Assessing the "Renewable Energy 2040" target: Roadblocks and recommendations for the Philippines

Mary Grace V. Gabis
GETPPP, Green School, Korea University
Department of Energy of Philippine,
Science Research Specialist II

ABSTRACT

In line with the goal of achieving a low carbon future, the Philippines made an aspirational target which aims to increase the total installed capacity coming from renewable energy (RE) to at least 20,000 MW by 2040. The country's RE sector has progressively advanced over the years following the enactment of its comprehensive RE Law in 2008. Among other RE technologies, solar achieved the highest installation growth from 2008 to 2018. The paper seeks to assess whether the Philippines' RE target by 2040 is achievable in terms of the current status and future outlook for RE. Major roadblocks that hamper RE development are identified and discussed, including some recommendations for policy-making and energy planning.

Keywords: Renewable energy, Solar PV, Energy policy, Philippines

Introduction

Philippines is one of the largest archipelagic country in the world consists of more than 7,000 islands. It is a democratic and developing country located in Southeast Asia with about 108 million total population, and 3,100 USD Gross Domestic Product (GDP) per capita. It has three major geographical islands which are Luzon, Visayas, and Mindanao. Philippines aspires to be a "prosperous, and predominantly middle-class society where no one is poor" by 2040 as embodied on its "AmBisyon Natin 2040", which "represents the collective long-term vision and aspirations of the Filipino people for themselves and for the country in the next 25 years".[16] To achieve this, the per capita income must increase by at least three-folds, along with the progressive and sustainable growth of the economy.[16]

Notably, all the economic sub-sectors will require a huge amount of energy, particularly electricity, for it to run and operate. In line with this, the Philippine Energy Plan, 2017-2040 (PEP) was published by the Philippine Department of Energy (DOE) which is anchored on the Ambisyon Natin 2040. The PEP identified the eight "Energy Sector Strategic Directions by 2040" (ESSDs) which will serve as the guiding principle to secure the country's energy future.[6] Among others, promoting a low carbon future (ESSD 3) is included as one of its core components, and the utilization of clean and renewable energy (RE) was recognized as a key towards the attainment of this goal. In line with this, the DOE came up with the "Renewable Energy 2040" (RE 2040)[1] target which aims to increase the installed capacity from RE to at least 20,000 MW by 2040. Philippines has the comparative natural advantage for the development of RE such as geothermal, hydro, solar, and wind, due to its location near the Pacific Ring of Fire and Western Pacific Ocean.

This paper seeks to assess whether the RE 2040 target is achievable. In order to do so, the country's RE law, policies, and programs, and power mix will be analyzed, with emphasis on the case of solar power development. Following this, the RE Outlook based on the upcoming projects will be discussed, including the major roadblocks to the development of RE in the Philippines. Recommendations for policy-making and energy planning are provided in the final section.

Renewable energy in the Philippines: The case of solar power development

The implementation of the Republic Act No. 9513, otherwise known as the Renewable Energy Law of 2008 (RE Law), served as the landmark policy which paved the way for the significant development and utilization RE in the country.[8] The Philippines' RE Law was the first in Southeast Asia to provide a comprehensive legislation for RE.[2] This law provides fiscal and non-fiscal incentives to accelerate RE exploration and use in the country.[17] Fiscal incentives include income tax holidays, duty-free importation, cash incentives, and exemption from various power-related charges, among others.[17] Non-fiscal incentives include Feed-In-Tariff (FIT), Net-Metering, Renewable Portfolio Standards (RPS),

1) For easier reference, this paper named the target as "Renewable Energy 2040" or "RE 2040" which stands for the "20" thousand MW target by the year 20"40".

Green Energy Option Program (GEOP), and the development of the Renewable Energy Market (REM).[17] The eligible RE facilities covered by the RE Law include biomass, solar, wind, geothermal, ocean energy, and hydropower and other emerging renewable energy technologies.[17] Since RE Law's inception in 2008, only the FIT and Net-Metering schemes have been fully implemented; while the RPS, GEOP, and REM are still underway. The specific policies and Implementing Rules and Regulations (IRR) for the RPS and GEOP were recently formulated and approved in 2017 and 2018. Likewise, the REM Rules was approved in December 2019 to support the implementation of the RPS and GEOP.

