

WORKING PAPER

Evaluating the Feed-in Tariff Policy in the Philippines

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This working paper is a draft in progress that is posted online to stimulate discussion and critical comment. The purpose is to mine reader's additional ideas and contributions for completion of a final document.

The views expressed herein are those of the authors and do not necessarily reflect the views of Ateneo de Manila University and the European Union.

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Abstract

In order to address the challenges of energy security and climate change, the Philippines enacted the Renewable Energy (RE) Act of 2008 to promote renewable energy. The Philippine Feed-In Tariff (FiT) policy was designed to provide a guaranteed fixed price to RE investors for a period of twenty (20) years to develop renewable technology. The objective of this paper is to evaluate the effectiveness of the FiT policy in promoting renewable energy development in the Philippines by assessing its costs and benefits. Data show that while the FiT led to the increase in RE generating capacity, the share of renewable energy in the total power generation mix has been declining since 2011. The findings also suggest that the Philippines has incurred a net social cost from its implementation of the FiT.

Key words: Feed-in Tariff, Electricity, Policy Evaluation, Philippines, Renewable Energy

1. Introduction

Energy is a critical component in the Philippines' pursuit of sustained economic growth and development. Economic expansion and the rapid growing population have raised concerns on how the increasing demand for energy will be met. The Asian Development Bank (2018) estimates that the country's energy consumption will double by 2035.

The Philippine energy mix is dominated by fossil fuels with the power sector relying on imported coal to power its baseload generation capacity which highlights the problem of resource depletion and CO₂ emissions. The Philippines is also vulnerable to price volatility and supply disruptions. These are inherent risks of an energy importer and the gradual depletion of the Malampaya gas field has forced the government to find other energy sources. Confronted with the challenges of energy security and environmental sustainability, the Philippines has sought to develop and utilize renewable energy sources.

The Renewable Energy (RE) Act of 2008, together with the Biofuels Act of 2006 aim to address the country's continuous dependence on imported fossil fuels by promoting the exploration, development and use of the country's renewable energy sources such as solar, wind, biomass, hydro and geothermal. The enactment of the RE Law is also vital for the low carbon emission development strategy of the Philippines and in addressing the challenges of energy security and threats of climate change.

The RE Law mandates the Feed-in Tariff (FiT) scheme, a non-fiscal incentive mechanism which grants renewable energy developers a guaranteed price for the purchase of their power generation over a mandated period of time. Institutionalizing the FiT for renewable energy sources assures potential investors of the financial viability of energy projects and the development of the targeted RE technologies.

The latest data from the National Grid Corporation of the Philippines (NGCP) show that FiT-eligible plants contributed an additional 1,375.77 MW of installed capacity from 2014 to 2019 which is significant in a country facing problems of energy security. Although the FiT mechanism increases investments in RE technology, it burdens consumers with higher electricity prices due to the additional cost of the Feed-in Tariff Allowance (FiT-All).¹ Moreover, the

¹ The Feed-In Tariff rules define the FiT-All as a "uniform charge (in PhP/kWh) to all on-grid electricity consumers who are supplied with electricity through the distribution or transmission network".

current FiT rates are higher compared to the average price in the Wholesale Electricity Spot Market (WESM). If electricity prices in WESM continue to go down, then Filipinos are burdened with additional costs of the feed-in tariff.

This study aims to assess the FiT policy in the Philippines. According to the literature, there are several criteria to measure the failure or the success of an RE promotion policy. Effectiveness and efficiency are used as the main criteria. The research objective is to answer the following research questions: (1) How effective has the FiT been in promoting RE technology and (2) Considering its costs and benefits, what is the net impact of the policy?

2. Feed-in Tariff Policy: Literature Review

Feed-in Tariff is a price-based support mechanism for RE developers which sets a guaranteed price to be paid to RE developers per kWh of electricity generated. It involves a purchase obligation on distribution utilities to buy the electricity produced by FiT-eligible RE generating plants. To date, FiT is recognized as the most efficient support scheme for promoting renewable energy (Menanteau, Finon, & Lamy, 2003) with over 111 states/countries/provinces adopting FiT to promote RE (IRENA, 2018). In Europe, FiT is responsible for the large-scale deployment of wind, solar, and biomass (Sijm, 2002).

Compared to quantity-based policies like the renewable portfolio standard (RPS), FiT is more attractive to investors as it poses lower investment risk due to the provision of long-term financial support. Purchase agreements for the sale of electricity under the FiT usually last from 10-25 years. Other design features of the FiT include differentiated FiT rates (to account for the level of maturity for each technology), installation targets, and degression rates to encourage technological change (Couture, et al. 2010). FiT is considered a subsidy and the cost of subsidizing producers are covered by electricity consumers.

The most important component of a FiT policy is determining the level of price which will stimulate investments in RE. A price that is too low will discourage RE developers from availing the FiT and a price that is set too high poses an additional burden to society. FiT payment design policies can either be independent or dependent of electricity price. Market-independent FiT, more commonly known as the Fixed-Price Policy is the most widely implemented policy design in Europe and Canada. Under this policy, RE developers are guaranteed a price for a fixed

period of time independent of electricity price volatilities in the market (see Figure 1). In contrast, under a premium price FiT policy, RE developers are paid a premium in addition to the market price of electricity (see Figure 2). Fluctuations in prices affect the amount of FiT received by producers. RE investors lose profit when market prices are low, while developers are rewarded with additional rent with higher market prices.

