Sara Jane Ahmed, Energy Finance Analyst
Colin Steley, Environment & Resource Economist
February 2020

Institute for Energy Economics and Financial Analysis
IEEFA.org

Paying Less for More - How Auctions Can Transform the Philippines Power Sector

Competitive auctions could attract US$2 billion in new investment through the Green Energy Tariff Program

Executive Summary

During President Rodrigo Duterte's fourth State of the Nation Address, he called for the expedited development of renewable energy to reduce dependence on imported fossil fuels such as coal: "We recognize the urgent need to ensure the sustainability and availability of resources and the development of alternative ones. In this regard, I trust that (Energy) Secretary Cusi shall fast-track also the development of renewable energy sources, and reduce dependence on the traditional energy sources such as coal." It is clear that Secretary Cusi is mobilizing the Department of Energy to heed the President's call for low-cost renewable energy.

The **Green Energy Tariff Program (GETP), to be introduced this year** targets 2,000 megawatts (MW) of new installed capacity, an investment value equivalent to USD2 billion (generation only, excluding transmission and distribution and storage). This program is timely, considering that this past June, the Luzon grid was placed under red alert, the most urgent warning of a potential power shortage; signaling available capacity was 10,962MW while peak demand reached 11,134MW. New energy supply installation is taking longer than expected[1]. Moreover, the Philippines has the third most expensive electricity in Asia, behind only Singapore and Japan, so a more competitive framework to reduce prices is crucial to future competitiveness.

The Philippines is perfectly positioned to benefit from low-cost renewables energy over the next decade.

The GETP draft circular indicates that the policy will be designed around a price cap and a renewable energy auction administered by the Department of Energy and a Green Energy Allocation Committee appointed by the Secretary of Energy. This is a good step in the right direction; the Department of Energy can achieve better pricing by refining its competitive auctions framework to address the competition shortcomings of previous policies. It would create a system that promotes competition and flexibility, while being resource efficient, and complementing the planned transmission line expansion to enable grid access. Just as important, it would improve the bankability of the GETP, permitting it to go beyond its initial

[1] Business World. Water, power lack intensifies. 20 June 2019.

design to facilitate compliance with the Renewable Portfolio Standard (RPS) requirements.

India, Brazil, Chile and Peru have all shown that competitive auctions can make it possible to surpass new capacity targets, providing lower-than-forecasted prices to consumers and industry. Now renewable energy procurement policy is at a turning point in Southeast Asia with the low prices achieved Cambodia's recent auction, the magnitude of Malaysia's ongoing large-scale solar rounds, and Vietnam's decision to pivot away from feed-in-tariffs (FiT) toward auctions.

These recent successes support the view that the most effective strategy for GETP would be to implement geographic and resource-specific auctions to maximize price competition and resource efficiency across the archipelago. The system would also benefit from the introduction of targeted sub-markets for the 2,000MW of planned renewable energy capacity. In addition to grid-connected distributed energy resources (DER), the strategy would enable auctions for island electrification, off-grid electrification, and renewable energy parks, positioning the Philippines to benefit from the best new technology.

Auctions: The single policy instrument leading to record-low bids.

Global capital could come from China's Belt and Road Initiative and clean energy funding programs initiated by the Asian Infrastructure Investment Bank (AIIB) and the Asian Development Bank (ADB). Philippine banks such as BDO Unibank Inc are also well positioned to take the lead in green financing. They are well placed to support initiatives such as the USD 2.0 billion, 2000MW first phase of the GETP. If the Philippines Government can use this program to align with sector best practices, we estimate that the Green Energy Tariff Program could be a catalyst for USD 20 billion of renewable energy and energy efficiency investment over the next 10 years. This finding is supported by research from the National Renewable Energy Laboratory (NREL) of the United States, which indicates that the Philippines could support a variable renewable energy (wind and solar) power generation mix of more than 50% by 2030[2].

