Comparative Analysis and Policy Study on Residential Electricity Bills in Selected ADB Member Countries

Electricity is a public necessity for a modern society, and electricity consumption grows more rapidly than consumption of other types of commercial energy as a society increases in affluence. This working paper intends to make a comprehensive comparison of electrical bills of residential consumers among ADB member countries and uncover what tariff structure and policies ADB member countries adopted to promote renewable energy and energy efficiency among end users. It discusses key findings and policy recommendations in supply and demand side issues that will enable a clean energy development future.

About the Asian Development Bank
ADB’s vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region’s many successes, it remains home to two-thirds of the world’s poor 1.8 billion people who live on less than $2 a day, with 903 million struggling on less than $1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.
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<th>Full Form</th>
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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<td>APEC</td>
<td>Asia Pacific Economic Cooperation</td>
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<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<td>BGE</td>
<td>Baltimore Gas &amp; Electric</td>
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<td>BSES</td>
<td>Bombay Suburban Electricity Supply Company Limited</td>
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<td>CNE</td>
<td>Comision Nacional de Energia</td>
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<td>DESCO</td>
<td>Dhaka Electric Supply Company Limited</td>
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<td>DMC</td>
<td>Developing Member Countries</td>
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<td>DWR</td>
<td>Department of Water Resources</td>
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<td>EdC</td>
<td>Electricité Du Cambodge</td>
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<td>Electricité de France</td>
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<td>FERC</td>
<td>Federal Electricity Regulatory Commission</td>
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<td>GMS</td>
<td>Greater Mekong Subregion</td>
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<td>KEPCO</td>
<td>Korean Electric Power Corporation</td>
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<td>MERALCO</td>
<td>Manila Electric Company</td>
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<td>MFI</td>
<td>Multilateral Financial Institutions</td>
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<td>Mtoe</td>
<td>million tons of oil equivalents</td>
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<td>NEA</td>
<td>Nepal Electricity Authority</td>
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<td>PEA</td>
<td>Provincial Electricity Authority</td>
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<td>Potomac Electric Power Company</td>
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<td>PG&amp;E</td>
<td>Pacific Gas and Electric Company</td>
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<td>PHP</td>
<td>Philippine Pesos</td>
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<td>PLN</td>
<td>Perusahaan Listrik Negara</td>
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<td>South Asian Association for Regional Cooperation</td>
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<td>SWM</td>
<td>Stadtwerke München</td>
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<td>TA</td>
<td>Technical Assistance</td>
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<td>TEPCO</td>
<td>Tokyo Electric Power Company</td>
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<td>TNB</td>
<td>Tenaga Nasional Berhad</td>
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<td>TOU</td>
<td>Time of Use</td>
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<td>UN</td>
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<td>VAT</td>
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Abstract

Asia and the Pacific has experienced rapid economic growth over the past three decades. Asia and the Pacific region’s share of world GDP accounts for 28% in 2010, from about 17% in 1970 (Asia 2050 2011). Economic growth is always coupled with energy consumption. This relationship has led to an equally large increase in energy demand. Energy consumption in the region rose by 4.8% in the same time frame to 4980 Mtoe. Electricity, as the most flexible and important form of modern energy in the market, supplies an increasing share of total energy demand. Energy Information Administration under US Department of Energy (2011) forecasted electricity consumption, in particular across Asia and Africa, will grow rapidly along with economic development and poverty reduction. Being a public necessity to consumers in the modern society, electricity consumption grows more rapidly than consumption of other types of commercial energy with increased affluence of the society. This paper intends to uncover what tariff structure and policies ADB member countries adopted to promote renewable energy and energy efficiency and make a comprehensive comparison of electrical bills of residential consumers among ADB member countries. It discusses key findings and policy recommendations in supply and demand side issues that will lead us to clean energy development future.
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I. Introduction

1. The supply of modern electricity services is organized into 4 main functions: generation, transmission, distribution, and supply. Consumers apply for electricity services from suppliers (often distribution companies, though in some cases high and medium voltage consumers, and consumers in remote areas could also directly purchase power from generators) and sign a contract to pay for the measured use of electricity. For a defined period of time, suppliers send electricity bills to their customers. Customers pay the metered amount of electricity after consumption, also known as post-payment scheme, which is the dominant approach in the payment for energy supply services. More recently, several utilities have introduced a ‘prepayment scheme’ that allows customers to pay for a fixed amount of electricity before using it, which is designed particularly for customers in remote areas or for those with demand that is highly sensitive to the electricity price.

