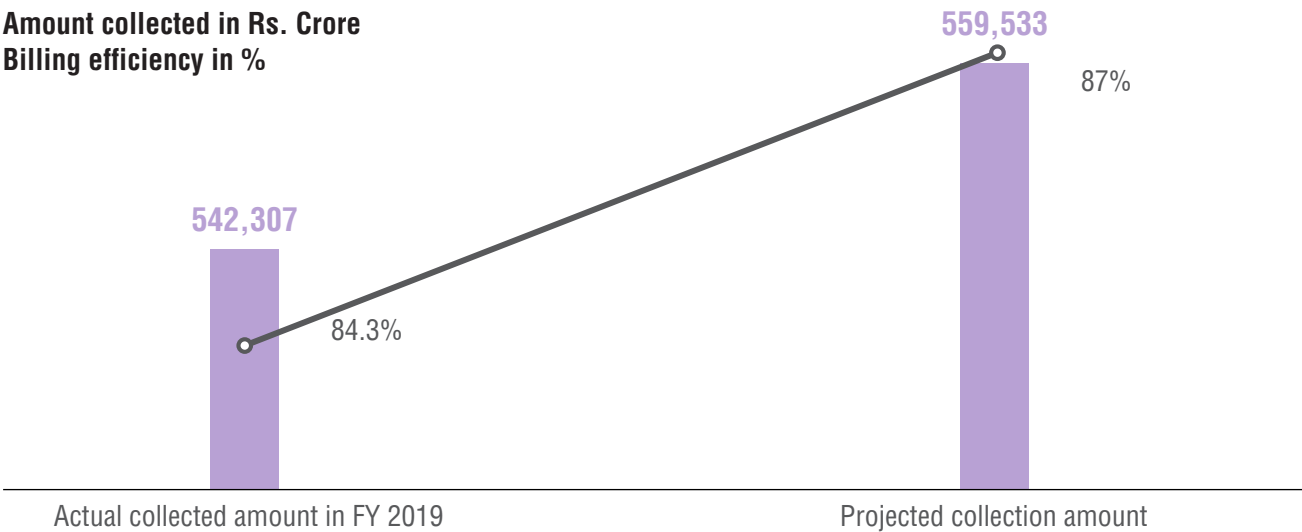[40]Tariff Order issued by UPERC, Uttar Pradesh for FY2018-19
[41]Source: https://www.uday.gov.in/, UDAY portal, last accessed on 22nd March 2020
[42]Example: MEPDCL, Meghalaya
[43]Source: https://www.uday.gov.in/, UDAY portal, last accessed on 7th March 2020

Figure 11: Impact of billing efficiency on the amount collected

Amount collected in Rs. Crore
Billing efficiency in %

542,307   559,533
                                      87%
        84.3%

Actual collected amount in FY 2019   Projected collection amount
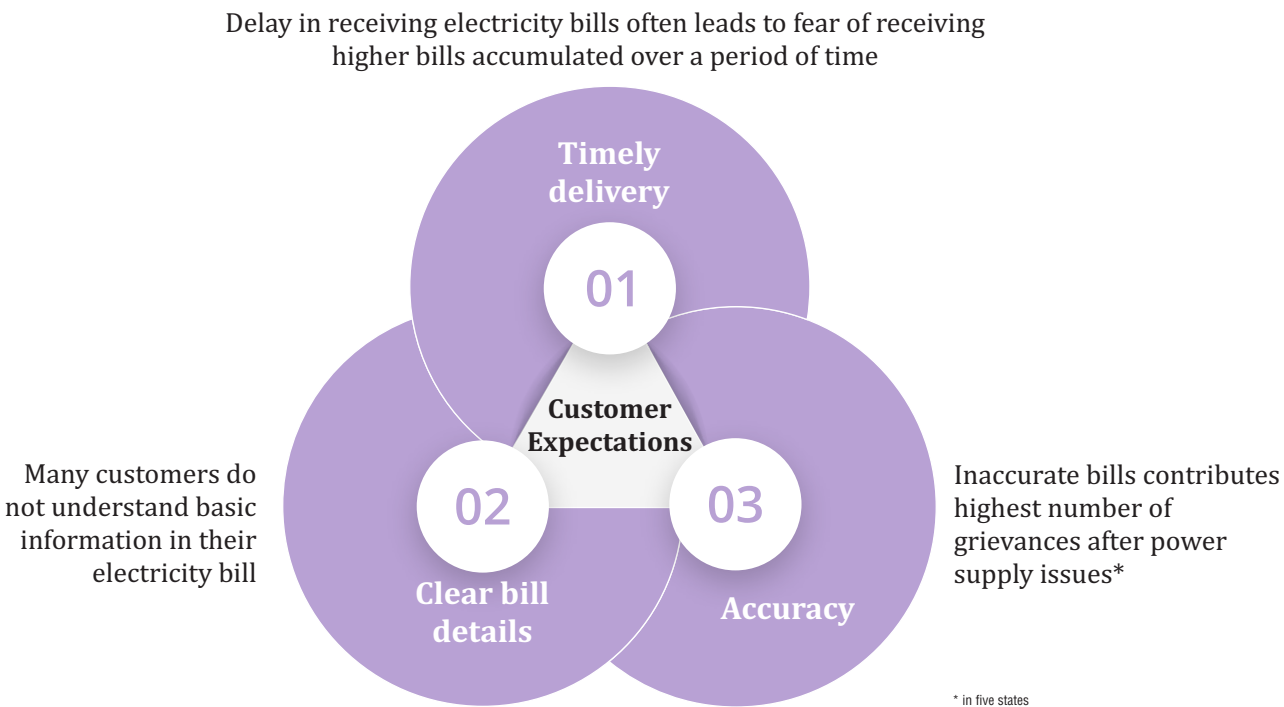
Incorrect billing contributes to highest number of grievances after power outages
A report by World Bank in 2015 studied the different kind of problems faced by customers with their electricity service. The range of issues identified include power supply interruptions, incorrect meter reading and billing, faulty meters, load and connection issues, among others. Customers were studied across five states including Delhi, Haryana, Karnataka, Maharashtra, and Rajasthan. The report revealed that issues related to incorrect bill contributed to the highest number of grievances after power supply issues across the identified five states.[44]

