

Combined Billing and Customer Care Systems for All Utilities in a Smart City



Amit Jindal

Abstract Smart city is a structural, predominantly composed of Information and Communication Technologies (ICT) and several physical devices, to optimize the system efficiency and improvement in various services including utilities (Electricity, Water, Gas, etc.). ICT assist to enhance service quality, system performance and collaboration between numerous departments to deliver services in a time bound manner. Utilities supply electricity, gas, water, sewer etc. to consumer's premise and charge fee against the services provided as per regulatory guidelines. These services might be provided by a single entity or multiple entities as per structure of urban local body. In major cases, utility services are provided by distinct entities and charges from the consumers are collected independently. In such a scenario, each entity must visit consumer premises and generate reports for billing, payments, collections, customer notices and customer base, which consume a lot of time, effort and impose huge costs. Consumers pay all utilities bills separately, which billing cycle, cash collection counter and customer care systems are working independently. Combined billing and customer care systems will help utilities to overcome aforementioned problems and visiting of consumer premises is required only once a month to collect consumption data and bill distribution for all utility services. In such scenarios all utilities will work in an efficient manner with a smaller number of employees, which leads to cost savings to them. The combined CC&B enables utilities to manage payments, deposits, consumer accounts, tax and meters through a single interface. Consumers will be empowered to make payment for all utility services at the same counter in one go and their service problem will be resolved in an efficient manner.

Keywords Billing · Customer care · Utilities · Revenue · Information and Communication Technologies (ICT)

A. Jindal (✉)
PricewaterhouseCoopers Private Ltd, Gurgaon, India
e-mail: amit.jindal@pwc.com

1 Introduction

A utility bill is a detailed invoice, issued from utilities, including electric, water, gas and sewer as per defined billing cycle in accordance with utilities business process. Utility bills for consumers are majorly categorized in residential, commercial and industrial segment. The billing structure of these categories are basically the same. However, charges for industrial and commercial categories are more than the residential category. The billing calculation of water, gas and sewer consumption is somewhat straight forward; however, electrical energy and power billing can be more complex.

A utilities infrastructure should be designed in such a way to meet its consumer's demand. Basically, the utility must predict the demand-supply scenario in its service area. The over-sizing of the equipment is expensive and the utility recaptures such investment through various components of the bill. On the aspect with the utilities is that the system's demand tends to be worse during certain seasons and times of the day. For example, during summers, electricity load of air conditioning will be highest in the afternoon and evening. Secondly, consumption of the water also increased multi fold. In the winters, the electrical and gas systems may experience increased loads in the early morning and afternoon. However, demand of water sharply declines due to less consumption. These peak demand/loads vary largely depending on what types of heating and cooling systems (gas or electric) make up in the utilities' service area.

In many cases, the utility systems are working on their full capacity. That is, any significant additional load (demand) will stretch the existing infrastructure such as lines, equipment and system's capacity. Utilities use different pricing methods for different time zone, or signals, to encourage consumers to reduce usage during periods when the utility system is nearing its peak capacity. These signals are often printed into the consumer's tariff structure. Understanding the tariff structure often leads to the ability to save energy costs.

In the "metered" service arena, we can accurately measure energy consumption for electricity, water and gas. Based on consumption, utility generates bill with applicable tariff structure and tax regime. Within just those confines, we obviously need a method to measure consumption, a technique to get that measurement back into billing system, and a way to create, store and apply the correct rate to that measurement. Additional complexities arise in the multiple ways consumption can be measured with the most complex being electricity with kWh, kW, kVAR, TOU, MD, PF, Fuel surcharge etc.

Utilities capture and maintain consumer centric information covering name, address, sanctioned demand, billing and payment history along-with other key parameters. Based on consumption, utilities generate the bills to the consumers and send them to pay for the services availed. i.e. it is the entire Meter-to-Cash process. In utilities, this is a structured and complicated process requiring a sophisticated software.

Every created bill has unique number to record in their general ledger. Therefore, a billing system to have a way to flexibly code their rent, tariff charges, consumption,

demand, taxes etc. to link them to an appropriate set of general ledger account numbers, and then appropriately roll up and transmit totals to those general ledger account numbers. All financial transaction, such as payments or adjustments or write-offs are recorded in a debit/credit pair. Ultimately a billing system is the AR (Account-Register) sub-ledger and must be fully integrated into the financial system.