Figure 1: Electricity Supply Segments

![Diagram of electricity supply segments](source: APERC (2000)).

2. Electricity bills are the most important information tool for communication between customers and power suppliers. The bills should provide customers the basic information plus energy usage and unit cost to help them understand their electricity use and expenditure, resulting in their change in electricity consumption. However, few consumers are able to understand the details of their electricity bills. To a common person, the bill’s key information is the total amount of payment due, and in some cases, the amount of electricity consumed during the month. The bill is often unclear on the breakup of charges, such as a delivery charge, universal charges, and additional fees and so on. Information and design of electricity bills in the region could be significantly different country by country. Friendly design of the bills can help customers understand the changes in electricity tariffs and raise people’s awareness in energy conservation, energy efficiency, and supporting renewable energy. The information in bills may also release the policy design, ongoing rebates, incentives, and other programs offered by national and local governments, or utilities (Caroll et al. 2009).

3. The tariff per unit of electricity (kilowatt-hour, in brief, kWh) is set either by an electricity regulator or a government unit responsible for economic regulation of the electricity supply industry. Further, electricity billing is also used by governments to generate revenues for various objectives such as cross-subsidy; public finance (sales taxes, VAT, etc.); stranded cost recovery (market reform transition charge); and public benefits which include social (energy access), environmental (environmental levies), and other programs (fund to support energy conservation, renewable energy development, livelihood activities, etc.).
4. Before deregulation occurred, the regulators balanced the needs of consumers and utilities to set prices. This arbitrary method of decision making is far less efficient than market processes because decisions are easily influenced by politics. Regulated utilities in developed and some developing economies are often transparent in reflecting regulator’s tariff rate design, in providing cost breakdown details according to supply industry segments, and in presenting additional charges based on government policies in electricity bills. In many developing countries however most utilities are opaque and provide only the summary figures of the customer consumption and average tariffs.

5. When electricity sector deregulation and restructuring was introduced in developed and developing countries, the electricity regulators required utilities to unbundle the tariff to separate cost towards different segments of the industry (generation, transmission, distribution, and supply) and accordingly inform the customers. Unbundling the tariff ensured that changes reflect the factors that influence the cost of particular segments, e.g., changes in fuel price can only influence generation tariff and not the others.

6. A number of utilities in developed and emerging economies most recently recognized that electricity bills can be used to provide feedback to consumers to encourage behavioral change and promote energy conservation (Mahone and Haley 2011). With these, utilities provide historical data of each customer’s consumption as well as benchmark information (most efficient level of consumption from the neighborhood or consumer type) and information (tips) on how to reduce electricity consumption were added in the bill to provide comparative information to customers and encourage energy conservation. In these cases, utility bills become a technological tool to provide feedback information to electricity ratepayers to stimulate behavioral changes.

7. The study reviews household electricity bills in selected ADB member countries and compares the level of information provided by utilities taking into account government pricing policies, level of electricity supply deregulation and unbundling, utility-based energy efficiency programs, etc. The study focuses only on the household electricity bills since it is the biggest (in terms of number of customers) and the most diverse market segment of the electricity supply industry whose levels of consumption are influenced by various factors such as income level, cultural practices, level of awareness, etc.

A. Information Related to Tariff Rate Design

8. Some utilities present the regulator-approved tariff structure and rates in household bills or present the bill calculation revealing the approved tariff structures and rates. Ratemaking is a complex process aiming to satisfy multiple policies and business goals. Efficiency goals for example are often being balanced with equity and other considerations. As rules of thumb, government regulators design electricity tariffs based on the principles described below (Reneses et al. 2009).