Several studies have analyzed FiT policies in different countries and evaluated its efficiency and effectiveness in promoting renewable energy. Sijm (2002) assessed the impact of FiT on several European countries. In Germany, FiT was introduced in 1991 with the passage of the Electricity Feed Law (EPL). Under the EPL, RE developers receive a feed-in tariff which is equal to a percentage of the annual average electricity rate per kWh. The corresponding feed-in tariffs for solar and wind were set at 90% while other RE technologies received 65-80% of the average electricity price. According to Sijm, the EPL was responsible for doubling the capacity of wind energy in Germany from 1990-1995. Similar results were found in Denmark and Spain. However, despite the impressive gains, the German FiT scheme was criticized for its failure to promote other renewable energy sources and for not providing enough incentives to encourage cost reductions and innovations (Frondel et. al, 2009)

An empirical assessment of the Spanish FiT policy was carried out by Del Rio and Gual (2007). They found that there was a significant increase in the deployment of renewables in Spain mostly from onshore wind. Moderate level of subsidies has not resulted in excessively high electricity rates but they have highlighted several challenges facing the Spanish RE industry including the unequal distribution of cost of the FiT subsidy.

The FiT mechanism accounts for a greater share of RE deployment in China compared to the RPS policy. However, Yan et al. (2016) points out that implementation of FiT in China was hindered by (1) uneven resource distribution, (2) reluctance of supply companies and power generators to get involved in RE and (3) insufficient FiT price to provide incentive to developers to invest in renewables.

In South East Asia, the Philippines is one of the first countries to adopt the FiT policy but studies on its impact is scant. Guild (2019) compared the implementation of FiT in the Philippines and Indonesia with the former successfully leading the development of the RE industry as seen in the rapid growth in installed capacity in biomass, solar, and wind. Pacudan (2014) studied the impact of FiT on electricity rates and found that the feed-in tariff allowance (FiT-All), a uniform

charge to consumers meant to cover payments for RE developers, is regressive for households with lower electricity consumption. De La Viña (2015) assessed the financial impact of the integration of FiT qualified resources such as wind and solar in the Wholesale Electricity Spot Market (WESM) and finds that the system receives a net benefit through the merit order effect but the impact to end-users may be a net cost.

FiT: Basic theory

Figure 3 presents a basic illustration of the determination of equilibrium price in the power sector. Because electricity is an important necessity, its demand curve is highly inelastic as shown by a steeper demand curve (D1). Introducing RE sources into the generation mix increase the supply of electricity shifting the supply curve to the right (S2) and decreasing the equilibrium price to P2. However, van Kooten (2013) notes introduction of renewable energy sources like wind and solar affects the dynamics in the market particularly when feed-in tariffs are introduced.

Consider a wholesale electricity market where generators offer to supply electricity in the market at a certain price. All information regarding prices and the amount of electricity to be supplied by power producers will be collected by the wholesale market operator who will then generate a ‘market merit order’ which serves as the supply curve in the market as shown in Figure 4. Suppose the demand curve is given by D1, then the market clearing price is given by the marginal cost of coal (coal 1) at P1.

Now consider the introduction of feed-in tariff for wind, solar, biomass and run-of-river hydro. Figure 5 describes its impact on the supply of electricity in the market by shifting the supply curve to the right with the new market-clearing price decreasing to P2 given by the marginal cost of CCG2 (combined-cycle gas plants). The provision of the feed-in tariff to RE producers increases the supply of electricity in the market and exerts pressure on prices pushing conventional energy sources further in the merit order in favor of RE. This impact is what is known as the merit-order effect.

Feed-In Tariff Policy in the Philippines

The RE Law mandates the institutionalization of the FiT for renewable technologies such as biomass, solar, wind, run-of-river hydro, and ocean. On July 12, 2010, the Energy Regulatory

Commission released Resolution No. 16, series of 2010 (which was later amended through ERC Resolution No. 15, series of 2012) detailing the implementing rules on the establishing the FiT system, the method of establishing and approving the FiT rates and the administration of the FiT-All. According to the resolution, the FiT will follow a fixed-price policy design with the National Renewable Energy Board (NREB) calculating the initial technology-specific FiT rates which will be submitted to the ERC for approval.

Table 1 shows the approved feed-in tariff rates together with their corresponding installation targets as set forth in ERC Resolution No. 10, series of 2012. For the first round of FiT, Solar PV received the highest FiT price at PhP 9.68/kWh with 50 MW of installed capacity followed by wind with an approved rate of PhP 8.53/kWh and a target capacity of 250 MW. Run-of-river hydro and biomass FiT rates were at PhP 6.63/kWh and PhP 5.90/kWh, respectively. Installation target for both were capped at 250 MW.

