Chapter 11

Electricity Price Impacts of Feed-in Tariff Policies: The Cases of Malaysia, the Philippines, and Thailand

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CHAPTER 11

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Electricity market integration in the ASEAN requires the (1) development of the regional power infrastructure; (2) establishment of a regional power market; and (3) strengthening of national policies and regulatory frameworks that stimulate the development of national markets for renewable power generation. Among the countries in the region, Malaysia, the Philippines, and Thailand have advanced in terms of incentivizing the private sector to invest and increase the deployment of renewable energy technologies. However, one of the main barriers to renewable energy deployment is that its generation is more expensive than those from conventional energy resources. Thus, a higher deployment of these technologies would increase the financial burden of electricity ratepayers, particularly the lower-income households. The paper, thus, examines the implications of the feed-in tariff policies on electricity prices in these countries and reviews the measures introduced to minimise impacts of the existing tariff design on low-income households. Key conclusions of the study include the following: (1) At the outset, a political will to address the impacts of feed-in tariffs is essential; (2) Regulatory support measures for renewable energy ought to be taken as separate from the main ratemaking regulation; (3) Each regulatory approach has certain limitations but each could be addressed by specific measures available in the policy toolbox; (4) There is a need to establish a well-coordinated feed-in tariff program; and (5) Regulatory requirements vary depending on the electricity market structure. However, in competitive electricity markets, additional measures are needed to mitigate the impact on low-income households.

Keywords: Electricity market integration, electricity supply market structure, electricity price regulation, renewable energy policy, feed-in tariff, feed-in adder, tariff impacts.

Introduction

Among the key objectives of the ASEAN Economic Community for the energy sector are the integration of electricity markets, and open trade of renewable energies (ASEAN, 2008). Electricity market integration helps optimise the use of resources, improve regional energy security and stimulate trade, financing, technology and knowledge transfer within the region. The trade of hydropower generation is one of the foundations of electricity trade in the ASEAN region, and to extend this to other renewable energy resources requires the (1) development of regional power infrastructure; (2) establishment of a regional power market; and (3) development of the national market for renewable power generation (Chang and Li, 2013).

The economics of interconnection will determine how the ASEAN Power Grid (APG) will develop, while the dynamics of trade within ASEAN will determine the progress of market integration. This grid is subdivided into the northern system (covering the Greater Mekong Sub-region), the southern system (covering Malaysia, Singapore, and Indonesia) and the eastern region (covering Brunei, Indonesia, Malaysia, and the Philippines) (Hapua, 2014),
Based on the current developments in the ASEAN's electricity trade, electricity market integration will most likely evolve from the growth of the three sub-regional markets, with the Greater Mekong Sub-regional market being the most developed (Pacudan, 2014).

In expanding renewable energy trade in the region, the development of national markets for renewable power generation and the strengthening of policies and regulatory frameworks that promote public-private partnerships in the deployment of renewable energy technologies are equally important.

One of the main barriers to renewable energy deployment is the higher capital investments required in its technologies. Relatedly, the cost of renewable power generation is higher than those from conventional power generation. These affect electricity prices and pose a financial burden to residential electricity consumers, particularly lower-income households. This is particularly relevant in ASEAN countries, where a significant number of the population is within the lower-income consumer category.

Malaysia, the Philippines, and Thailand have recently introduced feed-in tariff schemes that promote private sector investments on grid-connected renewable energy technologies, and are funded by electricity ratepayers. The paper reviews existing electricity market structures, electricity pricing policies and feed-in tariff policies, and analyses measures introduced by these countries to reduce the financial burden of feed-in tariff on low-income households.

Electricity Supply Market Structure and Institutional Arrangement

Because of disparate economic structures, levels of economic development levels, as well as political, institutional, and cultural conditions and orientations, the electricity supply industries in Malaysia, Thailand, and the Philippines are at various stages of market liberalisation and structural reforms. These industries are continuously evolving from a monopolistic, vertically integrated electricity supply model to an "enhanced" single-buyer model in Thailand's case; "managed market" single-buyer model for Malaysia; and open access and retail competition in the Philippines.

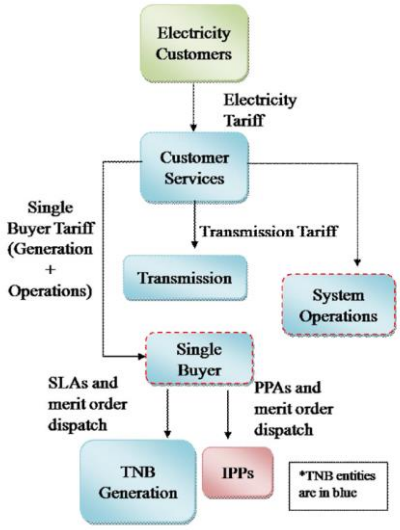
Malaysia

With three independent grid systems, Malaysia's electricity supply industry remains to be a single-buyer model with a competitive generation market but vertically integrated monopolistic transmission, distribution, and supply market in three geographic regions. The Tenaga Nasional Berhad (TNB) operates in Peninsular Malaysia, Sabah Electricity SDN Berhad (SESB) in Sabah, and Syarikat Sesco Berhad (SESCO) in Sarawak. These utilities are investor-owned although the government maintains the majority shareholding (Malaysia Country Report, 2013). The three utilities carry out mainly the generation, transmission, distribution and supply in their specific territories. In the 1990s, the government opened up the generation sector to private sector investments, allowing entry of independent power producers (IPPs).

Among the three geographic regions, Peninsular Malaysia has around 96 percent of the country's total electricity demand. Its TNB was established in 1990 as the result of the privatisation of the National Electricity Board (NEB), which during that time had consolidated key electricity supply industry functions. The TNB was corporatised and partially privatised through listing at the Kuala Lumpur Stock Exchange in 1992.

With the implementation of the incentive-based regulation (IBR) in 2014, Peninsular Malaysia's industry structure advanced from a single-buyer model to a "managed market model" (Figure 11.1). Under this model, five business entities under TNB are subjected to incentive-based regulations and required to unbundle and maintain individual regulatory accounts (Zamin and Ibrahim, 2013).

Figure 11.1: Peninsular Malaysia's Managed Market Model



Source: Zamin and Ibrahim (2013)

The Electricity Supply Act (ESA) of 1990 is the main legal framework that empowers the ministry responsible for the energy sector to regulate and issue directives on the industry (Jalal, 2009). The act was amended when the Energy Commission Act was passed in 2001, removing and transferring the regulatory functions to the Energy Commission (EC). The EC regulates the energy supply industry and enforces laws and regulations related to the energy sector, while the Ministry of Energy, Green Technology and Water is the main agency responsible for energy planning and policy formulation.

Thailand

Over the past two decades various attempts were made to liberalise and restructure the electricity supply industry in Thailand. In the early 1990s, Thailand had a monopolistic and vertically integrated electricity supply industry. Its Electricity Generating Authority of Thailand (EGAT) consolidated the generation and transmission functions while the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA) were responsible for electricity distribution in Bangkok Metropolitan Region and in the provinces, respectively.