- **Sustainability.** Tariff must ensure that suppliers will recover all the accredited costs incurred in the production of electricity services.
- **Efficiency.** Tariff should provide correct signal to consumers encouraging them to use the amount of the resources that are most efficient to the system as a whole, both in short and long terms.
- **Equity and non-discrimination.** This means that consumers are charged with the same amount for using the same good or service regardless of the purpose for which
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it is used and the nature of the consumers. In many cases, particularly in developing countries, positive discrimination criteria are also being practiced to provide subsidies to very poor consumers.

- **Others.** Other principles considered in the electricity tariff design include transparency in tariff design, simplicity in the process, long-term stability, and consistency with existing regulations.

9. In tariff design, the total costs of service to be recovered through rates are determined. These costs which are functionalized into generation, transmission, distribution and retail, are then split into costs drivers. Common cost drivers used by regulators are peak demand (kW), energy consumption (kWh) and number of customers. Once the costs are split among cost drivers, they are then allocated to different consumer categories. The allocation of costs takes into account the specific contribution of each function that can be attributed to energy consumption and peak demand of the different customers. The tariff structures are then computed based on the tariff design specified by the electricity regulator. Traditional tariff designs which are relevant for ADB’s developing member countries include the following: i) flat rate, ii) linear tariff, iii) two-component tariff, iv) block tariffs, v) time of use tariffs, vi) seasonal tariffs, vii) interruptible tariffs, and viii) others (Lin and Jiang 2011).

B. Power Industry Liberalization and Tariff Unbundling

10. Some electric utilities in countries, where power sector deregulation and competition were successfully implemented, have their tariffs unbundled and reflected in household electricity bills. Unbundling electricity tariffs therefore becomes a natural consequence of electricity market liberalization. Historically, the whole electricity supply industry was considered to be a natural monopoly. The power production cost is declining due to economy of scale. And it would be more efficient to have a single firm involved in electricity production. Thus, in the past most electricity utilities globally were vertically integrated in generation, transmission, distribution, and supply.

11. Electric utilities were also traditionally owned by the public sector, particularly in Europe and most developing countries. However, in the 1980s, there was a growing recognition that only the transmission and distribution segments of the power industry were natural monopolies and that the generation and retail segments were competitive industries. Under monopoly, economic theory points out to market dominance which results in higher electricity prices because of less market competition. Reforms were introduced in many industrialized countries with the arguments of increasing economic efficiency and to lower prices and improve customer choice.

12. Following the deregulation trends in developed economies, many developing countries introduced reforms by unbundling and privatizing their power supply industries with the core objectives of improving public utilities' technical and operational efficiencies; reducing financial burden of national governments in expanding electricity supply; and attracting private sector investments. Under unbundling, vertically integrated companies were broken down into, at least 3 main segments: generation, transmission, and distribution. Under the privatization process, utilities were first corporatized, then privatization were carried out either through divestiture of public assets, or through public listing in the stock market (Trebilcock and Hrab 2004).
13. Competition was also introduced in the competitive segments of the industry in several countries like the Philippines, Singapore, Malaysia, and Thailand. During the transition phase, the private sector was allowed to participate in power generation services, known as Independent Power Producers (IPPs). Developed countries and some developing countries had introduced wholesale competition by establishing wholesale electricity spot markets while a number of developed countries have further introduced retail competition by separating distribution and supply functions. Deregulation and privatization require an effective regulation to ensure fair competition, control market power, promote investment, and protect consumers' welfare. As prerequisite to reforms, independent electricity sector regulatory agencies were also established in most countries that introduced market competition, such as, Federal Electricity Regulatory Commission (FERC) in United States, Comision Nacional de Energia (CNE) in Spain, Italian Regulatory Authority for Electricity and Gas for Italy and the Regulatory Authority for Energy in Greece in Europe.

14. Reforms in electricity tariffs including tariff unbundling were integral component of electricity market reforms. Tariff unbundling refers to the segregation of different cost components such as generation, transmission, distribution, and supply costs in the electricity bill. Many developing countries are in the process of restructuring and deregulating their electricity markets (IEA 2001).