Key expectations of customers from a billing perspective are elaborated in Figure 12.

Figure 12: Customer expectations from a billing perspective

Delay in receiving electricity bills often leads to fear of receiving higher bills accumulated over a period of time

Timely delivery

01

Customer Expectations

Many customers do not understand basic information in their electricity bill

02

03

Clear bill details

Accuracy

Inaccurate bills contributes highest number of grievances after power supply issues*

* in five states

[44]Khanna Ashish, Singh Daljit, Swain K Ashwini, Narain Mudit (2016), Transforming Electricity Governance in India, Has India's Power Sector Regulation Enabled Consumers' Power?

a.   Timely delivery

Consumers expect timely delivery of their electricity bills. According to a study on "Empowering People – Enhancing Effectiveness of Rural Electrification Programmes", 22% of rural customers (sample size of ~2,200) reported that they did not receive regular electricity bills. A study conducted by CEEW on 'Electricity Consumers and Compliance' also revealed that about 23% of rural customers mentioned that their billing frequency was more than 3 months. This often leads to a fear of receiving higher electricity bills accumulated over a period of time, thereby restricting some consumers to use electricity only for lighting.

b.   Accuracy

Billing inaccuracy is one of the major issues raised by customers across states. For instance, as per the details provided in Forum of Regulators (FOR) report, billing inaccuracy complaints constituted 89% and 69% of the total grievances received by the Consumer Grievance Redressal Forum (CGRF) during 2015 in Chhattisgarh and Madhya Pradesh respectively[45]. The key reasons for inaccuracy may be attributed to faulty meters, manual errors in meter reading and billing, fault in billing software, etc. There is no doubt that billing accuracy is a primary requirement in electricity supply business and is a prerequisite to ensure customer satisfaction.
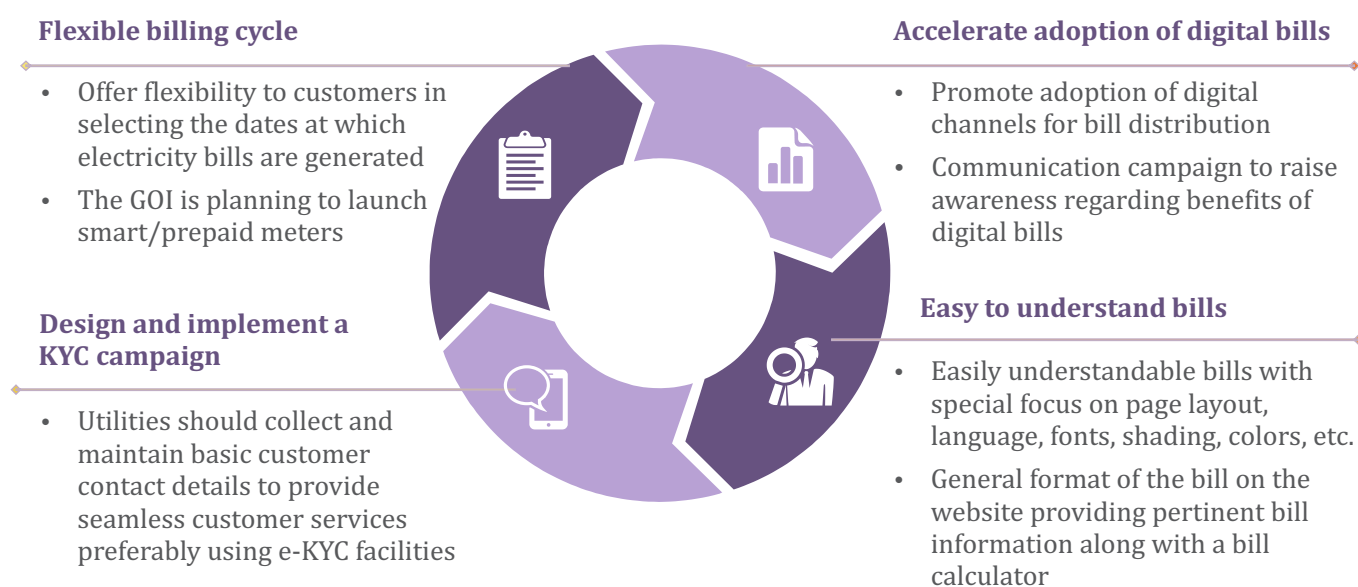
c.   Clarity about the bill constituents