[2] *Greening the Grid* published by USAid and National Renewable Energy Laboratory (NREL)

Contents

Competitive auctions could attract US$2 billion in new investment through the Green Energy Tariff Program 1
Executive Summary 1
Introduction 4
Generation Mix and Benchmark Costs 6
Recommendations for the Green Energy Pricing Program 10
Tapping Into Resources and Capital 13
Scaling Up the Green Tariff Program 15
Conclusion 17
Appendix 1: Deliver and Execute Transmission Line Planning and Expansion 18
Appendix 2: Lessons Learned From Other Markets 19
Acknowledgements 24
About the Authors 25

Table of Figures & Tables

Figure 1: Installed Capacity and Power Generation by Source 7
Table 1: Generation Tarriffs 8
Table 2: Solar Photovoltaic Technical Potential 9
Table 3: Wind Technical Potential 9
Figure 3: Potential Battery Storage Uses and Combination 10
Figure 4: Effect of Interest Rate on the Financial Viability of Renewable Energy 12
Figure 5: Timelines of the Cambodia National Solar Park and Phase 1 Plant 16

Introduction

The Philippines Renewable Energy Act of 2008 called for a Feed in Tariff (FiT), Renewable Portfolio Standards (RPS), complementary Renewable Energy Certificates (RECs), a Green Energy Options Program (GEOP) and Net Metering (NM) with a limited cap.[3]

This policy reflected a renewables strategy, based on policy tools pioneered in developed markets, that provided an initial, if imperfect, catalyst for renewables development. Now it's time for the government and the power sector to review the 2008 Act's track record to identify more effective market strategies. The first two FiT rounds highlighted several challenges including grid congestion in Negros Occidental due to too much new capacity, an initial lack of local bank support for new technology, inadequate program funding, and a failed biomass and hydro-power FiT program that could not mobilize the investment needed to meet the 250MW generation target.[4]

The renewable energy programs[5] under the Renewable Energy Act are unlikely to deliver what is required for a competitive and transparent market that encourages competition and flexibility. The **Green Energy Tariff Program** (GETP) does address competition shortfalls in previous policies. This creates a meaningful opportunity for market players because flaws in earlier programs can now be tackled with more effective strategies. IEEFA conservatively estimates the clean energy investment opportunity in power generation assets is equivalent to USD 7.6 billion (7.6GW) by 2023 and USD 20 billion (20GW) by 2030. This excludes investment in storage, transmission and distribution upgrades.

Competitive auctions can introduce greater transparency and competition in power generation that in turn can:

- Lower electricity prices for consumers and industry
- Streamline the procurement process for developers, utilities and regulators
- Ensure procurement of low-cost generation to meet renewable portfolio standards (RPS), is subject to competition
- Guarantee that generation from a Green Energy Pricing Program is subject to price competition
- Ensure that larger volumes of variable renewable energy are available throughout the country

[3] The Net Metering limit of 100kW is set in the Renewable Energy Act and thus an increase can only be set by the senate and congress. For now, any embedded system greater than the 100kW cap is not permitted to export to the distribution grid.
[4] Business Mirror. Run-of-river hydropower developers have more time to qualify for FiT. 1 July 2019.
[5] Renewable Energy Programs include: Renewable Portfolio Standards (RPS), Net Metering (for rooftop solar only),

- Fast-track procurement to reach the moderate renewable energy targets of 15,304 MW installed capacity by 2030

There are two defining components in the Department of Energy's public consultation on its *Promulgating the Rules and Guidelines Governing the Green Energy Tariff Program in the Philippines* plan to auction 2,000 MW of renewable energy capacity under a proposed Green Energy Tariff Program:

1. Provisions to determine a price signal for the renewable energy generation market, setting the prescribed price ceiling;

2. A green energy auction to "facilitate contracting for supply from qualified renewable energy projects to eligible end-users under a competitive process".[6]

The GETP mandates that all projects contracted through the program automatically comply with the Open and Competitive Selection Process (OCSP) requirement and will be counted towards Renewable Portfolio Standard (RPS) compliance requirements.