15. According to the equity principle of tariff ratemaking, all customers should be charged with the same amount for the consumption of the same good or services. Under public interest, electricity is being considered as one of the basic necessities of life, and should be provided at affordable rates even to the poorest. Regulatory agencies often set subsidized lifeline rate for this consumer category. The cost of providing lifeline rate is often passed on to the non-lifeline rate end-users in the form of cross-subsidy and regulators ensure that utilities will not incur losses in the implementation of the lifeline rate.

16. In addition to the lifeline rate, other forms of cross-subsidies also exist in many countries. Prior to electricity market reforms, cross-subsidies were prevalent in markets operated by publicly-owned utilities. Cross-subsidization distorts electricity market and will not be supported under competitive environment (Lin and Jiang 2011, IEA 2001). When introducing reforms, governments introduce gradual phase-out of cross-subsidies to reduce the impact on electricity rates while regulatory authorities ensure that cross-subsidization is transparent and reflected in the electricity bills. Regulatory agencies include provisions for changes in fuel prices and exchange rate fluctuations in tariff calculations, particularly in determining wholesale generation costs. Some utilities however provide this information in electricity bills to inform customers about the price movement of electricity due to these variables. For instance, the Tokyo Electric Power Company (TEPCO) in Japan provides information concerning the current fuel cost adjustments as well as the following month's projected adjustments. On the other hand, WienEnergie Utility in Austria provides information related to increase of electricity rates due to increased penetration of renewables in the generation mix.

II. Profiles of Studied Countries

17. ADB has 67 members of whom 48 are from the region and 19 are from Europe and North America. The study analyzed household electricity bills from ADB’s 24 member countries, of which, 14 are developing member countries and 10 are donor countries. These are shown in the following table.
18. The information revealed in the household electricity bills of ADB member countries could be classified as follows: account information, rate structure and pricing policies, public policies (taxes, social equity considerations, fuel adjustments, public benefits surcharges), and feedback information to promote energy conservation.

19. This section reviews the concepts and definitions of the different information categories in household electricity bills.

III. Summary of the Analysis

20. Household electricity bills in selected ADB member countries, in general, include the following four types of information: account information, tariffs, policies, and feedback information. Not surprisingly, all household electricity bills collected in this study contain basic information such as payment due, contact details, customer service information, etc. Among the utilities in the selected developing countries, only Meralco in Philippines has tariffs unbundled into generation, transmission, and distribution since Philippines has competitive electricity market structure (wholesale competition) and that tariff unbundling was prescribed in the Electric Power Industry Reform Act. An analysis of these four types of information was done to compare the difference between developing and developed countries, illustrated in Figures 2 and 3. More details are discussed in the following subsection.

- Basic Rate Structure

21. In general, commercial customers pay demand charge while residential customers do not. It is not cost effective to have two meters for residential customers. More than one-half of studied utilities present calculations revealing tariff structure while the other half show only aggregate electricity consumption and average rate. BSES (India) moreover shows regulator-approved tariff structure.

22. A simple calculation showing total consumption and average rate is shown in the electricity bills of ENA (Armenia), DESC (Bangladesh), EdC (Cambodia), Telasi (Georgia), PLN (Indonesia), Sever Electro (Kyrgyz Republic), NEA (Nepal), and Meralco (Philippines).

23. In the developed countries, two-thirds of the utilities (mainly European and American utilities) have shown unbundled tariffs in their bills. Utilities with unbundled tariff rates are SWM Munich (Germany), WienEnergie (Austria), STEWEAG-STE (Austria), PEPCO (US), BGE (US), PG&E (US), Delmarva (US), Hydro Ottawa (Canada), Enel (Italy), and British Gas (UK). The rest, Endesa (Spain), EDF (UK), TEPCO (Japan), SP Services (Singapore), and KEPCO (Republic of Korea) have bundled tariffs.
24. Tariff unbundling in US utilities is according to electricity supply industry segments (generation, transmission, and distribution charges) while those in European utilities are based on monopolistic and competitive industry segments (energy charges and network charges). One-third of examined utilities present calculations revealing tariff structures while the remaining two-thirds show aggregate electricity consumption and average tariff rate. Those that reveal tariff structures are British Gas (UK), Enel (Italy), TEPCO (Japan), PG&E (US), and PEPCO (US). Those utilities that show tariff calculations have inclining block tariff rates.