Given the country's strong commitment towards a low carbon future and ambitious national target, the development and utilization RE should be increasing more than fossil fuels, specifically coal. However, despite the laws, policies, and programs for RE which have been implemented over the years, the annual average growth of installed capacity coming from RE sources remained sluggish at 4% as compared to coal at 10% from 2008-2018, as shown in Table 1. The share of RE in the installed capacity even declined from 34% in 2008 to 31% in 2018, while coal's share increased from 26% to 39% over the same time period.

This disparity between RE and coal is even more evident in terms of power generation. As depicted in Table 2, the share of electricity production from RE dropped from 34% in 2008 to 23% in 2018. Whereas, power generation from coal significantly increased by two-folds from 26% to 52%, making the country largely dependent on coal for more than half of its electricity supply in 2018.

Among all RE technologies, the installed capacity and power generation from solar has significantly taken-off. Solar power installation enormously increase from only 1MW in 2008 to 740 MW in 2018, which is equivalent to the annual average growth rate of 647% (Table 1). Likewise, power generation from solar also increased from 1 MWh to 1,249 MWh over the ten-year period, which is translated into a three-digit annual average growth at 252% (Table 2). The implementation of the FIT and Net-Metering policies triggered this sharp increase in solar power

Table 1. Philippines' installed capacity, 2008-2018

Plant type	2008		2018		2008-2018 AAGR (%)
	Installed capacity (MW)	Share (%)	Installed capacity (MW)	Share (%)	
Coal	3,412	26	8,368	39	10
Oil Based	2,702	21	2,995	14	1
Natural Gas	2,562	20	3,286	15	3
Renewable Energy	4,372	34	6,592	31	4
Geothermal	1,388	11	1,770	8	3
Hydro	2,950	23	3,473	16	2
Biomass	0	0	182	1	46
Solar	1	0	740	3	647
Wind	33	0	427	2	75
Total	13,049	100	21,241	100	5

Source: DOE, 2018 Power Statistics[7]

Table 2. Philippines' power generation, 2008–2018

Plant type	2008		2018		2008–2018 AAGR (%)
	Power generation (MWh)	Share (%)	Power generation (MWh)	Share (%)	
Coal	15,749	26	51,932	52	13
Oil Based	4,868	8	3,173	3	0
Natural Gas	19,576	32	21,334	21	1
Renewable Energy (RE)	20,628	34	23,326	23	1
Geothermal	10,723	18	10,435	10	0
Hydro	9,843	16	9,384	9	0
Biomass	–	0	1,105	1	80
Solar	1	0	1,249	1	252
Wind	61	0	1,153	1	59
Total	60,821	100	99,765	100	5

Source: DOE, 2018 Power Statistics[7]

Table 3. Feed-in-Tariff installation target, rate, and status as of May 2018

RE resource	Installation target (MW)	FIT rate (PhP/kWh[2)])	Served (MW)	Unserved (MW)
Run of River Hydro	250	5.90	43.1	206.9
Biomass	250	6.63	138.6	111.4
Solar	500	8.69*	500	–
Wind	400	7.40**	400	–
Ocean	10	–	–	10

* Energy Regulatory Commission (ERC) Approved Rate in April 2015
** ERC Approved Rate in October 2015
Source: DOE, Philippine Energy Plan 2017-2040: Sectoral Plans and Roadmaps[6]

installation. As stipulated in the RE Law, the FIT system includes priority connections to the grid, priority purchase and transmission of, and payment for electricity generated from RE resources by grid system operators.[17] In addition, FIT also provides a fixed tariff or premium payment for electricity produced from eligible RE resources for 20 years, subject to installation caps which are determined on a first-come-first-serve basis,[17] as summarized in Table 3.