The first round of auctions, named the First Wave Projects, can include projects that did not meet the FiT deadlines, are currently stranded assets, or have sub-optimal offtake agreements. It is also open to all projects with Renewable Energy Service Contracts (RESC) that so far have failed to make headway in further developments.

Currently, the GETP is geared for RPS compliance. The Department of Energy can expand the use of auctions beyond RPS compliance. If successful, the program will inject significant amounts of low-cost renewable energy into the grid, presenting the Philippines a large investment opportunity across on-grid, distributed power and off-grid areas.

Auctions in the power sector are not new to the Philippines. During the initial reform period when the Electric Power Industry Reform Act of 2001 (EPIRA) took effect, the Power Sector Assets and Liabilities Management Corporation (PSALM)7

[6] Manila Standard. Government Offering 2000MW under Green Energy Tariff Program. 1 July 2019.

[7] "The privatization of the assets assumed by PSALM from the National Power Corporation (NPC) is anticipated to raise this needed capital. For one, the new owners of the privatized assets will have to undertake improvements in their assets to ensure that they remain competitive and viable. On the other hand, the government will be able to use the proceeds from the sold assets to settle the debts of NPC, thereby helping reduce the country's consolidated public-sector deficit. Seen as the key to dismantling the monopoly by government, the privatization of the generation assets is programmed to promote competition in the sector by expanding the ownership base. Republic Act No. 9136, the Electric Power Industry Reform Act (EPIRA), limits the ownership of generation assets by a single owner to only 30% of the generating capacity within a single grid. This means that in any single grid, there can be at least four different owners of generation assets to allow competition. The privatization of the generation assets will help bolster competition as envisioned by the EPIRA. This will also usher in a new regime where open access and retail competition will prevail to enable electricity consumers to enjoy the benefits of a restructured electricity industry." PSALM. Privatization of National Power's Generation and TransCo's Transmission Assets. 2019.

sold 20 plants totaling 4,300MW of generation capacity via auction. In 2017, the DOE indicated an interest in pursuing auctions for generation, putting an end to negotiated Power Supply Agreements (PSAs).8

Despite this earlier experience, there is inevitably a steep learning curve for auction implementation that Philippine experts will want to study. Problems encountered by other countries when first implementing auctions offer several examples of factors that could undermine the auctions' processes success:

- Aggressive bidding by under-capitalized project sponsors that failed to find financing and were unable to complete projects
- Too few bidders, leading to potential collusion
- Boom and bust cycles; and
- Too much discretion in awarding bids

All these design flaws can be addressed, however, with research, clear policy objectives, and a commitment to stakeholder engagement and transparency. The key elements of a successful auction program for the Philippines are discussed below.