ERC released Resolution No. 06, series 2015 revising the installation target for solar energy generation from 50 MW to 450 MW and setting a new Solar FiT rate of PhP 8.69/kWh (“Solar FIT 2”). A new wind FiT rate of PhP 7.40/kWh (“Wind FiT 2”) was set under ERC Resolution No. 14, series 2015 to be applied to three wind power projects namely San Lorenzo, Nabas, and Pililia Power. On 24 February 2018, the DOE endorsed the extension of the biomass and run-of-river hydropower installation targets eligibility until December 31, 2019, or upon successful commissioning of the run-of-river hydro and biomass power projects. The extension covers the remaining balance of the respective initial installation targets. The FiT mechanism also guarantees all eligible renewable energy plants a (1) purchase agreement for a period of twenty (20) years, (2) priority connection to the transmission or distribution system, and (3) priority scheduling and dispatch in the spot market. According to De La Viña (2015), these concessions are a departure from the market-based scheduling and pricing regime of WESM.

ERC Resolution No. 15, series of 2012 mandates the designation of the National Transmission Corporation (TransCo) as the FiT-All Fund Administrator which will establish, manage, and administer the FiT-All Fund. The rules on the determination and imposition of the FiT-All Rate are outlined under the FiT-All guidelines released by the ERC on 16 December 2013. Under the FiT-All guidelines, TransCo must submit its proposed FiT-All Rate no later than July of each year for implementation the following year. Table 2 shows the proposed and the approved FiT-All Rates together with the date of approval and billing period. TransCo failed to

meet the July deadline for the submission of the proposed FiT-All rate for 2016-2017. In 2018, the ERC decreased the rate by PhP 0.0706/kWh to arrive at the current FiT-All rate of PhP 0.226/kWh.

3. Data Analysis and Results

In order to evaluate the Feed-in Tariff policy, this study will follow the methodology of Del Rio and Gual (2007). Due to data limitations, the assessment of the FiT will focus on two criteria: effectiveness and efficiency. The main objective of implementing the FiT is to promote and accelerate the deployment of RE technologies in the Philippines. Table 3 presents the number of FiT-eligible plants per technology and its corresponding total installed capacity. From 2014-2019, 82 new renewable energy plants were developed providing a total of 1,375.77 MW of additional installed capacity to the grid. Of the four technologies, only run-of-river hydropower has undersubscribed its installation target while both solar and wind energy are in excess of 26 MW from their approved installation capacity.

Table 4 shows that RE generating power plants contributed a total of 9,892,162 MWh of electricity from 2015 to the 3rd quarter of 2019. 45% of actual generation comes from wind energy with biomass and solar each providing 25% to the total share of FiT-eligible plants. The remaining 5% comes from run-of-river hydro.

Despite the increase in renewable energy sources, data from the Department of Energy (DOE) reflects the continuing dependence of the Philippine energy sector on coal. On average, the share of coal to total power generation increase by 2% every year. From 2017 to 2018, almost half of the total power generated in the Philippines is supplied by coal while the share of renewable energy sources decreased to 23% in 2018. Figure 3 shows the growing gap between the share of coal and renewables in the Philippines. Even with the passage of FiT, renewables failed to take over some of the share of coal in total power generation.

The efficiency of the FiT can be evaluated using a static efficiency approach where the benefits from the policy is compared to its costs. Due to data limitations, quantifiable benefits from FiT considered in this study are the (1) merit-order effect and (2) the environmental benefit of using renewable energy from FiT.

The merit-order effect is a result of the downward pressure on prices due to the increase in supply of renewables in the market. Using WESM data from November 2014 to October 2015,

De La Viña (2015) estimates that the FiT merit-order effect results in savings of PhP 8.3 billion per year.

To estimate the environmental benefit of the FiT, the actual generation of FiT-eligible plants from 2015-2019 (see Table 4) is used to calculate the amount of coal displaced by using RE. Table 6 presents the parameters used in the estimation. Total amount of CO₂ emissions avoided from using RE is at 9,694,318.76 metric tons. To compute for the monetary benefit of avoiding CO₂ emissions, the amount of CO₂ emissions avoided is multiplied with the social cost of carbon to arrive at an estimated benefit of PhP 24,037,063,365.42.

To estimate the cost of the FiT policy, actual data on FiT-All Fund Cashflow from 2015 to 2019 are used. The FiT-All is the amount paid by end-users to cover for the payments to RE investors who availed of the FiT. As of September 2019, the total amount collected from consumers is PhP 79,000,800,000.00.

Combining the total estimated environmental benefit from the FiT and the merit-order effect, Philippine society received an estimated total gain of PhP 73,837,063,365.42. Total costs is greater than the total benefits from the policy suggesting that the Philippines is incurring an estimated net social cost of PhP 5,163,736,635 from its implementation of the FiT.

4. Other Considerations

Apart from its net social cost, RE has certain unintended consequences. The resulting decline in market prices due to the merit order effect leads to what is called the “missing money” problem. Investors in conventional energy may not recoup their capital costs because of the drop in prices. Not only will existing investors be adversely affected, future investment in conventional energy will be discouraged.

A related problem is described by ADB (2018) as “curtailment risk and price dislocation”. The experience in Negros island provides a clear example. Under the FiT program, Negros saw the addition of 279 MW of solar capacity during March and April 2016 which amounts to 57% of the total solar capacity under the program on an island where peak demand reached 316 MW in 2016. The shift to overcapacity during 2016 combined with the priority of dispatch given to solar and other newer forms of renewable energy (under the Renewable Energy Act) has led to the curtailment of coal and geothermal generating capacity by the NGCP to mitigate grid congestion.