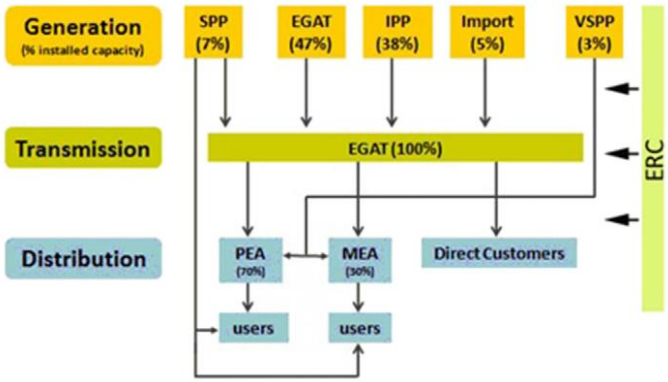
To address the lack of a national body to carry out energy planning, formulate policies and regulate the energy sector, the National Energy Policy Council (NEPC) Act was passed in 1992, and the National Energy Policy Office (NEPO) was established as its secretariat (Wisuttisak, 2010). The NEPO was later upgraded into a permanent department under the Office of the Prime Minister to become a regulatory body supervising and coordinating state-owned enterprises (SOEs). Pressured to reduce public sector debt, the government then opened up the electricity supply industry to private sector investments. The NEPO promoted liberalisation of the power market and encouraged independent power producers (IPPs) and small power producers (SPPs) to participate in power generation. The EGAT Act was also amended in 1992 to accommodate IPPs and SPPs as well as to establish subsidiary IPP companies. In the late 1990s, a NEPO plan to liberalise and privatise the electricity supply industry, transforming the industry structure from a single-buyer model to a wholesale and retail competition, was approved by the government.

The energy landscape transformed with the change of government in early 2000. The new government restructured its ministries and established the Ministry of Energy (MOE) in 2002 to be the new energy sector's policy-making, regulatory and executive body. The NEPO was downgraded to become the Energy Policy and Planning Office (EPPO) under the MOE. With this, the establishment of the competitive electricity market was abandoned and an "enhanced" single-buyer model was implemented in 2003 instead (Wisuttisak, 2010). This enhanced model was similar to the established structure during that time except that it called for the unbundling of accounts of EGAT's generation and transmission business as well as ring fencing the system operator and the relationship between generation side and system operations side (Bull, 2012).

There were also attempts to corporatise and list EGAT at the Stock Exchange of Thailand since 2004. Two royal decrees were passed by the government to provide the legal framework for corporatising the utility but met opposition from various stakeholders. The Supreme Administrative Court revoked the said decrees and nullified the corporatisation of EGAT in 2006 (Wisuttisak, 2010).

Still, the lack of an independent regulatory body remained a concern in the country. The National Legislative Assembly, thus, passed the Energy Industry Act in 2007, whose objectives are to promote competition, encourage private sector participation and establish an independent regulatory agency that provides a new regulatory framework. The Energy Regulatory Commission (ERC) was created and tasked to supervise and regulate the electricity and natural gas industries. Figure 11.2 below shows Thailand's enhanced single-buyer electricity industry structure.

Figure 11.2: Thailand's Enhanced Single-buyer Industry Structure



Source: Tongsopit and Greacen, 2013

Philippines

Among the countries, the Philippines is the most advanced in terms of introducing electricity supply industry reforms. Its government unbundled the electricity supply industry, privatised public utilities and introduced wholesale and retail competition.

Prior to reforms, the National Power Corporation (NPC) monopolised the generation and transmission functions of the industry, while public and private distribution utilities and electric cooperatives carried out the distribution and supply functions. Energy sector regulation was carried out by the Energy Regulatory Board (ERB). Meanwhile, franchising of electric cooperatives was managed by the National Electrification Administration (NEA) (Antonio, 2013).

Due to NPC's lack of financing capability to meet the needed capacity and to operate its generation portfolio efficiently, the government issued Executive Order No 215 in 2007, thus allowing the participation of the private sector in electricity generation. Three years later, the Build-Operate-and-Transfer (BOT) Law (1990) was enacted, encouraging contractors to build and operate power generation facilities with assured reasonable returns on their investments. With demand outstripping supply capacities, the Amended BOT Law was enacted in 1992, which introduced new schemes and new concepts such as unsolicited proposal and negotiated contracts---both of which are deviations from the standard procurement procedures (Antonio, 2013). This

was followed by the passage of the Electric Power Crisis Act in 1993, which empowered the Philippine president to enter into negotiated contracts and reorganise the NPC.

Almost a decade later, the NPC continued to accumulate total obligations of US$16 billion in 2001. Various sectors, including creditors, pressured the government to introduce reforms so as to avoid another power crisis. In 2001, the government introduced sweeping reforms with the passage of the Electric Power Industry Reform Act (EPIRA). The EPIRA called for the (1) unbundling of the industry; (2) deregulation of the generation sector; (3) establishment of the transmission company; (4) establishment of an independent regulatory body, which is the Energy Regulatory Commission; (5) creation of the wholesale electricity spot market; (6) implementation of retail competition and open access; and (7) divestment of NPC assets (Republic Act No 9136, 2001).

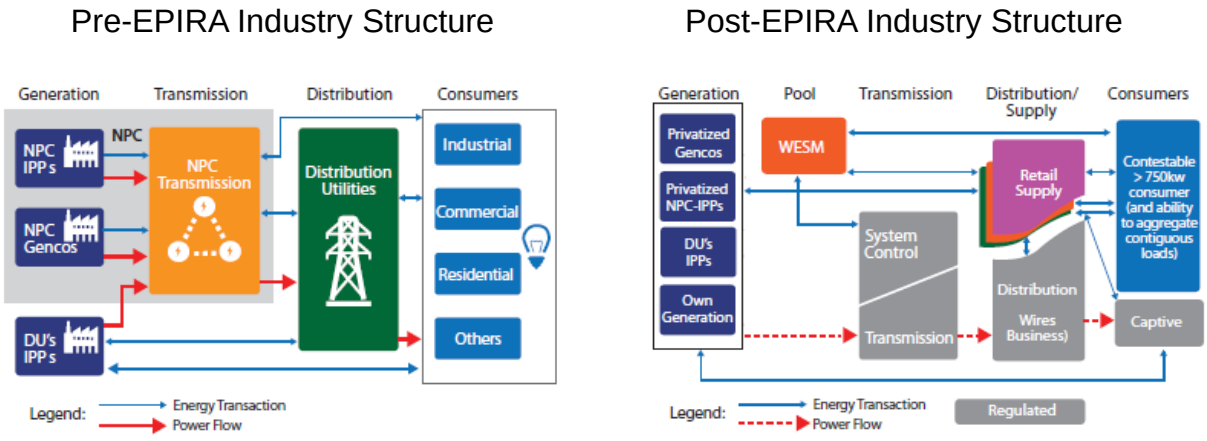
Despite delays in the implementation of EPIRA, considerable progress was achieved in the restructuring and privatisation of the electricity supply industry (DOE, 2013):

- The Power Sector Assets and Liabilities Management Corporation (PSALM) was established to manage and privatise NPC's generation assets and IPP contracts;
- The National Transmission Company (Transco) was established under the ownership of PSALM to assume the transmission function. The operation and maintenance of the transmission system was later privatised through concession. The National Grid Corporation of the Philippines (NGCP) was awarded the concession and became the power system operator.
- The distribution and supply functions were separated under a competitive electricity market structure. The distribution function is the common carrier business while the supply is the sale of electricity. Under retail competition, suppliers (other than the distribution company) can sell, broker, market or aggregate electricity to end-users. In 2012, the Energy Regulatory Commission declared that the preconditions for retail competition have been achieved, prompting the initial implementation of open access and retail competition.