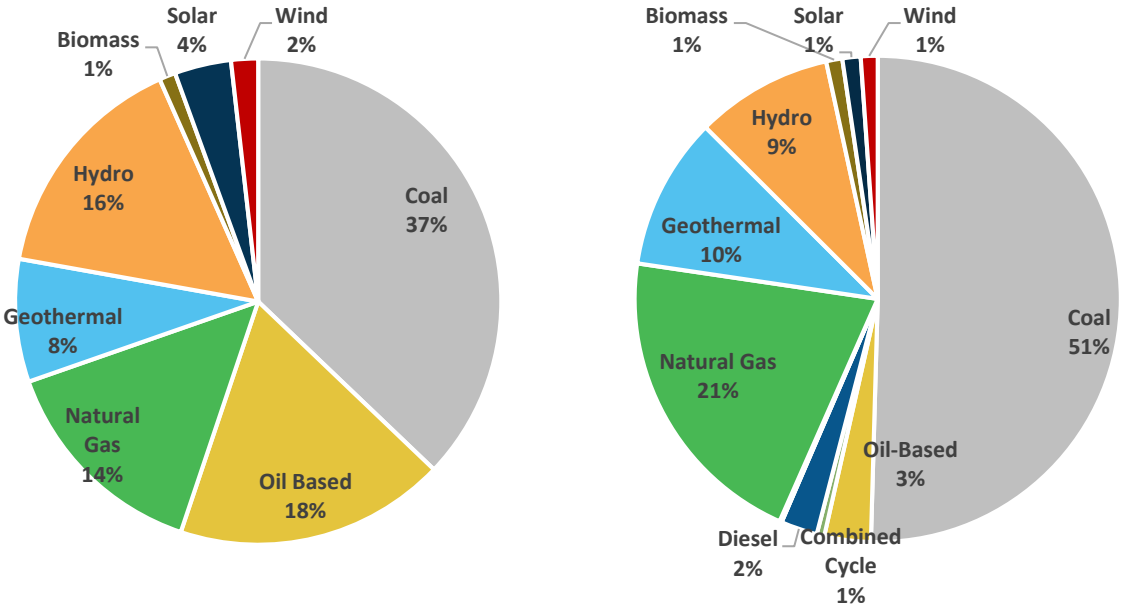
Generation Mix and Benchmark Costs

The GETP can stimulate real market competitiveness today, which could allow renewables to reach grid parity, offering stable, long-term prices, potentially reaching below 2.75 Philippine pesos (PHP) (USD0.055) per kWh in generation.

Market competitiveness will likely shift the generation mix. Currently, the generation mix is dominated by imported fossil fuels at 69%. Coal dominates at 37% followed by oil at 18% and natural gas at 14%. Renewable energy is predominantly hydro at 16% and geothermal at 8%. Despite its potential, biomass is at 1% and variable renewable energy, wind and solar, are at 2% and 4%. Power generation by source is dominated by imported fossil fuels at 68% and domestic renewable energy at 22%. However, biomass, wind and solar lag with just 1% of power generation, respectively.

[8] BusinessWorld. DoE to shift to reverse auction system for power supply deals. 12 December 2017.

Figure 1. Installed Capacity by Source (MW) and Power Generation by Source (GWh)



Source: Department of Energy, as of 31 December 2018, released 29 March 2019

The Philippines has the third most expensive electricity in Asia, behind only Singapore and Japan. It is important to note that in 2018, average annual income in the Philippines was USD 3,103, compared with Singapore and Japan at USD 64,582 and USD39,290, respectively.[9] This raises affordability concerns and knock-on effects in the economy. If the Philippines is unable to manufacture high-value products at competitive prices, it may end up simply exporting low-value raw materials to countries with lower costs, including electricity.

High electricity costs in the Philippines can be attributed to imported fuel (coal, oil) and diesel subsidies making the true cost of electricity generation very high. Surcharges on electricity and the Philippines' archipelagic geography have constrained economies of scale in the generation, transmission, and distribution of power, compounded by past government errors in investment and regulation. [10]

Present-day generation tariffs can be seen in Table 1. Offshore wind and concentrated solar power are not currently being developed. However, an IRENA report points out: "offshore wind and CSP (concentrated solar power) are less widely deployed, and their global weighted-average electricity costs are in the top half of the fossil fuel cost range. Their costs, however, continue to fall, with auction and PPA (power purchase agreement) results suggesting that by 2020 or 2022, they will also be highly competitive."[11]

[9] World Bank. GDP per capita (current US$). 2020.
[10] IEEFA. Carving out Coal in the Philippines: Stranded Coal Plant Assets and the Energy Transition. 12 October 2017.
[11] IRENA. Renewable Power Generation Costs in 2018. 2019

Table 1. Generation Tariffs

Power Type	Generation Price
Import Coal Generation	Between PHP 4 (USD0.08) per kWh to PHP 8 (USD0.16) per kWh
Import Diesel Generation	Between PHP 10 (USD0.20) per kWh to 35 (USD0.70) per kWh Note: these rates are subsidized; the true cost can be as much as three times higher without the cross-subsidy)[12].
Solar Rooftop	Between PHP 2.5 (USD0.05) per kWh to PHP 5.5 (USD0.11) per kWh Note: these rates depend on the financing terms of the household/corporation
Solar (Utility Scale)	PHP 3 (USD 0.060) per kWh
Geothermal	Between PHP 3.5 (USD0.07) per kWh to PHP 4.5 (USD0.09) per kWh
Run-of-River Hydro	Between PHP 3 (USD0.06) per kWh to PHP 6.5 (USD0.13) per kWh
Onshore Wind	PHP 3.5 (USD0.07) per kWh
Biomass	PHP 6.60 (USD0.132) per kWh

Source: Various generation sources. Department of Energy; IEEFA Report — "Carving out Coal in the Philippines: Stranded Coal Plant Assets and the Energy Transition"; MERALCO; ERC; Solar Philippines; SolarNRG; Energy Development Corporation.