Electricity bills are often packed with a lot of information or technical terms. However, most customers do not understand basic information such as break up of charges, applied tariffs, consumption, etc. in their electricity bill[46]. The FOR has also issued a model format for electricity bills to make sure that the information provided in the bills is easy to understand by customers[47]. However, many utilities have not adopted this format. It is imperative to ensure that both the content and layout of electricity bills meet customer expectations.

5.3 Key interventions to enhance customer satisfaction

Based on the review of the current processes and stakeholder consultations, a set of interventions (Figure 13) have been identified to enhance customer experience.

Figure 13: Suggested interventions

Flexible billing cycle

- Offer flexibility to customers in selecting the dates at which electricity bills are generated
- The GOI is planning to launch smart/prepaid meters

Design and implement a KYC campaign

- Utilities should collect and maintain basic customer contact details to provide seamless customer services preferably using e-KYC facilities

Accelerate adoption of digital bills

- Promote adoption of digital channels for bill distribution
- Communication campaign to raise awareness regarding benefits of digital bills

Easy to understand bills

- Easily understandable bills with special focus on page layout, language, fonts, shading, colors, etc.
- General format of the bill on the website providing pertinent bill information along with a bill calculator

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[45]Source: Report by Forum of Regulators, "Review of functioning of CGRF & Ombudsman", August 2016

[46](May 2017), Energy Billing: Landscape Report and Summary of good practice, BEUC Input to The Consumer-Friendly Energy Bill Initiative, last accessed on 2nd January 2020

[47]http://www.forumofregulators.gov.in/Data/study/SEB.pdf, last accessed on 28th April 2020

1.   **Flexible billing cycle**
      All electric utilities in India generate periodic electricity bills depending on the billing cycle which is generally allocated by the utilities. Customers do not have the flexibility to select a billing cycle or date when bills are generated. This contrasts with other sectors (for example banking/financial services) where customers have an option to select the dates on which the bills will be generated. Similarly, electric utilities may also provide this flexibility to its customers. With smart pre-paid meters, customers will get flexibility to use and pay for electricity as per their requirements, instead of paying the full electricity bill at one go.

Flexible billing cycle in the banking sector
Many leading FIs such as American Express, HDFC Bank and Citibank, among others, provide a one-time option to its customers to change the payment due date or statement closing date. This provides flexibility to the customers to opt for the most suitable date at which they can clear their dues (e.g. few days after receiving salary).

2.   **Accelerate adoption of digital bills**
      One of the major cost elements for electric utilities is the printing and distribution of electricity bills. For instance, printing and distribution costs contributed nearly 27% to the overall bill generation and distribution costs[48] for Jaipur DISCOM (Rajasthan, India)[49]. The printing and distribution costs can be reduced by switching to digital modes such as e-mails, mobile messages, mobile applications, etc. A switch to digital channels will also ensure that customers receive their bill on time. Utilities may consider providing such options to their customers along with suitable incentives. A robust communication campaign can be designed and implemented to raise awareness about related benefits such as environment benefits, reduced cost of electricity distribution, etc.

Digital bills in the U.S.
Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Long Island Power Authority in the U.S.; and Energy Australia and Horizon Power in Australia are some examples of utilities that provide a digital version of the electricity bills to their customers. In some cases, utilities also incentivize customers to opt for digital bills, e.g. Long Island Power Authority provides a USD 15 gift card on enrolling for paperless billing.