Combined billing system is the collective bill of different utilities covering electricity, water, gas and sewer and only single entity will responsible for the meter to cash process. The combined bill sent by the responsible entity to the consumer is actually separate invoices on one piece of paper, including all necessary information to fulfil regulatory requirements of the invoice. The entity is responsible for the receivables from the consumer, including debt collection in situations where the consumer is late with payments or does not pay at all. The consumer's payment is settled on a single account owned by the respective entity, which is responsible for settlement of payment with all utilities.

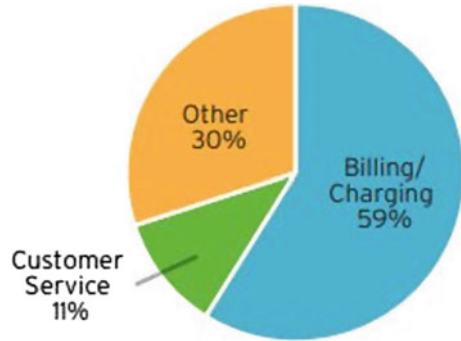
- a. The billing entity is responsible for printing and distributing the combined invoice to the consumer. The consumer will receive one piece of paper with data that fulfils regulatory requirements.
- b. The billing entity is responsible for the monetary settlement with the consumer and for accurately passing forward the respective utility's claim against the consumer.
- c. The billing entity shall responsible for due date monitoring and collection for the total claim against the consumer.

The entity shall be responsible for meter to cash related issues covering meter fault, billing issues, including debt collection. However, issue related to service quality, outage and leakage shall mainly be handled directly by respective utility.

2 Background

Nowadays consumer receive utility bills all the time for their services namely electricity, water, gas and sewer. These bills are received monthly or bimonthly and sometime on ad hoc basis as per their billing cycle in respective utility supply/service area. Many consumers have more than one connection at different periphery (Suppose different electricity connection in same city for different properties), so they receive multiple bills every month, whose billing cycles are different and it is very difficult to keep track of all the bills. Even consumer receive more than one bill from different utilities in the same territory in different bills and consumer need to pay them separately. Such bills are provided in hard copy or via e-mail to the consumer. The consumer reviews/validates the bills and pay to the utilities. Different bills have different payment deadlines and late payments usually result in substantial penalties. Needless to Say, receiving, reviewing, tracking, and paying each bill is and inconvenient and time consuming task (Fig. 1).

Fig. 1 Most cause of utility customer complaints. *Source* UK Energy Ombudsman



Additionally, if there is some discrepancy/dispute in the utility bills for different services or for same service under different territory then consumer needs to follow up with the separate consumer care service centers for resolution of the issues, which leads for the time, cost and dissatisfaction from the utility services. In such cases, creditability of the utility services will also be severely damaged.

In the 2016, Government of India has launched concept of Smart City would include:

- Adequate water supply
- Assured electricity supply
- Sanitation, including solid waste management
- Efficient urban mobility and public transport
- Affordable housing, especially for the poor
- Robust IT connectivity and digitalization
- Good governance, especially e-Governance and citizen participation
- Sustainable environment
- Safety and security of citizens, particularly women, children and the elderly and
- Health and education.

Smart city is a structural, predominantly composed of Information and Communication Technologies (ICT) to optimize the system efficiency and improvement in various services including utilities (Electricity, Water, Gas, etc.). ICT assist to enhance service quality, system performance and collaboration between numerous departments to deliver services in a time bound manner. Also, ICT can enable various services under one roof for improvement in consumer services, saving of time and fuel and gain consumer faith.

With deliberation of utilities backdrop in their billing and service methods and availability of smart city ICT infrastructure, notion of combined billing and customer care systems for all Utilities is conceptualized. Combined billing system is an individual-based System which collect billing information for a consumer premises and sends bills through the e-mail or a hardcopy, as per regulatory guidelines, for payment. The consumer receives a single bill with all desired information and make combined payment in a Single account.

Combined billing system will overcome mass mailing system, multiple bills in different billing cycle, different payment timelines and provide improved billing and payment Systems. Apart from this, customer bill dispute can be rectified from the one place only.