Variable RE has therefore crowded out conventional energy—and even traditional RE like geothermal—in terms of both price and quantity. These items will only add to the social cost if ever they are quantified. Hence, the estimated net social cost of PhP 5,163,736,635 from the implementation of the FiT can be considered a floor.

5. Conclusion

Energy security and climate change are among the major challenges affecting the Philippines today. The landmark passage of the RE Law and the Biofuels Act and the institutionalization of FiT are a vital step towards attaining self-sufficiency and promote the use of sustainable energy. FiTs are considered as the most effective support scheme for the promotion and development of renewable energy.

Meanwhile, the added capacity of FiT-eligible generating plants did not translate to a growing share of RE in the power generation mix with coal contributing 50% of the total mix. The trend also shows that coals' contribution to the power mix is increasing by 2% annually. Considering the total benefit and cost of the FiT, the net effect of the policy is estimated to be a burden to society in the amount of PhP 5,163,736,635. The allotment of the FiT-All also raises question on the equity of the policy. According to the Mindanao Development Authority, Luzon and Visayas receives 70.4% and 26% of the total FiT-All availment while Mindanao only has a 3.6% share.

Based on the analysis in this study, the FiT has not addressed its intended purpose of helping the Philippines create a low-carbon development strategy. With the continuing increase in electricity prices, the FiT is turning out to be an additional short-term burden to the Filipinos.