Electricity Bill Amount = Energy Charge + Demand Charge + Surcharge
25. On the other hand, calculations showing inclining block tariff rates are observed in EdL (Lao PDR), the PRC, BSES (India), Astana (Kazakhstan), MEA (Thailand), TNB (Malaysia), and EVN (Viet Nam).

\[
\text{Electric Bill Amount} = \sum (\text{kWh used/block} \times \text{Rate/block}) + \text{Taxes} + \text{Other Charges}
\]

26. In DESCO and NEA, rates are further disaggregated into energy charges (kWh) and capacity charges. The PRC and MERALCO in the Philippines, on the other hand, have time-of-use (TOU) rates for residential customers.

\[
\text{Electric Bill Amount (TOU)} = \text{kWh used on peak} \times \text{Rate on-peak} + \text{kWh used off-peak} \times \text{Rate off-peak} + \text{Taxes} + \text{Other Charges}
\]
Public Policies

27. Two-fifths of the sampled household electricity bills indicate government taxes. These are in the form of VAT or general sales taxes. NEA (Nepal) and MERALCO (Philippines) have explicit subsidy charges, split into lifeline rate and cross subsidy in the case of MERALCO. MERALCO customers consuming over 100 kWhrs per month pay a constant lifeline subsidy of PHP 0.1395/kWh and a constant senior citizen subsidy of PHP 0.0001/kWh. All consumers pay a cross-subsidy of PHP 0.0103/kWh. Those consuming 100 kWhrs or less (lifeline consumers) have discounts ranging from 20% to 100%. A hundred percent discount is only available for those consuming 20 kWh or less per month.\(^1\)

28. Public benefits charges are collected by 4 utilities: MERALCO (missionary electrification and environmental fund), PLN (street lighting charges), the PRC (renewable energy premium), and Thailand (feed-in tariff charge). Additional charges are also collected in the PRC to cover the resettlement costs from local, medium and large dams; to finance water resource development (water fund) and programs for urban areas (urban fee).

29. In the developed countries, almost all of the sampled bills indicate government taxes. Value added tax (VAT) is common in all European utilities under study: SWM Munich (Germany), WienEnergie (Austria), STEWEAG-STE (Austria), Enel (Italy), EDF (UK) and British Gas (UK). In addition, electricity and user’s taxes are often included in federal taxes. In Spain, additional tax is imposed on consumption higher than the contracted capacity. Taxes in the US are in various forms such as delivery taxes (PEPCO), state surcharge taxes (BGE), franchise taxes (BGE), energy commission tax (PG&E), utility user’s tax (PG&E), etc. Regulatory charges are levied in Canada (Hydro Ottawa). In Delaware, state and local taxes are integrated in the rates. For Asian countries, taxes are not shown in TEPCO (Japan) and KEPCO (Republic of Korea) bills. In Singapore (SP Services), goods and services tax (GST) is imposed on electricity consumption.

30. Electricity ratepayer-funded lifeline subsidies are common in the US but not in Europe. Subsidies in the US are either levied as a dedicated support fund (residential aid discount PEPCO, rate stabilization plan in BGE) or as part of a fund for general purpose programs (PG&E). In Spain (Endesa), a note on subsidy is shown in the bill but the funding is taken from the government budget and not from ratepayer contribution. For Asian countries, elderly and families with more than 3 children are given discounts by KEPCO. No surcharges for subsidies are explicitly imposed in Japan and Singapore.