- The wholesale electricity spot market (WESM) was established and started its operation in 2006 for the Luzon grid and further expanded in 2011 to the Visayas grid. The WESM was organised as a gross pool where all physical sales of electricity are offered in the pool and all purchases are drawn from the pool. This also includes electricity sold through bilateral contracts. The Philippine Electricity Market Corporation (PESM) was established as the administrator of WESM.

The pre- and post-EPIRA (current) industry structures are shown in Figure 11.3. Under the current structure, the transmission, system operations and distribution are monopolistic functions as well as regulated segments of the industry (Republic Act No 9136, 2001). Generation and supply are competitive segments and are not regulated. Power supply generators include IPPs and privatised NPC generation companies. These generators can sell either to the spot market (power pool) at market prices or directly to distribution utilities, retail suppliers and contestable consumers through bilateral and negotiated contracts. Captive consumers can only purchase power from retail suppliers, but contestable consumers can buy directly from the WESM, retail suppliers, and power generators.

Figure 11.3: Pre and Post-EPIRA Electricity Industry Structure in the Philippines



Source: Antonio (2013).

Key institutions involved in the administration of the electricity supply industry are the following:

- Joint Congressional Power Commission (JCPC), which is the main body with overall oversight of the implementation of EPIRA;
- Department of Energy (DOE), the policy-making body;
- Energy Regulatory Commission, the regulatory body tasked to encourage competition and protect consumers' welfare; and
- National Electrification Administration (NEA), which is tasked to promote rural electrification and prepare electric cooperatives to operate and compete in the deregulated electricity market.

Electricity Pricing

Electricity supply industry regulation has also evolved in these three ASEAN countries over the past decades. All three saw a growing need to separate the electricity supply policy-making function from the regulatory function and to establish independent regulatory agencies. Often, these are established as part of the overall legal framework that introduced liberalisation and competition in the electricity supply industry or sometimes as a follow-up law to the reforms act. The creation of the independent Energy Regulatory Commission was one of the key elements of the Electric Power Industry Reform Act (2001) in the Philippines. Malaysia passed the Energy Commission Act (2001) more than 10 years after the implementation of the Electricity Supply Act (1990). In Thailand, its own Energy Regulatory Commission was created in 2007, a year after the legal issues hounding the electricity supply industry were resolved.

Electricity Price Regulation and Tariff Setting

The scope of pricing regulation carried out in each country reflects the level of reforms undertaken to liberalise the electricity supply industries. Under their vertically integrated monopolistic markets, Malaysia and Thailand determine their electricity tariffs based on the financial requirements of the industry. In the case of the Philippines' competitive wholesale and retail markets, only the monopolistic segments see prices being regulated (although its regulatory agency provides guidelines and reviews the transactions in the competitive segments of the industry).

There is also an evolving trend to move away from rate-of-return base regulation and towards performance-based regulation. In addition, in the case of Malaysia and Thailand, ring fencing of industry functions and separating business entity accounts have become standard practices in price setting and regulation.

Malaysia

From the rate-of-return-base (RORB) regulation, Malaysia's Energy Commission moved towards the incentive-based regulation (IBR) in the last quarter of 2013 (i.e., the interim period starts in the financial year 2014 while the first regulatory period will be from 2015 to 2017) (Zamin and Ibrahim, 2013). The implementation of the IBR requires separate accounting for various business entities under TNB (i.e., generation, single-buyer generation and operation, transmission, system operation, distribution and retail). Under the new scheme, the electricity tariff consists of the base tariff and the imbalance cost pass-through (ICPT) (Energy Commission, 2013). The base tariff is determined based on target utility capital expenditures (CAPEX), operational expenditures (OPEX), fuel and power purchase costs and others, while the ICPT reflects the uncontrollable costs from base tariff such as variations in fuel and power purchase costs.

Each business entity's revenue requirement, which eventually is translated into average tariffs for electricity consumers, consists of the returns on assets (capped at the weighted average cost of capital or WACC), OPEX, depreciation, and tax. During one regulatory period, entities are given incentives to improve efficiencies related to operation, financing, and performance. Efficiency gains will be reflected in the next regulatory period and these business entities' share of benefits will be incorporated in the average tariffs.

Thailand

The electricity tariff in Thailand consists of the base tariff and the automatic tariff adjustment mechanism, which is also known as *Ft* (Ruangrong, 2013). In the past, the base tariff was estimated based on long-run marginal cost (LRMC), and tariff schedules were set by adjusting target revenue

requirements and performance targets. In 2011, the Energy Regulatory Commission implemented a new pricing policy that aims to be cost reflective and ensures financial stability of state utilities (EGAT, MEA, and PEA). With this new policy, the base tariff is estimated based on the state utilities' projected financial requirements for providing electricity services from generation to supply, with caps set on returns on invested capital (ROIC) (International Resources Group, 2013). The automatic tariff adjustment mechanism (Ft) is added to the base tariff to reflect unanticipated changes in costs (e.g., fuel and power purchase costs) plus other factors affecting investments such as feed-in adder and power development fund contributions. The revision of Ft is carried out every four months while that for the base tariff is done every regulatory period. One regulatory period in Thailand is equivalent to five years.

Thailand also applies a uniform national tariff---i.e., the same tariff is applied to all consumers throughout the country (International Resources Group, 2013). This policy requires cross-subsidisation between urban and rural consumers since distribution costs per unit in the former is lower than in the latter. Actual financial transfers have been carried out from MEA to PEA and from EGAT to PEA.

Philippines

As earlier mentioned, the Philippines has succeeded to unbundle the electricity supply industry and to introduce wholesale and retail competition. Electricity rates, consisting of (1) generation charge; (2) transmission charge; (3) distribution charge, supply and metering charge; (4) system loss charges; (5) subsidies; and (6) taxes and other levies, are therefore unbundled (DOE, 2013). The remaining monopolistic segments of the energy industry are regulated by the country's Energy Regulatory Commission, while the competitive segments are considered as pass-through costs.

Transmission and distribution charges are determined by the Energy Regulatory Commission using performance-based regulations. The methodology for setting these charges are stipulated in Rules for Setting the Transmission Wheeling Rates (RTWR), Rules for Setting Distribution Wheeling Rates (RDWR) for private investor-owned utilities (PIOUs) and

Rules for Setting Electric Cooperatives Wheeling Rate (RSEC-WR) for electric cooperatives.

Prior to the implementation of the performance-based regulation for transmission in 2003 and for distribution utilities in 2004, the Energy Regulatory Commission was adopting the cost-of-service regulation or rate-of-return base regulation. Now, under the performance-based regulation, the building block is the forecasted annual revenue requirements, which is then transformed into electricity tariffs (Energy Regulatory Commission, undated). One regulatory period in the Philippines is five years.

Generation charges are energy costs sourced from either WESM or bilateral contracts. Full recovery of these costs is allowed based on the formula set by the ERC. For system loss reduction charges, the Republic Act 7832 (Anti-electricity and Electric Transmission Lines/Materials Pilferage Act) of 1998 introduced a cap on the loss that can be charged to customers.