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Annex

Figure 1: Fixed-Rate FiT Policy

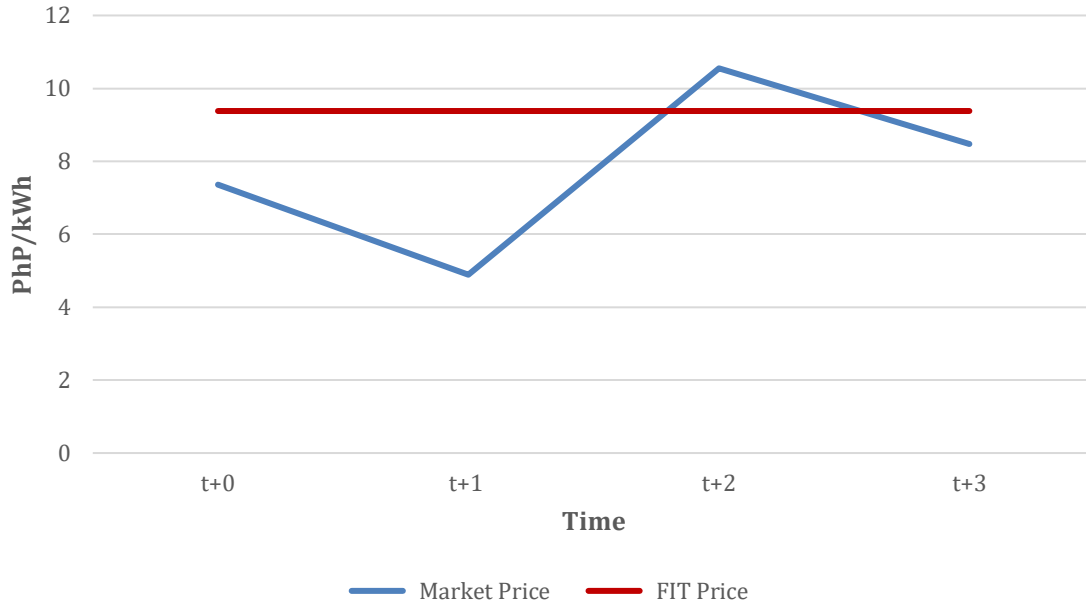


Figure 2: Premium Price FiT Policy

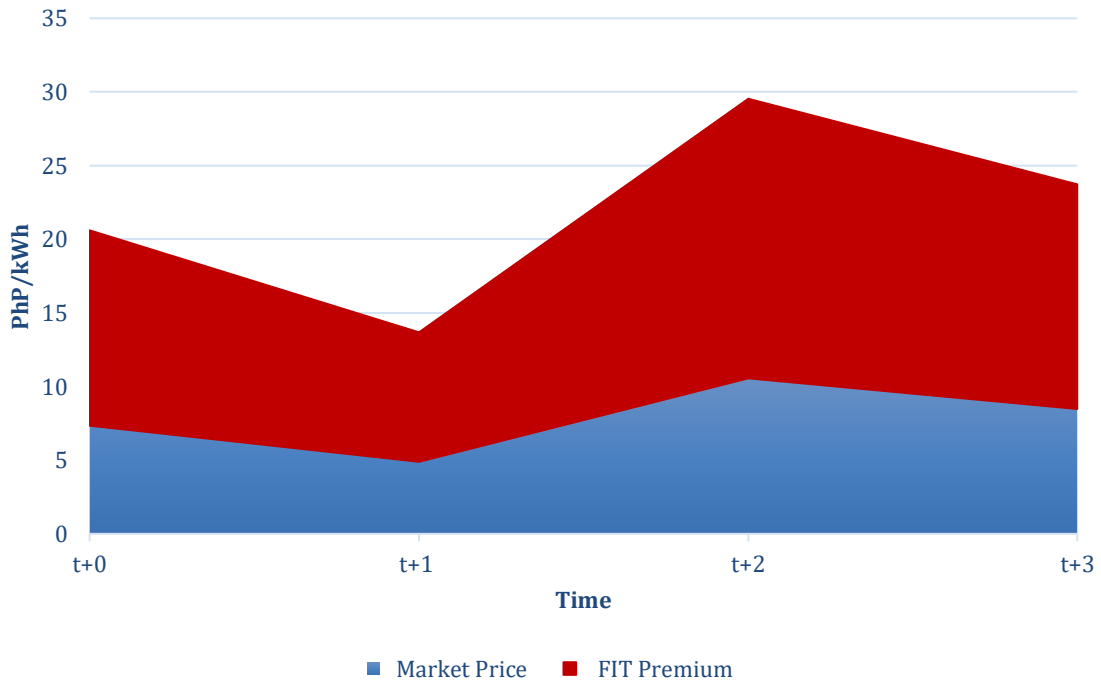


Figure 3: Supply and Demand Curves

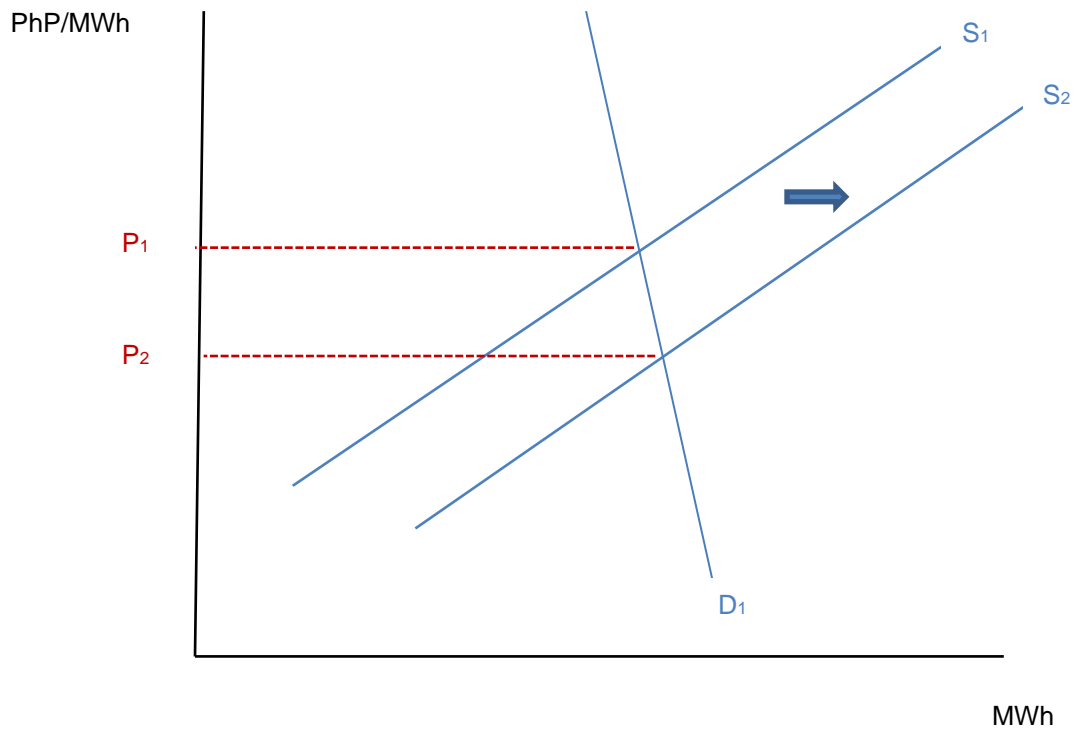


Figure 4: Market Merit Order

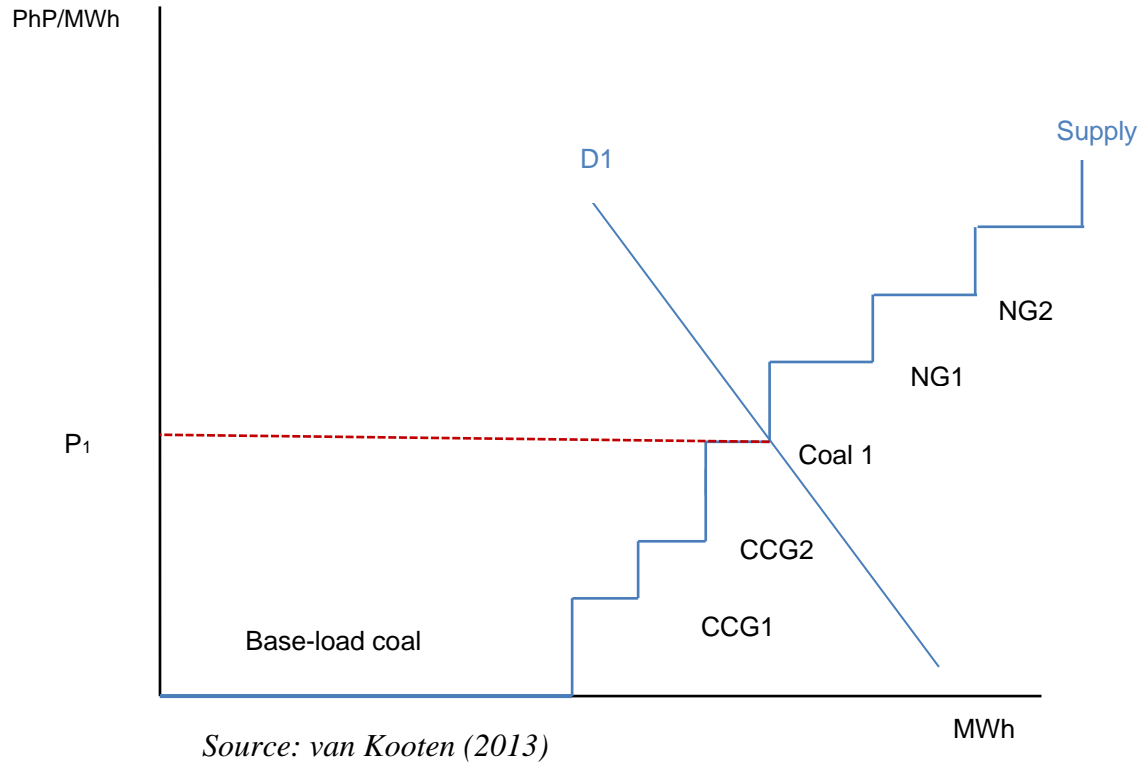


Figure 4: Market Merit Order and FiT

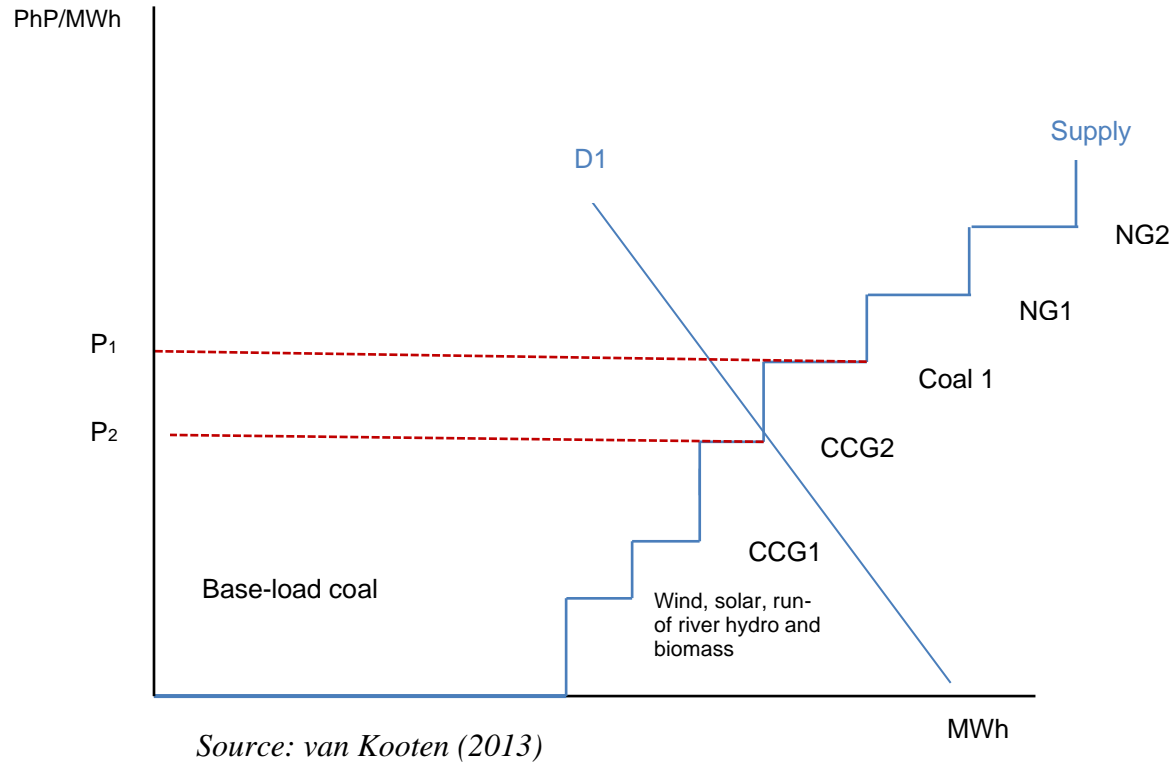


Table 1: Approved Feed-In Tariff Rates

Technology	Approved Rates (PhP/kWh)	Installation Target (MW)	Degression Rate (from effectivity of FiT)
1. Biomass	5.90	250	0.5% (from Y+2)
2. Run-of-River Hydro	6.63	250	0.5% (from Y+2)
3. Solar PV (FiT 1)	9.68	50	6.0% (from Y+1)
4. Solar PV (FiT 2)	8.69	450	6.0% (from Y+1)
5. Wind (FiT 1)	8.53	250	0.5% (from Y+2)
6. Wind (FiT 2)	7.40	150	0.5% (from Y+2)

Source: Department of Energy (DOE) and Energy Regulatory Commission (ERC)

Note: FiT rates for installed capacity are subject to annual adjustments for local inflation and foreign exchange.