3 Recent Utilities Trends

In recent years, the utilities are moving towards transformation of their business in digital era. Digitalization and new technologies are driving demands for advanced strategies and integrated data-driven business solutions, providing higher operational efficiency, better financial management and advanced customer services in cost effective manner.

Nowadays, the customers are demanding for more accurate and transparent billing along-with real time monitoring for control, billing review and timely payment. So, utilities are concentrating on customer demand and listening more carefully their voice to respond for more involvement and control over energy usage. The new generation become more conscious and comfortable with mobile apps, social media, and always-on connectivity, which all adds up to a “new normal” in the customer experience. In this new normal, customer is desiring, specifically in electricity energy, in tariff structure, source of electricity, time of day mechanism, micro grid, RE and net metering. Commercial and industrial customers are looking to combine more cost and utilization control with opportunities to self-generate, while setting themselves and their utilities ambitious targets to reduce emissions from their energy use.

On the other hand, Involvement of multiple stakeholders, more access of data and open access, cybersecurity anxiety is increasing from technology to management that can disrupt service on multiple levels, from data security to infrastructure. Unfortunately, cyber security and associated threats are underestimated and unimplemented by the utilities due to lack of knowledge, expertise, cost, resource, and time constraints.

According to the UK government’s latest survey on cybersecurity breaches, almost half of businesses experienced a breach or attack in the last year, making the cybersecurity the 2nd most addressed topic for the UK’s utilities.

Cyber security technology by itself, however, can only partially address the issue of cyber threats. Utilities also need to deploy the proper organization and processes in order to supplement the impact of cyber security protection technologies. One potential solution is for utilities and suppliers to develop standardized processes together, so that concepts such as device configuration will be effective in a multi-suppliers environment.

In the technology changing environment, the regulators are promoting for evolve and adapt to recognize and incentivize new technology options such as energy storage, EV charging infrastructure, Rooftop solar, two-way power flows, cloud-based solutions, demand side management, smart metering and customer centric solutions throughout the business. Traditional cost-of-service regulatory structure

often does not encourage innovation nor impels the investments necessary to satisfy customers' evolving needs.

It will be of utmost importance that regulations in the energy and utility sectors are timely aligned with the customer expectations, market evolution and adoption of new technologies such as digital capabilities or storage, taking their relationship with customers on an entirely new level, for the overall disruptive transformation of the industry.

4 Distinctive Features of Purposed Solution

We propose combined billing and customer care systems (CB&CCS) for all utilities in a smart city. Combined billing system will extract all utilities bills of single customer and combined them into one bill. The customer can pay for the consolidated bill once per billing cycle and all the bills are settled by the combined billing system. The customer can call to combined customer care center to rectify of bill dispute related to any utility service.

- **Multiservice** bill for utilities of different standards (electricity, gas, water, sewage, garbage collection, etc.)
- **Multi-regional** supports for multiple jurisdictions, with different business rules for each jurisdiction, including different utilities, prices and tariffs, taxes, billing and payment options etc.
- **Multi-payment mechanism** provision of the multiple payment mechanism like cash counter, card swiping, online, account auto-debit and payment gateway.
- **Multi-utility customer care** support to handle multiple utilities billing and service-related complaints.
- **Multi-language** bill as per customer requirement.

The combined billing and customer care systems (CB&CCS) should be able to connect to all utilities billing, payment and customer care interfaces so that system can get the billing information such as user account, bill amount, bill date, payment deadline, bill breakdown details and minimum payment amount, and payment details such as payment history, and store them into database. The billing deadline for all utility bills for one customer shall be same (Fig. 2).

Utility Billing: We recommend that combined billing agency collect the billing data from customer premises for all utility services in one visit. Collected billing data to be sent to the respective utility for calculation of the bill amount and send back to the combined billing agency for distribution. Combined billing agency collect the billing parameters from respective utilities, validate data and compute combined bill with a suitable payment deadline. Further, they send the combined bill to customer on email or hardcopy as per regulatory guidelines. Each customer has unique account number for combined billing system as well. Consumer receive a single combined