It can be noted that the initial installation target for solar PV was expanded from 50 MW to 500 MW to accommodate the huge number of projects developers who want to avail of the FIT incentive.[6] The initial FIT rate for solar was also adjusted from 9.68 PhP/kWh to 8.69 PhP/kWh to accommodate such an increase in the installation target. As of May 2018, the installation target for both solar and wind was already met, while the only remaining unserved targets are for the run of river hydro and biomass. Meanwhile, the net-metering was implemented to encourage consumers and end-users to produce their own electricity from eligible RE facilities at a maximum capacity of 100 kW.[5] The excess power generated by consumers will be delivered and sold back to the grid, thereby off-setting their final electricity consumption. As of August 2019, there are 2,973 qualified end-users with net-metering connections, with a total capacity of

2) Philippine Peso (PhP) per Kilowatt Hour (kWh)

23.76 kWp[3].[11] All of these capacities are from solar photovoltaic (PV). The full implementation of the RPS and GEOP, along with the operation of the REM, are expected to further increase the capacity of RE, especially solar. RPS is the market-based policy that mandates electric power industry participants to source or produce a portion of their electricity requirements from eligible RE resources (DOE, 2017), while GEOP provides end-users the option to select RE as their source of energy.[4]

Renewable energy outlook

In assessing the achievement of the RE target, it is important to look at the upcoming RE facilities and their capacities. The DOE, through its Renewable Energy Management Bureau (REMB) which is the dedicated unit in-charge of RE development, issues and grants project developers with Renewable Energy Service Contract (RESC). RESC is a "*service agreement between the Government, through the President or the DOE, and an RE Developer over an appropriate period as determined by the DOE in which the RE Developer shall have the exclusive right to explore, develop or utilize a particular RE area*".[9] As of July 2019, there are a total of 449 and 226 RE projects, with 24,056 MW and 4,475 MW capacity, which are under pre-development and development stage that have been given RESC by the DOE.[11] Table 4 provides the status of RESC per RE resource, as well as the number of projects and corresponding installed capacity. RE projects with pre-development status are those which are still undergoing various exploratory, feasibility, permitting, and financial-closing activities; while those with development status are already undergoing construction, testing, and pre-operation activities. Majority of the projects under pre-development stage comes from solar, while those under the development stage comes from hydro.

The total installed capacity of these RE projects with RESC accounts to 28,531 MW. If all these projects will materialize, the 20,000 MW RE target by 2040 will be achieved and even be exceeded. Adding the existing installed capacity of RE as of 2018 which is 6,592 MW, and these prospective additional capacities, the total installed capacity coming from RE may reach 35,123 MW in the future.

Table 4. Status of RESC, as of July 2019

Renewable energy resource	Pre-development stage		Development stage	
	Number of projects	Installed capacity (MW)	Number of projects	Installed capacity (MW)
Geothermal	12	265	–	–
Hydro	176	7,747.63	167	3,130.87
Biomass	–	–	35	295.32
Solar	199	14,178.05	17	511.52
Wind	55	1,839.10	7	537.15
Ocean	7	26	–	–
Total	449	24,055.78	226	4,474.86

Source: DOE, Updates on Renewable Energy Plans and Programs[11]

3) Kilowatt-peak

Given these, it is important to provide and secure a favorable environment for RE investments, especially those under the pre-development stage, to fully realize the RE 2040 target.

Roadblocks to the development of renewable energy in the Philippines

The RE Outlook presented and discussed in the previous section suggests a promising future for RE development in the country. It not only signifies the attainability of the RE 2040 target, but more importantly, it manifests the strong support and interest of the private sector to invest in the RE industry in the Philippines. However, the reality is that the advancement of the RE sector in the country is hampered by a lot of hurdles and bottlenecks. If these key issues will not be addressed and resolved, the RE 2040 may just remain as an aspirational target that can hardly be reached.