Subsidies include payments to recover the lifeline rates for low-income customers and discounts granted to senior citizens. Taxes and other levies include (1) value-added tax (VAT); (2) local franchise tax; (3) business tax; (4) energy tax; (5) universal charge; (6) loan condonation; (7) incremental currency exchange rate adjustment (ICERA); and (8) reinvestment fund for sustainable capital expenditures (DOE, 2013).

Lifeline Rates and Other Social Considerations

Regulators in the three countries also introduced progressive tariff designs for residential customers. That is, tariff rates progress with increasing consumption levels. Poorer households (lower consumption levels) pay lower rates than households with higher incomes (higher consumption levels) (Table 11.1).

Table 11.1: Electricity Tariff Rates

Malaysia TNB (1)		Thailand MEA (2)		Philippines MERALCO (3) Distribution charge only	
kWh	sen/kWh	kWh	Baht/kWh	kWh	Peso/kWh
1-200	21.80	1-15	1.8632	0-20	1.2225
201-300	33.40	16-25	2.5026	21-50	1.2225
301-600	51.60	26-35	2.7549	51-70	1.2225
601-900	54.60	36-100	3.1381	71-100	1.2225
Over 901	57.10	101-150	3.2315	101-200	1.2225
		151-400	3.7362	201-300	1.5798
		Over 400	3.9361	301-400	1.9170
				Over 400	2.5043

Note: (1) **Tenaga Nasional Berhad**, www.tnb.com.my, accessed 3 June 2014. (2) **Metropolitan Electricity Authority**, www.mea.or.th, normal tariff for consumption not exceeding 150 kWh/month, accessed 3 June 2014. (3) **Manila Electric Company**, www.meralco.com.ph, accessed 3 June 2014.

To promote universal access and alleviate the conditions of poor households, these countries have also introduced lifeline rates. The design of lifeline rates vary from country to country:

- In Malaysia, residential customers with total electricity bill of RM 20 (US$6.22) or below are entitled to a rebate of RM 20 per month (Tenaga National Berhad, 2014).
- In Thailand, the lifeline rate applies to consumption levels of 50 kWh or less per month. Households with up to this level of consumption need not pay their monthly electricity bills. Prior to the price regulation reforms in 2011, the lifeline rate was set at 90 kWh per month (Metropolitan Electricity Authority, 2014).
- In the Philippines, the lifeline rate varies from utility to utility. In the case of the Manila Electric Company (MERALCO), the lifeline discount structure is as follows: (1) Households consuming up to 20 kWh per month receive up to 100-percent discount on generation, transmission, system loss, distribution, supply and

metering charges; (2) Consumers of up to 50 kWh per month receive a 50-percent discount; (3) Households consuming up to 70 kWh per month are entitled to a 30-percent discount; and (4) Those using up to 100 kWh per month get a discount of 20 percent (Manila Electric Company, 2014).

Senior citizens (over 60 years old) in the Philippines also receive a special discount. The Energy Regulatory Commission sets the discount formula, which varies by utility.

Moreover, when new tariff rates were introduced in Malaysia in early 2014 in line with the implementation of the incentive-based regulation, there was no tariff increase imposed on those who consume up to 300 kWh per month (Tenaga National Berhad, 2014). Although residential consumers were expected to experience an average increase of 10.6 percent on their electricity bills with the introduction of new tariff rates, the zero-tariff hike actually benefited around 4.6 million of TNB's domestic consumers.

Feed in Tariff Policies

Feed-in Tariff Schemes

Feed-in tariff is one of the regulatory tools to promote private sector investments in renewable energy. Based on global experience, feed-in tariff is proven to be the most cost effective measure to achieve higher deployment of renewable energy technologies (Couture *et al*, 2010). Under this scheme, RE generators are guaranteed purchase of their power generation at a cost-based price with reasonable rate of return on investments over a long period of time.

Feed-in tariff policies are the main regulatory framework used by Thailand, Malaysia, and the Philippines to achieve their long-term renewable energy targets (Table 11.2). In fact, these are the first three ASEAN countries that introduced feed-in tariff schemes. Thailand's scheme is a premium payment also known as feed-in adder while those in Malaysia and the Philippines are the real feed-in tariff schemes. Thailand, however, has introduced a feed-in

tariff program specific to roof-mounted and community-owned solar PV projects in 2013.

Table 11.2: Target Capacity Additions

Malaysia 2011-2030		Philippines 2011-2030		Thailand 2011-2021	
Biogas	390	Geothermal	1,495	Solar	3,000
Biomass	1,230	Hydropower	5,394	Wind	1,800
MSW	370	Biomass	277	Small	324
Small hydropower	430	Wind	2,345	Hydropower	4,800
Solar PV	1,371	Solar	284	Biomass	3,600
		Ocean	71	Biogas	400
				MSW	3
				New Energy	
TOTAL	3,781	TOTAL	9,866	TOTAL	13,927

Source: **Malaysia** – Handbook on the Malaysian Feed-in Tariff for the Promotion of Renewable Energy; **Philippines** – Renewable Energy Plans and Programs (2011-2030); **Thailand** – Energy in Thailand: Facts and Figures 2013.

Thailand

Among the three countries, Thailand was the first in the ASEAN to introduce a feed-in tariff policy scheme. The feed-in adder is one of the effective measures used by the government to achieve targets stipulated in its renewable energy policies. Initially, under the 15-year Renewable Energy Development Plan (2008-2022) introduced in 2009, the government aimed to increase the share of renewable energy to 20 percent of the total final energy consumption. This plan was, however, superseded in 2011 by the 10-year Alternative Energy Development Plan (2012-2021), which targets 25 percent of the total final consumption in 2021 to come from renewable energies (Department of Alternative Energy Development and Efficiency, 2014).

The feed-in adder program was approved by the National Energy Policy Council (NEPC) in 2006, but utilities started implementing only in 2007

(Tongsopit and Greacen, 2013). During this period, measures were simplified and streamlined. In 2009, bid bonds were introduced by the government in response to huge interests to apply in the program. In 2010, alarmed with the huge number of power purchase agreements, the NEPC reduced the solar PV adder rate and suspended the power purchase from solar power projects (Woradej, 2012). Studies on feed-in tariff policy started during this period and eventually, a feed-in tariff scheme for distributed solar PV generation was rolled out in July 2013. The scheme contain a target of 200 MW from rooftop solar PV to be installed in 2013 and 800 MW community-based projects to be done by the end of 2014 (Tongsopit, 2014).

The feed-in adder and feed-in tariff program is carried out by three state-owned utilities: EGAT, which purchases power from small power producers (SPPs); and MEA and PEA, which procure power from very small power producers (VSPPs) (Tongsopit and Greacen, 2013). Initially, project approvals were carried out independently by these three utilities. Since 2010, however, project approvals were transferred to the Ministry of Energy, where additional criteria for feed-in adder applicants such as projects' readiness in accessing loans, land, and government permits were introduced (Tongsopit and Greacen, 2013).

As to the new feed-in tariff policy for solar PV projects, the administration of the solar rooftop program is assigned to the Energy Regulatory Commission while that of the community ground-mounted solar program is given to Thailand's Village Fund and the Ministry of Energy (Tongsopit, 2014).