31. Public benefits charges are common in North America. These charges are intended to finance energy efficiency, renewable energy, and greenhouse gas emission reductions initiatives of the local and state governments. Examples are the charges for public purpose programs in California (PG&E); sustainable trust fund in DC (PEPCO), EMPower charge and regional greenhouse gas initiative credit in Maryland (BGE); clean energy benefit charge in Ottawa (Hydro Ottawa). In the case of Delaware (Delmarva), the environmental surcharge is imposed on gas consumption rather than electricity consumption.

32. In Europe, only EDF in the UK that has specific climate change levy. British Gas on the other hand has included 12% of the tariff to fund the government’s obligation to the

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1 PHP is Philippine peso. Exchange rate as of 24 April 2012 is PHP 42.72/US$.
environment. In Continental Europe, with renewable energy feed-in tariff policies and regulations put in place, tariff rates integrate the costs of electricity from renewable energies. In Germany (SWM Munich), electricity/energy taxes are also used to fund energy efficiency and renewable energy programs of the government.

33. For advanced Asian countries, KEPCO collects electricity fund to finance government programs on energy efficiency and renewable energies. TEPCO on the other hand imposes solar charge to its customers and use it to purchase power generation from solar power plants (TEPCO 2011).

\[
\text{Solar Surcharge Unit Price} = \frac{A - B \pm C}{\text{Overall electricity demand in the current year (estimation)}}
\]

where:

- \(A\) = Total cost TEPCO incurs in purchasing surplus power from solar power plants the previous year
- \(B\) = Power generation cost reduction as a result of purchasing surplus power from solar power plants
- \(C\) = Difference between the past purchasing cost and actual solar surcharge amount

34. Stranded costs, as explained earlier, are incurred when competition are introduced in electricity supply markets. Stranded costs (debts and contracts) of the privatized National Power Corporation and distribution utilities are passed on to the consumers and collected in the electricity bills. In the PRC, on the other hand, loan repayments for the development of the rural grid are also collected from the customers.

35. In developed countries, though fuel adjustments are integral part of tariff regulation process, some utilities reflect these adjustments in their electricity bills. For example, TEPCO (Japan) provides information on the amount of the fuel cost adjustments for both the billing month as well as estimate of the adjustment for the following month. WienEnergie (Austria) also reflects in the electricity bill the escalation in rates due to the increased penetration of renewable energy in the overall power generation mix. North American utilities collect stranded costs recovery in the form of universal service program (BGE), DWR Bond Charge and energy cost recovery charge (PG&E), debt retirement charge (Hydro Ottawa).

- Feedback Information

36. Comparative electricity consumption is shown in the bills of BSES (India), MEA (Thailand), and MERALCO (Philippines). For BSES and MEA, the historical electricity consumptions are shown in tabular form while a graph of past consumptions is shown in MERALCO bills. In addition, BSES provides information on government subsidies for customers who can limit their consumption during non-peak demand and peak demand months. MERALCO on the other hand provides information on how to save electricity particularly during the summer months.

37. In developed countries, almost two-thirds of examined household electricity bills in advance economies show historical energy consumption. Those from EDF (UK), Endesa (Spain), SP Services (Singapore), Delmarva (US) are presented in graphical form while those from PEPCO (US), Hydro Ottawa (Canada) are shown in tabular form. KEPCO (Republic of Korea), TEPCO (Japan), and PG&E (US) present the current month electricity consumption and that for the same month of the previous year.
38. SP Services (Singapore) provides benchmark consumption level while PEPCO (US), and Delmarva (US) provides benchmark retail prices. British Gas on the other hand presents the cost of electricity usage for the past 3 months.

39. Because of the disclosure regulation in the EU, information related to power generation mix, CO₂ emissions and its impacts are included in the household electricity bills of SWM Munich (Germany), WienEnergie (Austria), STEWEAG-STEAG (Austria), Enel (Italy) and Endesa (Spain). TEPCO, on the other hand, perhaps due to Japan’s commitment to reduce CO₂ emissions, has also included a calculation system to estimate CO₂ emissions from the given consumption of electricity and other fuels. Other information to increase awareness on energy efficiency are also provided by several utilities: energy savings tips (EDF – UK), EE demonstration centre (WienEnergie – Austria), suggested room temperature for air-conditioned rooms (KEPCO – Republic of Korea).