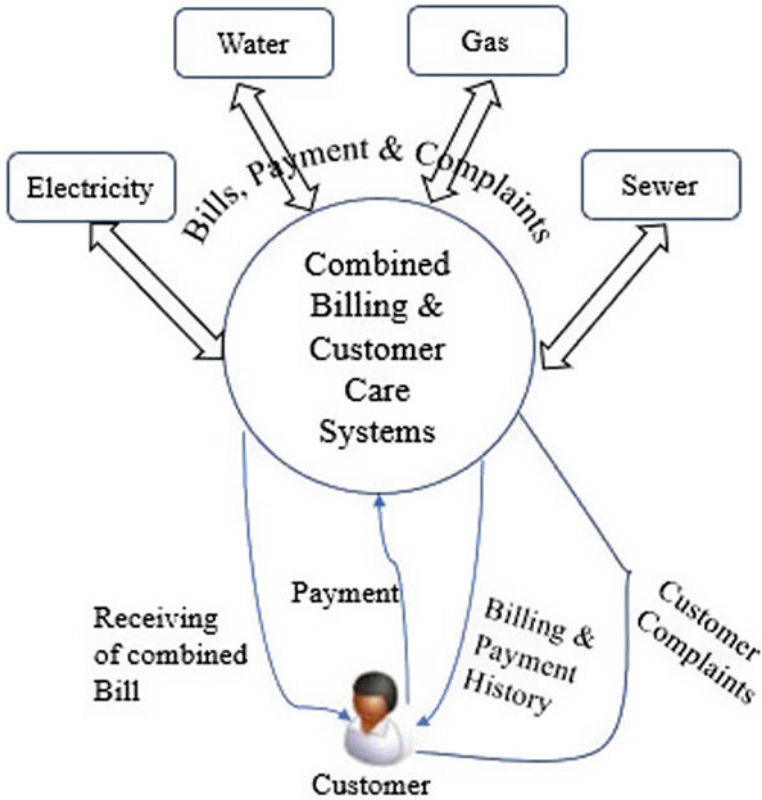


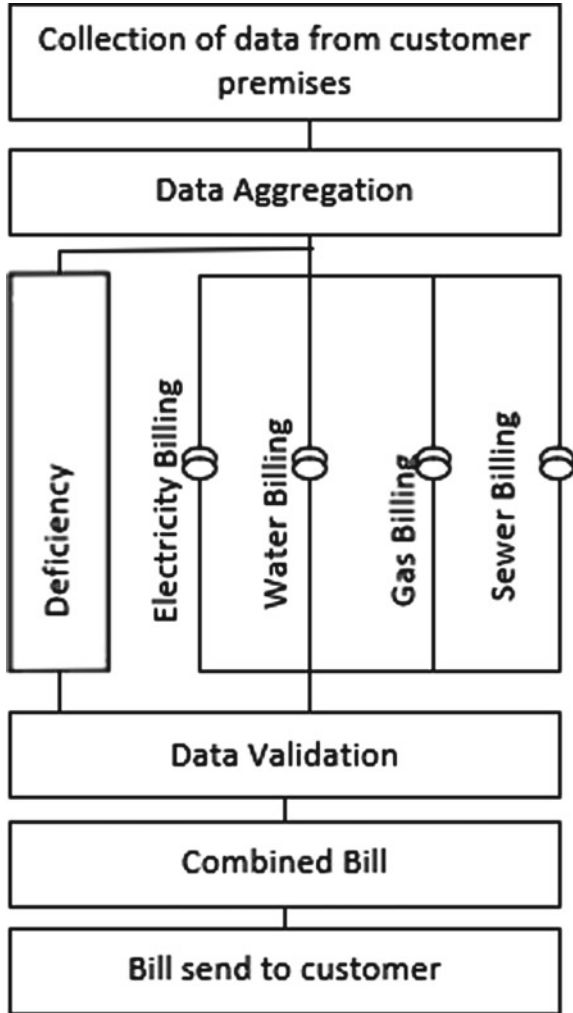
Fig. 2 Depicted of combined billing and customer care

bill for all utility’s services availed by them and deadline of the payment to be same for all services.

Payment Collection: Financial health of any utility solely depends upon collection of bill amounts from the consumers. To ensure prompt payments by consumers proper facilities to be provided. Combined billing agency collect the payment from consumers against the bill and handover to the respective utility as per their agreement. Consumer can receive their bill and payment history from single portal/app (Fig. 3).