Thailand's adder program covers solar, wind, biomass, biogas, hydropower, and waste energy. Special power producers and VSPPs that utilise these fuel resources are eligible to participate in the program as long as they are from the private or public sector but not utility-owned. Adder is differentiated by technology, installed and contracted capacity size, and project geographic location. The SPPs and VSPPs sign a five-year renewable power purchase agreement with the utilities based on their avoided costs. To cover the actual cost of RE power generation, the feed-in adder is awarded to these generators. The adder support for wind and solar is for 10 years while that for other renewable energies is seven years. Table 11.A1 of the Appendix shows the adder schedule.

Malaysia

Malaysia is the second country in the ASEAN to launch a feed-in tariff program. Renewable energy was considered as the "fifth fuel" under its 8th National Plan (2001-2005) but despite various initiatives during this period, renewable energy accounted for less than 1 percent of the fuel supply mix in Peninsular Malaysia (Kettha, 2011).

In 2009, the Malaysian National Renewable Energy Policy and Action Plan called for the establishment of legal and regulatory framework as its first strategic thrust. As a result, the government passed the Renewable Energy Act (RE Act) and the Sustainable Energy Development Authority Act (SEDA Act) in 2011. The RE Act provides the legal framework for the feed-in tariff program while the SEDA Act mandated SEDA to be responsible for the development of renewable energy and implementation of the feed-in tariff program. The National Renewable Energy Policy and Action Plan aims to increase the share of renewable energy to 17 percent of the power capacity mix by 2030 (Harris and Ding, 2009).

Biogas, biomass, small hydropower, and solar PV are eligible RE resources under the feed-in tariff scheme. The SEDA announces the annual RE development quota and allocates it on first-come, first-served basis. Utilities are obliged to sign a power purchase agreement with quota allowance holders, to connect their facilities and dispatch their power generation to the grid. Feed-in tariffs differentiated by technology, capacity size, and bonus payments are provided for economic and developmental criteria such as locally assembled or manufactured technologies, installation in buildings or use as building materials, use of more efficient technologies, use of landfill or sewage gas, etc. Feed-in tariff payments are guaranteed for 21 years for solar PV and small hydropower; and for 16 years for biogas and biomass. To account for technological learning, degression rates that vary by technology were also introduced. Table 11.A2 of the Appendix shows the feed-in tariff schedules and quota allocation.

Philippines

The Philippines has limited indigenous fossil fuel resources and is highly dependent on imported energy. To promote renewable energy development, the government pushes for self-sufficiency to improve the country's energy security. In the Renewable Energy Plans and Programs (2011-2030) launched in 2011, the government aims to increase the total installed renewable energy power from more than 5 GW in 2010 to more than 15 GW in 2030 (DOE, 2011).

The legal framework for feed-in tariff in the Philippines was enacted as early as 2008 with the passage of Republic Act 9153, or the Renewable Energy Act of 2008. The Act stipulates various regulatory frameworks to promote renewable energy such as the renewable energy portfolio standards, renewable energy certificates, feed-in tariff, net metering and green energy market option. It established the National Renewable Energy Board (NREB), where public and private stakeholders-representatives are expected to provide technical assistance to the DOE and support the Energy Regulatory Commission in the implementation of the feed-in tariff and management of the RE Trust Fund.

The Philippines' Energy Regulatory Commission announced the Feed-in Tariff Rules in 2010 and issued the Guidelines for the Collection of the Feed-in Tariff Allowance (FIT All) and Disbursement of the FIT All Fund in 2013. In accordance with the rules, the NREB launched its proposed feed-in tariff rates in 2011. In 2012, the Energy Regulatory Commission announced the feed-in tariff rates for run-off river hydropower, biomass, wind, and solar that were much lower than those proposed by NREB. Details are shown in Table 11.A3 in the Appendix.

Feed-in tariff in the Philippines as differentiated by technology and feed-in tariff payment is for 20 years (DOE, 2013). A uniform degression rate of 6 percent per year was approved by the ERC. Annual adjustments will be made to reflect inflation and changes in the exchange rate.

As specified in the Act, the DOE is responsible for awarding RE service contracts and maintains the registry for RE participants. Also, the Transco is responsible for the settlement and payment of feed-in tariffs to eligible RE

power plants. It is also with Transco that RE power developers sign the renewable power purchase agreements.

As of March 2014, around 90 projects with a total of 1.4 GW capacity have been awarded service contracts and registered by the DOE (DOE, 2014). As of July 2014, no project has been granted with feed-in tariff yet since commercial operation is one of the conditions for feed-in tariff awards. This condition differs from that in Malaysia, where feed-in tariff is awarded once the project owner receives the quota allowance; or in Thailand, where tariff is given once the readiness conditions have been satisfied (Sjardin, 2013).

Ratepayer Funding

Practices for funding feed-in tariff programs could be classified as either ratepayer funding, taxpayer funding, supplemental funding, or inter-utility cost sharing. There is a two-pronged reason for funding feed-in tariff programs: One is to ensure financial sustainability; the other is to minimize consumer impacts (Couture *et al.*, 2010). Globally, most feed-in tariff programs are found to be supported by ratepayers.

In fact, feed-in tariff programs implemented in the three countries in this study are all ratepayer funded. Feed-in tariff payments to RE power generators are being passed on to electricity consumers. Malaysia introduced an *ex-ante* feed-in surcharge to ratepayers, while the Philippines and Thailand have an *ex-post* feed-in tariff/adder charges.

Ex-ante proportional feed-in tariff surcharge

In Malaysia, the feed-in tariff program is funded by the surcharge on consumers' electricity bills. Until the end of 2013, the surcharge rate was 1 percent of the consumers' electricity invoices, but increased to 1.6 percent commencing January 2014 (Tenaga Nasional Berhad, 2014). Note, though, that only consumers with consumption levels of more than 300 kWh per month contribute to the feed-in tariff payments.

In this case, contributions are being collected prior to the development of an RE project. This approach has a limitation: that is, RE development is capped

by the total amount that could be collected by the predefined percentage rate of the electricity invoices. This notwithstanding, the scheme provides a regulatory control on the burden of the feed-in tariff program by minimising the impact on target consumers.

Distribution utilities are responsible for collecting this surcharge from consumers. The collected feed-in tariff revenue is deposited to the RE Fund that was established under the RE Act and managed by SEDA. But since these same utilities are also responsible for paying to RE power producers, in practice they can either deposit the excess collection to the RE Fund or claim from the Fund in case that there is a shortfall in collections. Likewise, they are also entitled to charge some administrative costs in managing the feed-in tariff program from the Fund.

The Fund received an initial RM300 million from the Malaysian Treasury (Kettha, 2011).

Ex-post uniform feed-in tariff charge

In Thailand and the Philippines, feed-in adder/tariffs are collected after the development of the projects while the rate (in local currency per unit of electricity) is estimated based on the financial obligations of the utilities under contract with RE generators.

In the case of Thailand, the feed-in adder is one of the five components of the Ft charge (Ruangrong, 2013). Thailand's ERC, with the guidance from the National Energy Policy Council (NEPC), is responsible for setting these components of the Ft charge. The adder component, specifically, is determined based on the obligations from feed-in adder of utilities to SPPs and VSPPs. The Ft is being reviewed and adjusted every four months to reflect changes in EGAT's fuel cost, power purchase cost, and impact of policy expenses. Currently, the MEA and PEA collect the feed-in adder, together with other charges, under the *retail* Ft charge from their consumers, while EGAT also collects *retail* Ft charge from its direct users. On the other hand, EGAT collects the *wholesale* Ft charge from MEA and PEA.