IV. Conclusion and Policy Recommendations

40. The study surveys the information embedded in the household electricity bills in both developed and developing member countries (DMCs) of ADB. The study results indicate that some utilities in DMCs (particularly those covering the metropolitan cities of each country) are converging with those in developed countries with respect to transparency in bill calculations and government policies as well as in using the electricity bill to provide feedback information to their customers concerning energy consumption and conservation.

41. As presented earlier, providing information on household electricity bills to encourage behavioral change is one of the measures under indirect feedback category of behavioral change interventions (other interventions are categorized as direct feedback, and advanced metering with dynamic pricing protocols). Additional indirect measures include reports and online interfaces (website information). Impact assessment studies show that direct feedback could result in energy savings between 5%–15% while indirect feedback from 0%–10%. Considering however the level of technological development in ADB’s DMCs, perhaps at this stage the most appropriate and practical for up-scaling is to redesign household electricity bills and to support utilities establish online information with respect to energy efficiency and conservation.

42. Based on the study analysis, the main features of the best practice household electricity bill are the following:

- Provision of basic account information, payment options, contact details and others is a standard norm.
- Unbundled tariff is transparent and tariff unbundling should be carried out when possible.
- Tariff rate calculations revealing tariff structure and pricing policies are desirable.
- Public policies are country specific and electricity bills should itemize and explain the objectives of all tariff surcharges and adjustments.
- Feeding back information to customers related to historical electricity consumption, benchmark consumption and prices, energy savings tips and information, climate change information, energy mixes and share of renewable energies, is becoming a trend in many countries.
43. Despite of these, a significant number of governments and utilities in ADB DMCs need to be sensitized with respect to the potential influence of household electricity bills on consumer behavior. To harness the behavioral change benefits from indirect feedback measures particularly redesigned household electricity bills, the study recommendations are outlined below.

**Recommendation 1:** Expand the sustainable energy policy toolbox to include intervention measures targeting behavioral change

44. Almost all of DMCs have policy statements concerning promotion of energy efficiency, renewable energy and clean fuels as means to achieve government objectives of ensuring energy security, providing energy access, and reducing environmental impacts (including climate change impacts) from energy production and consumption. The translation of these policy statements to specific interventions however vary from country to country due to different institutional circumstances and barriers to implementation of such measures.

45. In the case of the indirect feedback information through household electricity bills and utility websites, either there is a lack of awareness from government responsible agencies or lack of emphasis on behavioral change as an effective means to promote energy conservation and clean energies.

46. Policy makers and energy regulators should complement their existing or planned energy conservation and climate change programs (which mainly focus on technology deployment and financing) by equally putting importance on feedback information interventions. Improving the designs of household electricity bills and supported by customer care information in the utility websites, and occasional feedback studies are the initial steps for a comprehensive behavioral change programs.

**Recommendation 2:** Establish partnership with electricity supply utilities

47. Feedback and behavioral change programs are implemented by electricity supply utilities and target residential customers. For DMCs whose electric utilities are government-owned, the development and implementation of such programs could be straightforward since utilities are under the oversight of energy or power ministries.

48. For DMCs with privately-owned utilities, responsible government agencies and regulatory bodies should establish partnership with these utilities. Majority of utilities in ADB’s DMCs do not have demand side-management programs thus, the partnership is very important in order to kick start a utility-based energy conservation program.

49. These voluntary partnerships could be viewed as support to government’s policy objectives of promoting energy conservation and climate change mitigation, as means to address chronic supply shortages as part of the utility’s load management program, or as part of utility’s corporate social responsibility.

**Recommendation 3:** Integrate behavioral change programs as part of customer service and demand-side management interventions

50. This recommendation is aimed at distribution and supply utilities. Among household electricity bills analyzed in this study, only those from BSES (India), MERALCO (Philippines)
and PEA (Thailand) have provided information to stimulate customers’ interest on energy conservation. Utilities from other countries are encouraged to introduce similar initiatives as a starter, as part of their customer services and/or as one of the measures under their demand-side management activities. Household electricity bills should have the following attributes:

- **Simple.** Household electricity bills should present calculations that could be easily understood by customers. The bill should provide a summary page and detailed pages showing rate and surcharges calculations.