Customer Care: Consumer can connect to the central customer care for the bill, payment and supply related concerns. Central customer care system can resolve the billing and payment related disputes at 1st level, else take the consumer complaint and forward to the respective utility department for resolution of the matter. In case of consumer’s complaint related to supply quality and outages, customer care can connect with respective utility team and maintain the complaint history for record. Further, consumer can check the complaint status from the central portal only.

Fig. 3 Indicative process flow



5 Implementation Strategy

The combined billing and customer care systems can be implemented successfully with necessary strategy to address technical, commercial and regulatory aspects.

- Simplify utilities tariff structure and billing format to make easier for understanding to consumers.
- A standardized data exchange with all utilities to promote well-functioning processes.
- Minimum essential data requirements include the point of delivery data, accurate and timely measurement of data, and utility’s tariff data.

- Long-term commercial tie up of service provider with all utilities and relevant stakeholders.
- Solid payment reconciliation process along-with frequency to be defined clearly.

The customer's payment is settled on cash counter and online bank account owned by the service provider and the service provider is responsible for passing forward to the utilities part of the payment on regular frequency. In other way, consumer's payment can be settled in the escrow account for transparency.

System should be allowed to accept partial payment with the due approval of concern authority. However, at the time of payment, consumer needs to define particulars of utility to make partial payment.

Software as a service (SaaS):

The development of new technology and widespread availability of an access facility, the combined billing system on SaaS software complex with cloud-based solution is more flexible and productive. The system is maintained by the service provider with guarantee of 100% uptime and the access to the users (utilities and consumers) are provided through online services. The service provider shall collect the metering data from consumer premises and facilitate to the utilities through data exchange interface for billing calculation (Service provider can also calculate billing depends on the utility's requirement). The system combines billing data, receives payment data, as well as issues receipts and maintain customer complaints history. System provider shall have following key responsibilities as SaaS:

- Maintain and update system to achieve 100% uptime
- Development of new featured as per future requirements and regulatory guidelines
- Data exchange interface for seamless data transfer
- Both utilities and consumers can access system on the same platform.

6 Benefits

The combined billing and customer care systems are beneficial for all stakeholders including customer, utilities and combined billing agency in the new billing and payment mechanism.

Customers:

- Don't have to keep track of their individual bills and less risk of late payment fines.
- Online accessibility to check all utility bills along-with details from anywhere at one place in more organized way.
- Track multiple utilities bills and make payment without logging into individual utility portal/app separately.
- Easy to analyze various expenses at one place and generate reports without any expenses tracking tool.

- Rectification of utility's billing and service-related issue at one place.
- The user also doesn't have to receive multiple physical mails or emails from different organizations.
- Saving time for the customer as well as saving resources for the environment.

Utilities:

- The process of billing system is simplified by the combined billing system.
- No need to visit customer premises for collection of billing data and bill distribution.
- Saving time, manpower and fuel costs especially for the visiting consumer premises for data collection, bill distribution and payment collection.
- Improvement in billing and collection efficiency more reliably and more promptly.
- Less manpower is required for reconciliation of billing and payment collection data.
- Minimal capacity of customer care center is required to handle customer complaints.
- Improve customer satisfaction and reduce the workload on customer service.

Combined Billing and Customer Care Agency:

- Collection of all utilities metering data in one visit in place of repetitive visit at customer premises
- Combined billing system can make a profit by providing services to both utilities and the customers.
- Increase brand value and customer base for other billing services such as telecom, insurance, tax, banking etc.
- The billing system also earn some profit by holding collection money for some time.

7 Conclusion

Nowadays consumers are getting separate bill for each of the utility service, whose billing, and payment cycles are different so tracking of bills become huge task. In case of dispute in the billing or payment then consumer needs to connect with different utility offices, which is completely wastage of time, fuel, cost and other resources. The proposed combined billing system provides a more convenient way of organizing and tracking utility bills. Consumers will receive a combined bill of different utility's services instead of many bills separately. This makes consumer less likely to forget to pay the bills, saving both time and cost in convenient manner. Consumers can track and check different utility bills in one combined system, which help for more understanding about usage. Consumer can download billing and payment history from one place. Utilities don't require to visit at the consumer premises for collection of billing data and bill distribution. On the other hand, the combined billing agency

will get all the payments in time as billing cycle of all utility's service will same for individual consumer.

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