Technical barrier

RE development in the Philippines faces several technical constraints related to its intermittency and variability, season-dependency, grid integration, and site-specificity. Variable Renewable Energy (VREs) such as solar, cannot provide reliable and continuous supply of electric power at 24/7 since it is largely dependent on solar irradiance at a given time, hence its capacity factor or efficiency results in lower values.[14] In addition, the production of electricity from RE is largely affected by seasonal variations. Given these inherent technical issues on RE, its integration in the electrical grid remains a challenge. In some instances, the fast uptake and completion of VRE projects also create a "timing mismatch" for the necessary transmission line capacity expansions to be approved and operational.[12] In 2016, the huge influx of solar capacities in Negros located in the Visayas region, created transmission line congestion problems, and power curtailments and interruptions.[18] While this issue is set to be resolved with the ongoing construction of additional submarine cables to accommodate these solar capacities, this occurrence may still persist in the future if planning and implementation between different power industry players will not be aligned. Lastly, RE resources and facilities are site-specific. The country's archipelagic geography, and vulnerability to natural phenomenon and disasters, make RE siting a daunting task. Hence, the conduct of feasibility and system impact studies are required, and the appropriate technologies and technical designs have to be determined and utilized.

Policy making and implementation

The Philippines' electric power industry was liberalized in 2001 with the enactment of the Republic Act No. 9136, known as Electric Power Industry Reform Act of 2001, or the EPIRA Law. From a vertically-integrated and government owned- and -controlled power system, it was transformed into a competitive and private-sector dominated industry. EPIRA restructured the power industry into four major sectors namely generation, transmission, distribution, and supply.

The country's liberalized power sector makes RE planning, policy-making, development, and integ-

ration more difficult and complex.[15] In the power generation, distribution, and supply sector, the number of private companies account to more than a hundred each. Hence, the government, energy agencies, and regulator have to consider and balance all these competing interests and characteristics of power industry players in power system planning, policy-making, and implementation in a bureaucratic and consultative manner. Further, the consistency of laws, rules, and regulations have to be carefully and regularly checked and updated to ensure that everything is aligned and in order.[1] These, along with other factors, makes the whole process of energy and RE planning, policy-making, and implementation in the country longer, tedious, and in most cases delayed. For instance, the implementation of the policies and programs like the FIT, net-metering, RPS, GEOP, and REM, were all delayed as opposed to the provisions set forth in the country's RE Law.

Permitting process

The complex and lengthy permitting process in the country remains one of the major bottlenecks not just for RE development, but all power-related infrastructure. Approvals are required across different levels of government such as in the barangay, municipal, provincial, regional, and departmental agencies and authorities. According to Senator Sherwin T. Gatchalian, chairman of the Senate Committee on Energy of the Philippines, it takes about 1,340 days or about more than three and a half years to secure all the necessary permits.[13] These permits involve 359 signatures from 74 different agencies on the average.[13] This long and tedious process of securing permits not only delays the commercial operation of RE projects, but also discourages potential investors to enter into the RE power generation business. In view of these, the DOE has been greatly focusing on cutting the approval process through various policies, programs, and monitoring schemes.

Socio-environmental

Despite being a clean and sustainable energy alternative, RE development still creates some adverse social and environmental impacts. Land-use is one of the major concerns with large-scale solar farms because it requires a huge amount of space to produce enough electricity. This huge amount of area displaced by solar farms could have been habitats for animals or used as for other activities such as in agriculture or industries, among others. Further, proper waste disposal is another pressing issue in solar power development since solar panels contains toxic and harmful chemicals.[3]

Recommendations

Given the major roadblocks to the RE sector in the Philippines, following are the recommendations of this paper to aid in achieving the country's Renewable Energy 2040 target:

Establish a clear and cohesive national renewable energy target

Some stakeholders pointed out that the RE 2040 target is too ambitious given the current technical and institutional hurdles faced by RE, while others

raised that it must be more aggressive to keep up with the global trend towards a clean and sustainable energy. In this regard, a clear, cohesive, and unified national RE target must be established. This target must be scientifically backed-up and supported by technical, financial, and socio-environmental studies to be realistic, implementable, and acceptable. The Philippines' RE target must be mutually agreed upon by the government, energy agencies, and industry players, and properly communicated to concerned stakeholders and even the general public.

Comprehensive renewable energy resource assessments

To address the technical roadblocks of RE, a comprehensive RE Resource Assessment which include all types of technology or resource must be conducted. This shall not only include the specific RE resource potential per area; but also consider the current and future conditions which influence RE development like demand, transmission and distribution line capacities/limitations, industry and economic development, environmental condition, and socio-political climate, among others. Doing this kind of assessment will map out the country's full RE potential that will serve as a basis for project developers' and power industry players' investment decisions, and infrastructure plans.