Table 2: Approved FiT-All Rate

Year	Rate as Applied PhP/kWh	Approval	Date
2014-2015 (filed July 30, 2014)	0.0406	Provisional: PhP 0.0406/kWh	January 2015 Billing Period
		Final: PhP 0.0406/kWh	December 10, 2015
2016 (filed December 22, 2015)	0.1025 or the updated amount at the time of evaluation	Provisional: PhP 0.1240 /kWh	April 2016 Billing Period
		Final: PhP 0.1830/kWh	May 9, 2017 (docketed May 13, 2017)
2017 (filed December 1, 2016)	0.2291 or the updated amount at the time of evaluation	No Provisional Authority Issued to Date	
		Final: 0.2563/kWh	Feb 27, 2018 (docketed May 11, 2018) effective June 2018 billing
2018 (filed August 29, 2017)	0.2932 or the updated amount at the time of evaluation	No Provisional Authority Issued to Date	
		Final: PhP 0.2226/kWh	March 12, 2019 (docketed March 29, 2019 (effective April 2019 billing
2019 (filed on July 27, 2018)	0.2780 or the updated amount at the time of evaluation	No Provisional Authority Issued to Date	Awaiting ERC resolution

Source: Energy Regulatory Commission (ERC)

Table 3: Number of FIT Eligible Plants and Installed Capacity (in MW)

Technology	2014		2015		2016		2017		2018		2019 (as of July 3 2019)	
	No. of Plants	Installed Capacity	No. of Plants	Installed Capacity	No. of Plants	Installed Capacity	No. of Plants	Installed Capacity	No. of Plants	Installed Capacity	No. of Plants	Installed Capacity
Biomass	8	65.35	15	153.20	16	160.49	18	144.69	25	159.54	31	250.50
Run-of-River Hydropower	3	12.60	5	35.73	12	59.98	8	107.89	12	120.10	20	172.42
Solar	3	50.00	11	161.90	22	523.02	24	526.43	24	525.95	24	525.95
Wind	4	200.00	7	426.90	7	426.90	7	426.90	7	426.90	7	426.90
TOTAL	18	327.95	38	777.73	57	1,170.39	57	1,205.91	68	1,232.49	82	1,375.77

Source: National Transmission Corporation (TransCo)

Table 4: Actual RE Generation of FiT Eligible Plants(in MWh)

Technology	2015	2016	2017	2018	As of 5 September 2019	Total
Biomass	264,569	512,081	592,919	715,107	403,413	2,488,089
Hydro	85,760	94,323	149,094	167,456	69,603	566,236
Solar	102,079	571,791	660,721	693,258	403,286	2,431,135
Wind	763,120	952,836	1,074,849	1,135,082	480,815	4,406,702
TOTAL	1,215,528	2,131,031	2,477,583	2,710,903	1,357,117	9,892,162

Source: National Transmission Corporation (TransCo)

Table 5: Power Generation by Source (in GWh)

Technology	2010	2011	2012	2013	2014	2015	2016	2017	2018
1. Coal	23,301	25,342	28,265	32,081	33,054	36,686	43,303	46,847	51,932
2. Oil-Based	7,101	3,398	4,254	4,491	5,708	5,886	5,661	3,787	3,173
3. Combined Cycle	1,202	124	227	247	515	276	694	405	522
4. Diesel	4,532	2,762	3,332	3,805	4,730	5,521	4,722	3,100	2,505
5. Gas Turbine	3	-	-	-	-	10	-	-	-
6. Oil Thermal	1,364	512	695	438	463	80	245	282	145
7. Natural Gas	19,518	20,591	19,642	18,791	18,690	18,878	19,854	20,547	21,334
8. Renewable Energy (RE)	17,823	19,845	20,762	19,903	19,810	20,963	21,979	23,189	23,326
a. Geothermal	9,929	9,942	10,250	9,605	10,308	11,044	11,070	10,270	10,435
b. Hydro	7,803	9,698	10,252	10,019	9,137	8,665	8,111	9,611	9,384
c. Biomass	27	115	183	212	196	367	726	1,013	1,105
d. Solar	1	1	1	1	17	139	1,097	1,201	1,249
e. Wind	62	88	75	66	152	748	975	1,094	1,153
TOTAL	67,743	69,176	72,922	75,266	77,261	82,413	90,798	94,370	99,765
Share of Coal (%)	34%	37%	39%	43%	43%	45%	48%	50%	52%
Share of Renewable Energy (%)	26%	29%	28%	26%	26%	25%	24%	25%	23%