As part of the tariff adjustments made in 2011, Thailand's Energy Regulatory Commission passed a resolution to include the Ft rate of 0.9581 Baht/kWh in the base retail tariff, while the Ft charge starting July 2011 was reset to zero (Ruangrong, 2013). Thus, the existing Ft charge, which included the existing feed-in adder, became part of the retail base tariff. Since July 2011, the feed-in adder under the new Ft charge covers only those outside the base tariff.

Similarly, a feed-in tariff allowance is collected in the Philippines from all electricity ratepayers for renewable power generation. Under the Guidelines for the Collection of the Feed-in Tariff Allowance (FIT All) and Disbursement of the FIT All Fund (Energy Regulatory Commission, 2013), a uniform charge in Philippine Pesos per kWh will be estimated annually. Also, all consumers who are supplied from transmission and distribution networks in all on-grid areas in the country shall be billed to cover the financial obligations to eligible RE power generators. The guideline also stipulates the creation of a feed-in allowance fund to be administered by Transco.

Distribution utilities, electric cooperatives, the National Grid Corporation of the Philippines, retail electricity suppliers and the operator of the wholesale electricity supply market (WESM) will collect from their direct customers. The collected payments will be deposited in the feed-in allowance fund and disbursed by Transco, the party that signed the renewable power purchase agreements with the RE power generators.

Impacts on Electricity Bills

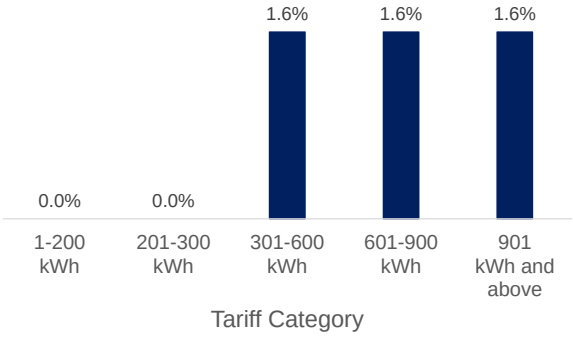
Malaysia

Malaysia is conscious of the potential implications of the feed-in tariff to low-income consumers. In the policy design, the government deliberately exempted lower-income households in the coverage of the feed-in tariff. Domestic customers with consumption level below 300 kWh per month are not required to contribute to the RE Fund (Tenaga Nasional Berhad, 2014). These represent around 67 percent of the customers of the distribution licensees.

The government places the burden on paying for the generation of green electricity on high electricity-consuming households. This is in line with the polluter pays principle, where those who cause more pollution (high electricity consumption) are expected to pay more to the RE Fund (Kettha, 2011). Also, the government hopes that as a positive effect of higher electricity rates, consumers will be incentivized to adopt energy-efficient measures, thus reducing their electricity consumption levels.

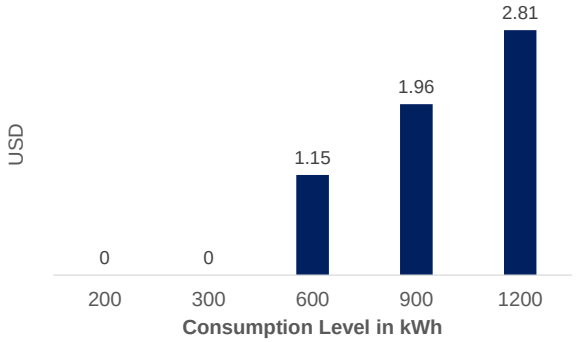
In addition, the *proportional* charge rate is neutral to all customers who will be paying contributions to the RE Fund since everybody is paying the same percentage rate on their electricity bills. This is shown in Figure 11.4.

Figure 11.4: Payment to RE Fund as Percentage Share of Household Electricity Bill (Starting January 2014)



In this study, the actual payments to be made by households at different consumption levels and based on current TNB electricity tariff rates are estimated. The calculated household RE Fund payments (in US dollar equivalent) according to consumption level are shown in Figure 11.5. In absolute terms, the payment rises along with increasing incomes but in terms of the overall burden, households pay the same percentage rate at their consumption level.

Figure 11.5: Payment to RE Fund by Household Electricity Consumption Level (Estimated based on May 2014 TNB tariff rates)



Philippines

In the Philippines, no special considerations for lower-income households were included in feed-in tariff rules and guidelines. The only concession relevant to the feed-in tariff allowance is the lifeline rate. Those who consume within or less than the identified lifeline rate are exempted from paying all other utility charges.

In contrast to Malaysia's case, the Philippines' feed-in tariff allowance is a uniform charge in terms of Philippine Pesos per kWh. This study thus estimates the impact of the uniform charge feed-in tariff allowance to electricity tariffs based on the methodology specified in the feed-in tariff allowance guidelines. The aim of this exercise is to proximate the indicative uniform charge that could be used in the analysis.

As of March 31, 2014, there are around 90 projects (11 biomass, 53 hydropower, 14 solar, 11 wind) with a total of 1.3 GW capacity in the registry of the Department of Energy. Assumptions on reasonable load factor levels were made and the demand projections in the Power Development Plan were used in the analysis. It was also assumed that all these projects would start operating in 2015. The feed-in tariff allowance on the first year amounts to PhP 0.45 per kWh. The feed-in tariff allowance will, however, decline over time as the projected electricity demand increases.

More recently, Transco filed an application to the Energy Regulatory Commission for feed-in tariff allowance of PhP 0.04057 per kWh covering

the period 2014-2015 (Manila Standard Today, 2014). The study used this amount in the analysis.

Using MERALCO's tariff structure, the feed-in tariff allowance payment by consumption level is shown in Figure 11.6. Households with consumption level up to 20 kWh--- the cut-off consumption level for the lifeline rate---are exempted from paying the feed-in tariff allowance. For the rest of the consumers, the contribution to the feed-in tariff allowance increases as consumption levels rise. By taking the share of the feed-in tariff allowance payments to the total electricity bill (in this case, using MERALCO's residential bill at typical household consumption for May 2014), one finds that the uniform charge approach demonstrates a regressive feed-in adder rate design. Households with lower consumption levels contribute a relatively higher share of feed-in tariff payment to their electricity bills. This is shown is Figure 11.7.

Figure 11.6: Household Payment to Feed-in Tariff Allowance Fund by Consumption Level (estimated based on MERALCO's May 2014 Tariff level)

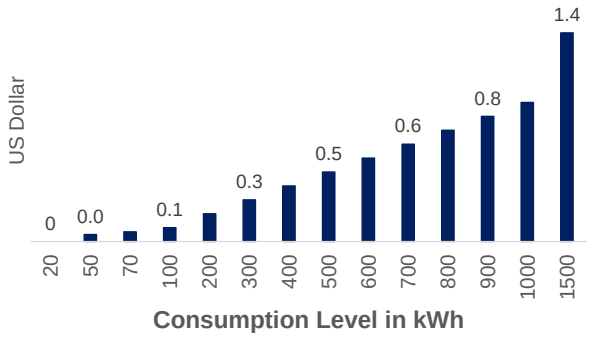
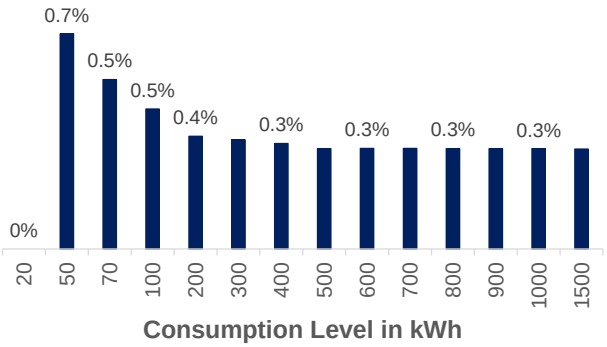


Figure 11.7: Household Payment to Feed-in Tariff Allowance Fund as Percentage of Electricity Bill (estimated based on MERALCO's May 2014 Tariff level)



Thailand

Thailand also has a similar uniform charge rate for feed-in adder. The adder values are being passed on to the consumers via the Ft charge. With the regulatory reset in July 2011, the previous period's adder charges were moved to the base tariff and only the adder charges from July 2011 to the present are reflected in the Ft charge.