Regular updating of renewable energy statistics and assessment of developments

Collecting and updating RE-related statistics still remain a challenge that needs to be addressed in the Philippines. Having accurate, consistent, and up-to-date data is crucial for monitoring and assessing the RE targets, and identifying policy and implementation gaps. Hence, this paper recommends the establishment of a transparent, systematic, and streamlined reporting scheme that will require owners and developers to submit all relevant RE data on a periodic basis (monthly, quarterly, and/or annually). Data sharing (between the government, energy agencies, and RE project owners and developers) and its digitization, are also a must to enable efficient and real-time information gathering and analysis.

Harmonize energy plans and regulatory policies

It is vital to come-up with energy plans, policies, and programs that are complementing rather than conflicting with each other. For example, developing RE while still supporting the entry of fossil-based power generation like coal, could dampen the Philippines' pursuit towards a low carbon future. If the country is committed to achieve the RE 2040 target, it is necessary to align and harmonize all its energy plans which include the PEP, Power Development Plan (PDP), National Renewable Energy Plan (NREP), Transmission Development Plan (TDP), and Distribution Development Plan (DDP), among others. Likewise, the regulatory environment must be conducive enough to spur the deployment of RE, which can be achieved through preferential tariff rates and faster project approval process, among others.

Fast-track and streamline permitting process

Both the private sector and government recognize

the urgency to shorten the permitting procedure in the Philippines. The multi-layer and tedious approval process not only cause delays in RE project construction and operation, but also result in huge financial losses on the part of investors, and forgone socio-economic benefits (e.g. needed electricity which could have been already supplied to consumers) to the country.

Pursuing decentralized energy systems

Given the country's archipelagic geography, pursing decentralized energy systems particularly for off-grid areas[4] , can aid in achieving the RE target. Off-grid areas and small islands in the Philippines heavily rely on oil, particularly diesel, for power generation at about 97% percent share[5]. This concentrated power mix, which is biased on imported and expensive oil, makes the electricity price in off-grid areas higher and vulnerable to international price fluctuations. Decentralization of energy systems powered by RE in these rural and least developed areas not only increase the utilization of cleaner energy, but also increases energy access and combats energy poverty.

Conclusion

The renewable energy sector in the Philippines has significantly developed over the years, following the implementation of the country's Renewable Energy Law in 2008. Through this law, various programs and policy mechanisms have been and will be implemented such as the FIT, Net Metering, RPS, GEOP, and REM, with the end goal of further increasing the RE utilization in the country. In line with this objective, the government, through the DOE, made an aspirational target coined by this paper as "Renewable Energy 2040" which aims to increase the total RE installed capacity of the country to 20,000 MW by 2040. The RE Outlook presented in this paper manifests the strong interest of the private sector to invest in RE, and suggests the attainability of the country's RE objectives. Based on the number and capacities of RE Service Contracts issued by the DOE, the total RE installed capacity may even exceed the 20,000 MW target by 2040, if all these projects will materialize. However, these numbers and outlook only tell one side of the story. The sector is currently facing a number of issues and challenges which include technical barriers, policy making and implementation, permitting process, and socio-environmental concerns.

These concerns can be addressed by technically studying and assessing the country's RE potential, and periodic updating of all relevant RE statistics and information. On a macro level, a unified national RE target must be set once and for all. Consequently, all energy plans, policies, programs, and regulations must be aligned, rather than conflicting with each other. Other innovative solutions must be also considered such as pursuing a decentralized energy system, which not only aid in achieving the RE target, but also critical for increasing the country's electrification level especially in rural and off-grid areas. Therefore, to achieve the renewable energy target, the technical, institutional, and political aspects of its

4) Areas that are not connected to main grid or transmission backbone
5) Percent share of oil-based production to the total off-grid power generation as of December 2017

development must be timely and properly addressed. A strong leadership and governance, as well as the cooperation and collaboration between and among all stakeholders, would be necessary.

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