Source: Department of Energy (DOE) Power Statistics

Figure 3: Share of Coal and Renewable Energy in the Philippines

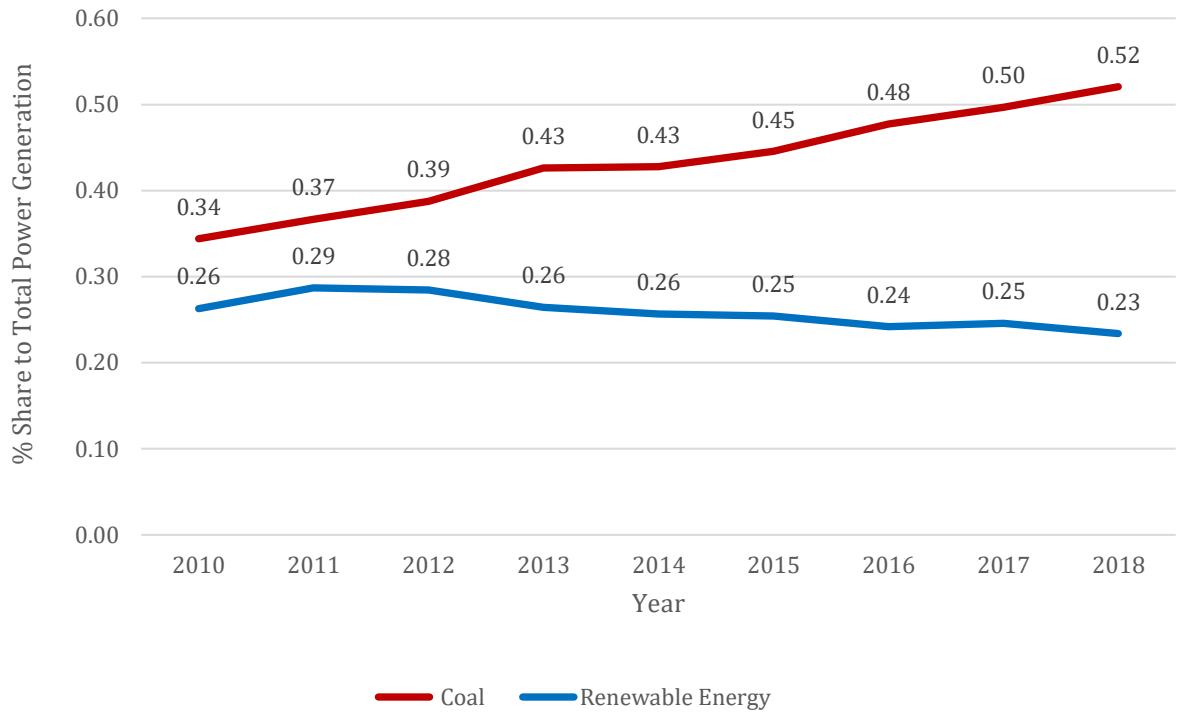


Table 6: Total Environmental Benefit From Using RE Instead of Coal

A. Actual Generation of FiT-Eligible RE, in MWh	9,892,162.00
B. CO ₂ emissions (metric ton per MWh)	0.98
C. Amount of CO ₂ Avoided by use of RE (in metric tons)	9,694,318.76
D. Social Cost of Carbon ² (\$ per metric ton)	50
E. Average Exchange Rate, 2013-2018 (Peso per 1\$)	49.59
F. Social Cost of Carbon (Pesos per metric ton) =50 x 49.59	2,479.50
Benefit from Using RE instead of coal (Pesos)	24,037,063,365.42

Table 7: FiT- All Fund Cashflows (as of September 5, 2019, in million pesos)

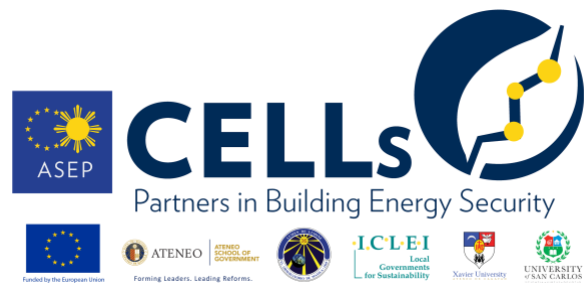
	2015	2016	2017	2018	As of 5 September 2019	TOTAL
Total Fund Cash Inflow	3,058.40	10,235.10	18,006.70	26,271.60	21,429.00	79,000.80
Total Fund Cash Outflow	2,738.00	10,106.70	17,641.30	26,197.80	15,824.40	72,508.20
Excess of Collection over Disbursement	320.40	128.40	365.40	73.80	5,604.60	6,492.60
Cash, Beginning		320.40	448.80	814.20	888.00	
Fund Balance	320.40	448.80	814.20	888.00	6,492.60	6,492.60

Source: National Transmission Corporation (TransCo)

² The social cost of carbon used is from the United States Environmental Protection Agency (US EPA). With an average discount rate of 3%, the social cost of carbon is \$ 50.00 per metric ton of CO₂ in 2030. Skeptics of climate change effects use a higher discount rate. At an average discount rate of 5%, the social cost of carbon falls to \$ 16.00 per metric ton of CO₂ in 2030.

Table 8: Over-all Net Social Cost of FiT in the Philippines

Total Benefit	PhP 73,837,063,365.42
Environmental Benefit	PhP 24,037,063,365.42
Merit Order Effect (from 2014-2019)	PhP 49,800,000,000.00
Total Cost	PhP 79,000,800,000.00
Total Amount of FiT-All Collected from Consumers	PhP 79,000,800,000.00
Net Social Cost	PhP 5,163,736,635



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