In this study, the incremental adder from 2011 to 2013 was estimated based on projects that were commissioned after the regulatory resetting. The aim here is to proximate an indicative figure to be used in the analysis. The incremental projects were taken from the SPP and VSPP database, while the average load factors of such projects were estimated based on the Department of Alternative Energy Development and Efficiency's (DEDE) data. The national electricity demand used in the analysis is based on the Energy Policy and Planning Office's (EPPO) data. Thus, for 2013, this study estimates the equivalent uniform adder to be Thai Baht 0.053 per kWh.

Taking the MEA's current tariff structure, the estimated household adder contributions by consumption level is shown in Figure 11.8, while the shares of adder to the total electricity bill by consumption level is presented in Figure 11.9. The analysis shows that the uniform adder rate is slightly regressive. The share of the adder in the total electricity bill is slightly higher

in households with lower consumption levels than those with higher consumption.

Figure 11.8: Household Payment to Feed-in Adder by Consumption Level (Estimated based on MEA's May 2014 Tariff Level)

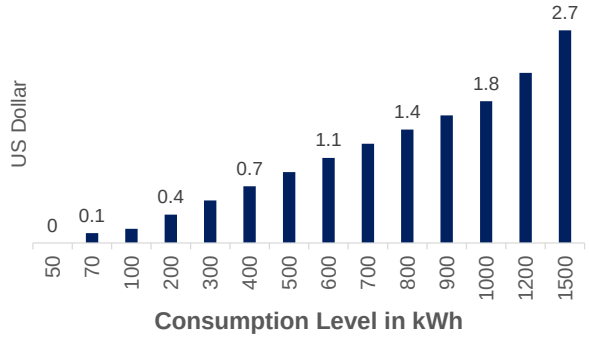
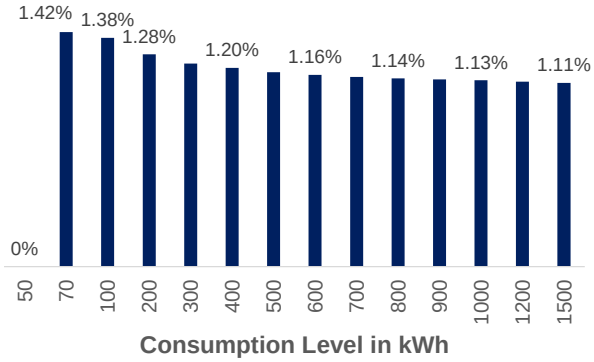


Figure 11.9: Household Payment to Feed-in Adder as Percentage of Electricity Bill (Estimated based on MEA's May 2014 Tariff Level)



Policy Analysis and Implications

Social Considerations in Feed-In Tariff Design

In Malaysia, the Philippines, and Thailand, concerns on the impacts of the feed-in tariff policies on electricity tariffs have long been expressed during their policy-making processes, but it is only in Malaysia where the social impacts on low-income households have become one of the key criteria in its feed-in tariff policy design and implementation. Malaysian policymakers, at

the onset of the feed-in tariff policy design, had recognized social and perhaps political considerations and, thus, exempted households with consumption levels below 300 kWh per month in the feed-in tariff scheme. Political awareness and determination, therefore, play important roles in mitigating the potential impacts of the feed-in tariff policy on lower-income households.

Proportional and uniform charge rates

The study shows that a proportional charge rate results in a neutral design where the incidence of the surcharge is uniform to all consumers regardless of the consumption level while a uniform rate yields a regressive design, creating higher financial burden on households with lower consumption levels.

The ex-ante proportional charge rate offers better control with respect to social impacts but one of its shortcomings is that renewable energy development is capped by the total amount collected from the pre-defined charge rate.

On the other hand, schemes with uniform charge rates require that the annual energy project's development be well managed and controlled to mitigate any negative impact on consumers, particularly the poorer households. In the case of Thailand, the lack of coordination among implementing bodies and weak regulatory control in the past led to an unrestrained increase in power purchase agreements from solar PV projects (Tongsopit and Greacen, 2013). This resulted in higher estimated adder in the Ft charge and in the eventual suspension of the solar PV adder program in 2010 (Woradej, 2012).

Tariff Structure and Level of Reforms

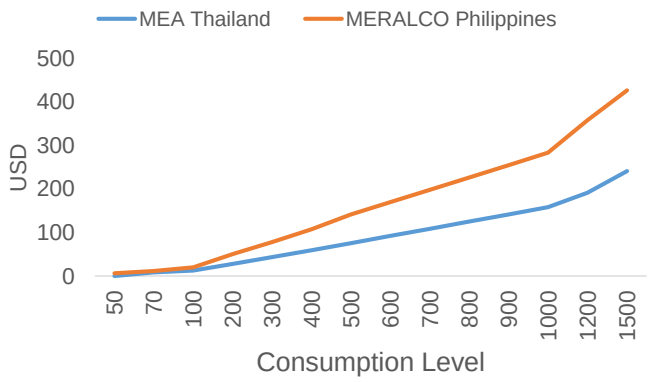
Thailand and the Philippines both have uniform charge rates but results show that the Thai adder scheme is less regressive than the feed-in tariff scheme in the Philippines. This can be explained by the difference in the design of tariff structures.

In Thailand, the whole industry is regulated. Its regulatory agency has control over the base costs that could be included in the tariff-setting process and can

design a tariff structure that is more equitable to all consumers. Thus, Thailand's current tariff structure generates a much flatter curve for electricity payment against consumption levels (Figure 11.10).

Meanwhile in the Philippines' competitive electricity market, electricity rates are being unbundled according to different electricity supply functions. Only the monopolistic activities such as transmission, system operation and distribution functions are regulated; the rest are market determined. Also, except for the distribution charge and taxes, all other charges are uniform rates per unit of electricity. The uniform charge could pose a much steeper increase in electricity payments as the household's electricity consumption rises (Figure 11.10).

Figure 11.10: Electricity Bill by Consumption Level



A regulated industry structure has much room to adjust its tariff structure and make it more equitable to all electricity consumers. In contrast, it is clear that competitive markets will not respond to social needs; thus, regulatory intervention would be necessary. In the case of the Philippines, it appears that the current lifeline rates and senior citizen discounts are not sufficient to alleviate the impacts of its feed-in tariff scheme. Additional measures may need to be introduced to remedy the potential impact of the feed-in tariff allowance on lower-income households.