- **Transparent.** Household electricity bills should be transparent and provide cost breakdowns with respect to the following:
  - tariff rate calculations and unbundling
  - public policy related surcharges (from subsidies to taxes, public benefits, etc. that are supported by ratepayers)

- **Instructive.** Household electricity bills should provide information related to the following:
  - payment options and instructions,
  - contact details for customer services, regulators and others
  - warnings related to fraud, theft, etc.
  - other information that benefit residential customers

- **Tool to encourage behavioral change.** Household electricity bills should provide feedback information related to energy efficient use and practices; climate change implications related to electricity use; and energy mix and use of renewable energies. Typical information include:
  - historical energy consumption, either in tabular or graphical presentation, and benchmark energy consumption and prices.
  - energy savings tips related to appliance use, ideal room temperature setting for air conditioners, etc.
  - addresses to learn more about energy conservation, energy efficiency services, etc.
  - power generation mix and environmental and climate change implications

**Recommendation 4:** Provide technical assistance to utilities to introduce and upscale behavioral change programs

51. Multilateral financing institutions, donor countries and organizations, United Nations organizations, and international not-for-profit institutions have traditionally provided technical assistance to various programs on energy efficiency and conservation, clean energy, and climate change in several DMCs. A technical assistance project on feedback information should be initiated with activities focusing on indirect feedback mechanisms (household bill improvement and development of online information) on the first phase. The second phase could focus on direct feedback and advanced metering and dynamic pricing for selected metropolitan areas of DMCs.

52. The technical assistance program covers capacity building for utilities and government agencies concerning behavioral change interventions, assistance in the identification and design of appropriate measures, and provision of financing for the implementation of these mechanisms.
53. For ADB, the existing or a new regional TA on energy efficiency could also support up-scaling of indirect feedback mechanisms in DMCs. Alternatively, these activities could be included when a technical assistance project or a loan is implemented in one of the candidate countries.

**Recommendation 5: Strengthen regional dialogue and sharing of experiences**

54. Feedback interventions and behavioral change programs are widely applied and experimented in a number of North American utilities. As also shown in this study, BSES (India), MERALCO (Philippines) and to some extent MEA (Thailand) as well as utilities in some economically advanced ADB member countries such as SP Services (Singapore), KEPCO (Republic of Korea) and TEPCO (Japan) have provided information in their household electricity bills eliciting change in their customers’ behavior.

55. Sharing of these utilities’ experiences through regional cooperation frameworks would be essential to encourage other DMCs to introduce consumer behavioral change interventions. Various cooperation groupings and agreements which involve energy sector dialogue exist in Asia. These include the Asia Pacific Economic Cooperation (APEC), the association of Southeast Asian Nations (ASEAN), the South Asian Association for Regional Cooperation (SAARC), and the Greater Mekong Subregion (GMS) energy cooperation. Energy sector movers of these regional groupings should be made aware of the importance of feedback interventions to complement with current initiatives related to energy efficiency, renewable energies, and climate change.

56. A number of these cooperation frameworks however depend on external financing to initiate regional activities. MFIs, donor countries and organizations, UN organizations and international not-for-profit organizations mentioned earlier should provide not only technical assistance but also support to regional dialogue and sharing of experiences.
References


Comparative Analysis and Policy Study on Residential Electricity Bills in Selected ADB Member Countries

Electricity is a public necessity for a modern society, and electricity consumption grows more rapidly than consumption of other types of commercial energy as a society increases in affluence. This working paper intends to make a comprehensive comparison of electrical bills of residential consumers among ADB member countries and uncover what tariff structure and policies ADB member countries adopted to promote renewable energy and energy efficiency among end users. It discusses key findings and policy recommendations in supply and demand side issues that will enable a clean energy development future.

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