3.   **Easy to understand bills**
      Utilities should realize that providing more information does not necessarily make a bill "easier" to understand. Many techniques are available to make a bill more understandable, including working with page layout, language, fonts, shading, colors, etc. Many customers are unable to understand the key constituents of electricity bills. A study by the European Commission (2010:16) found that only less than half of European households knew how much electricity they consume. It may therefore be advantageous for utilities to engage with customers and representative organizations/forums to develop bills which are best suited in the local context. The electricity bills can also be used as a tool for educating customers about energy efficiency and demand side management techniques. Utilities may also include a QR code on the bill to enable customers to make payment through the mobile application.

[48]Other costs include implementation and operation of billing system and meter reading
[49]http://energy.rajasthan.gov.in/content/dam/raj/energy/jaipurdiscom/pdf/orders/ITCirculars/TN_42_DIL.pdf, last accessed on 12th December 2019

Redesigning electricity bill

SSE, a U.K-based energy company, published a simplified bill to reduce customer confusion over energy bills. SSE proposed a simpler bill sample covering a range of topics including energy savings tips, clear depiction of payable amounts, benchmarking against previous duration and contact details for further correspondence among others[50].

4. Know Your Customer

In order to provide seamless customer services, it is imperative to collect and maintain basic details about the customers like name, address, e-mail address, phone numbers, BPL cardholder number (if any), etc. This information is also a prerequisite for implementing alternate mechanisms for disbursal of subsidies like DBT scheme, wherein customers pay electricity bills as per the tariff determined by the regulators, and subsidies are transferred directly into their bank accounts. Such a mechanism could help in resolving the issues related to poor targeting of subsidies (even wealthy customers are eligible for subsidies), inefficient consumption (inadequate incentives for customers to enhance consumption efficiency) and increased subsidy burden for the government. Many utilities in India (Delhi, Jharkhand, Haryana, etc.) have initiated or are planning to initiate the process of collecting such details for each customer. The DISCOMs should initiate the process of capturing such details for all customers. The data collection may be done through digital modes of communication as adopted in an e-KYC facility.

e-KYC facility in the banking sector

- In the banking sector, complying with KYC regulations increased the turnaround time for carrying out major activities. For instance, opening a bank account used to take 7-10 days. To address the issue, application forms for financial products started to be digitally filled using data from each person's e-KYC. This significantly cut down the paper usage and reduced both cost and time. Each form was digitally signed through biometric authentication. Since all records are provided instantaneously in electronic form, the time taken for document verification and data entry was reduced to zero.
- Axis Bank was the first bank in India to offer an e-KYC facility in 2013. This reduced the turnaround time for opening a bank account to just one day. Today, this facility has become a norm as many traditional banks and licensed payment banks in India offer bank accounts that can be opened and used instantly with e-KYC.

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[50]https://sse.com/newsandviews/allarticles/2016/02/new-sse-bill-design-aims-to-end-energy-bill-confusion/, last accessed on 20th February 2020

5.4 Nudge techniques

Among the suggested interventions, adoption of digital bills requires customer sensitization and behavior change. Appropriate nudge techniques which can be adopted by the utilities to increase uptake of digital bills include:

- **Minimize friction costs by making digital bills as default option:** Automatic enrollment for a choice increases customer participation along with sustaining a substantial retention rate. (Madrian et al, 2001)[51]. Several countries in Europe have changed their laws to make organ donation the default option, increasing participation from 15% to 90%. Instead of requiring customers to choose their preferred mode of bill distribution, utilities may provide digital electricity bills as default option to new customers. This may increase the uptake of digital bills by reducing friction costs for customers.

- **Sharing information related to number of customers opting for digital bills:** Several international brands such as Google Apps for Work[52] and Netflix[53] highlight the most popular pricing plan to incentivize the customer to select the same. In a similar manner, utilities may also spread the message related to number of customers who have opted for digital bills to increase adoption (e.g. 90% of people have shifted to digital bills in your locality).

- **Minimize fear of shifting to digital bills:** Customers tend to prefer known risks over unknown risks (Fox & Tversky, 1995).[54] Customers may be fearful of shifting to digital only bills due to consequences such as fear of missing the date, unclear charges, and data inaccuracy. Ensuring that the digital bills are viewed as trustworthy and accurate source of information may help to increase adoption. This could be done by combining digital bills with other services like regular reminders of payment of electricity bills, flexibility to verify consumption charges through DISCOM's website or mobile application or through call centers, etc.

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[51]Madrian & Shea (2001), The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior, The Quarterly Journal of Economics
[52]https://gsuite.google.co.in/intl/en_in/pricing.html, last accessed on 10th March 2020
[53]https://www.netflix.com/signup/planform, last accessed on 15th March 2020
[54]This tendency to prefer known risks over unknown risks is referred to as uncertainty aversion.