One option could be feed-in tariff allowance discounts similar to the existing lifeline rate discounts. This discount could be passed to other consumers as

cross-subsidy; likewise, it could also be funded by the Renewable Energy Trust Fund as stipulated in the Republic Act 9153 of 2008.

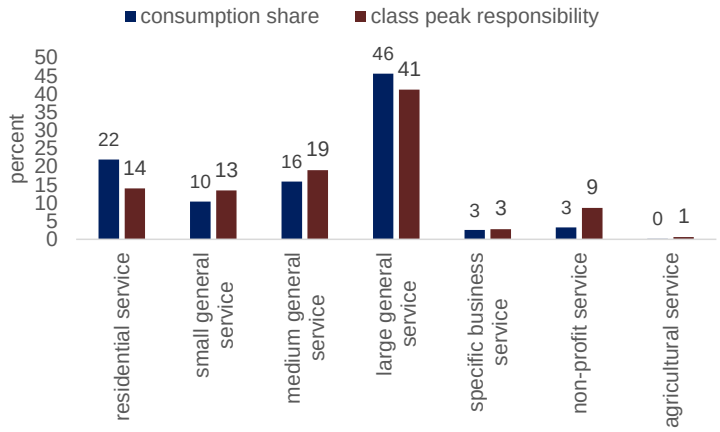
Adjustments Using Joint Cost Allocation Approach

In the uniform charge-per-unit approach, the overall contribution by each sector to the total feed-in tariff/adder corresponds to the total consumption share of the given sector. Under the cost allocation theory, the uniform charge per unit, while it is more equitable than the uniform charge per customer approach, does not differentiate the customers who make full use of renewable power generation, from those who do not. Neither does the uniform rate differentiate the types of services being provided by renewable energy facilities (Conkling, 2011).

One of the most common approaches to address this issue under the principle of joint cost allocations in electricity pricing is through the demand peak responsibility method. Under this approach, joint costs are allocated based on demand burden caused by each customer class. The demand burden is measured based on either "coincident peak" or "non-coincident peak" methods. These approaches are commonly used in allocating costs for base tariff calculations but could also be applied in allocating costs for feed-in tariffs. For example, under the "coincident demand peak responsibility method", the peak demand share of each customer class could be used as basis for allocating the feed-in tariff.

As shown in Figure 11.11, applying this principle in Thailand's case will further reduce the burden of the feed-in adders on residential customers (Woradej, 2012). With a uniform charge per unit, the residential sector's share of the total annual cost stands at 22 percent. On the other hand, by using the peak responsibility allocation, the said sector's share would drop to 14 percent.

Figure 11.11: Consumption Share Allocation Vs Class Peak Responsibility Allocation (Thailand)



Conclusions

This study reviews how Malaysia, the Philippines, and Thailand have promoted the use of renewable energy technologies using the feed-in tariff framework. It also looks at regulatory approaches and how passing the feed-in tariff/adder impacts electricity ratepayers.

Since there are various regulatory methods of charging feed-in tariff/adder to electricity consumers, each country's choice of method depends on the prevailing regulatory traditions and practices. Each framework has its strengths and weaknesses, but there are key lessons learned from this study:

- At the outset, political will and determination to address the potential impacts of feed-in tariffs are essential;
- Regulatory measures to promote deployment of renewable energy technologies must be considered separate from the main ratemaking regulation (i.e., feed-in tariff/adders are add-on to the base electricity tariffs).
- Each regulatory approach has certain limitations but these could be addressed by specific measures available in the current regulatory policy toolbox as well as by establishing a well-coordinated feed-in tariff program.

- Regulatory requirements vary depending on the electricity market's structure. Under regulated markets, there exists some room to adjust tariff structures so as to make the feed-in adder rates more equitable. In competitive markets, on the other hand, additional measures would be necessary to alleviate the impact of the feed-in adder on lower-income households.

This analysis would be very useful for other countries in the region to consider when designing policy frameworks on how to promote renewable energy deployment that will be funded by ratepayers.

Appendix

Table 11.A1: Thailand Adder Rates

Type of Renewable Energy	Adder in 2009	Adder Since 2010	Additional for Diesel Substitution	Additional in Top 3 Southern Provinces	Period of Support
	Baht/kWh	Baht/kWh	Baht/kWh	Baht/kWh	Year
1. Biomass					
≤1 MW	0.50	0.50	1.00	1.00	7
> 1 MW	0.30	0.30	1.00	1.00	7
2. Biogas					
≤1 MW	0.50	0.50	1.00	1.00	7
> 1 MW	0.30	0.30	1.00	1.00	7
3. Waste					
Fertilizer/landfill	2.50	2.50	1.00	1.00	7
Thermal process	3.50	3.50	1.00	1.00	7
4. Wind					
≤ 50 kW	4.50	4.50	1.50	1.50	10
> 50 kW	3.50	3.50	1.50	1.50	10
5. Hydro (mini/micro)					
50 kW ≤ 200 kW	4.50	0.80	1.0	1.0	7
< 50 kW	3.50	1.50	1.0	1.0	7
6. Solar	8.00	6.50	1.50	1.50	10

Source: Ruangrong, P. (2013)

Table 11.A2: Malaysia Feed-in Tariff Rates

Capacity	FIT Rate (RM per kWh)	Effective Period (Years)	Annual Degression Rate
1. Biogas≤ 4 W			
Above 4 MW ≤ 10 MW	0.32	16	0.05%
Above 10 MW ≤ 30 MW	0.30	16	0.05%
Use for gas engine with efficiency above 40%	0.28	16	0.05%
Use of locally assembled gas technology	+0.02	16	0.05%
Use of landfill or sewage gas as fuel	+0.01	16	0.05%
	+0.08	16	1.80%
2. Biomass			
≤ 10 MW	0.31	16	0.05%
Above 10 MW ≤ 20 MW	0.29	16	0.05%
Above 20 MW ≤ 30 MW	0.27	16	0.05%
Use of gasification technology	+0.02	16	0.05%
Use of steam-based generating systems with efficiency above 14%	+0.01	16	0.05%
Use of locally assembled gasification technology	+0.01	16	0.05%
	+0.10	16	1.80%
Use of MSW as fuel			
3. Small hydro			
≤ 10 MW	0.24	21	0%
Above 10 MW ≤ 30 MW	0.23	21	0%
4. Solar PV			

≤ 4 kWp	1.23	21	8%
Above 4 kWp ≤ 24 kWp	1.20	21	8%
Above 24 kWp ≤ 72 kWp	1.18	21	8%
Above 72 kWp ≤ 1 MWp	1.14	21	8%
Above 1 MWp ≤ 10 MWp	0.95	21	8%
Above 10 MWp ≤ 30 MWp	0.85	21	8%
Installation in building or building structures	+0.26	21	8%
As building materials	+0.26	21	8%
Locally manufactured or assembled PV modules	+0.03	21	8%
Locally manufactured or assembled inverters	+0.01	21	8%

Source: KeTTHA (2011)

Table 11.A3: Philippines Feed-in Tariff Rates

RE Technology	FIT Rate (PhP/kWh)	Degression Rate	Installation Target (MW)
Wind	8.53	0.5% after 2 years from effectivity of FIT	200
Biomass	6.63	0.5% after 2 years from effectivity of FIT	250
Solar	9.68	6.0% after 1 year from effectivity of FIT	50
Run-of-River Hydropower	5.90	0.5% after 2 years from effectivity of FIT	250

Source: Department of Energy (2013)

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