It is clear that in an emerging market such as the Philippines, every dollar saved matters and every opportunity to increase added value matters. The real opportunity is to use renewables to end the Philippines' over-reliance on high variable cost imported fuels. Today, based on accurate pricing, neither diesel nor coal are competitive relative to renewables on a short- or long-term cost basis. Meralco, the largest utility company in the Philippines, has also stepped away from the automatic pass-through of variable fuel and foreign exchange costs to consumers and industry, meaning fossil fuel operators are now absorbing the fuel and currency price fluctuations associated with their technology decisions.

A pragmatic roadmap towards renewable energy is a key starting point. *Greening the Grid* published by NREL, with support from the Philippines' Department of Energy, finds that **the Philippines can support up to and more than 50% variable renewable energy (wind and solar) in power generation by 2030.** A more recent NREL publication[13] also finds there is a large potential for solar (Table 2) and wind (Table 3). As of 2018, current solar and wind generation was just over 1.25 TWh and 1.15 TWh, respectively. Finding the right pricing signals to bring more low-cost variable renewable energy into the grid is key.

[12] IEEFA. The Philippine Energy Transition. Building a Robust Power Market. 12 March 2019.
[13] NREL. Exploring RE Opportunities in Select SEA Countries. June 2019.

Table 2. Solar Photovoltaic Technical Potential

Scenario	Generation Price	Suitable Land	Capacity	Generation
Relaxed	PHP2.5 to PHP5 per kWh	1,164.2 km^2	41.9 GW	68 TWh
Moderate		464.8 km^2	16.7 GW	27.2 TWh
Restricted		142.2 km^2	5.1 GW	8.3 TWh
Urban		102.9 km^2	3.7 GW	6 TWh

Source: NREL[14]

Table 3. Wind Technical Potential

Scenario	Generation Price	Suitable Land	Capacity	Generation
Relaxed	PHP2 to PHP5 per kWh	13,601.0 km^2	421.6 GW	68 TWh
Moderate		7,144.5 km^2	3,402.8 GW	27.2 TWh
Restricted		3,180.8 km^2	5.1 GW	8.3 TWh

Source: NREL[15]

Currently, the Luzon-Visayas grid has load drops of 200MW. Although there is discussion about using gas for peaking, it is clear that load drops currently facing the grid demand a solution that is quicker to deploy than gas. This opens an opportunity for battery storage.

Storage investment is driven by several factors, notably an intent to bring down transmission charges and provide grid resilience. Battery storage can be used to provide firm renewable power. Specifically, a storage system can address the variable nature of solar and wind power, which is not always available when needed, or is produced in quantities that cannot be fully used at a particular time.

India installed its first grid-scale lithium-ion battery energy storage (10MW/10MWh) system in February 2019. According to the CEO of the distribution company "this (installation) will address our key challenges in the areas of peak load management, system flexibility, frequency regulation and reliability of the network".[16] The Solar Energy Corporation of India (SECI) announced tenders in February 2019 for 3,600MWh of energy storage to be connected to the Interstate Transmission System (ISTS)[17]. This extra storage will be primarily used to integrate renewable energy, ancillary services, micro grids, telecommunications, and railways.

Firming up renewable energy with storage is also seen today in the United States. Specifically, Arizona's "Solar after Sunset" program and the "Renewable Dispatchable Generation" program[18] in Hawaii. Battery storage can also be used to

14 Ibid.

15 Ibid.

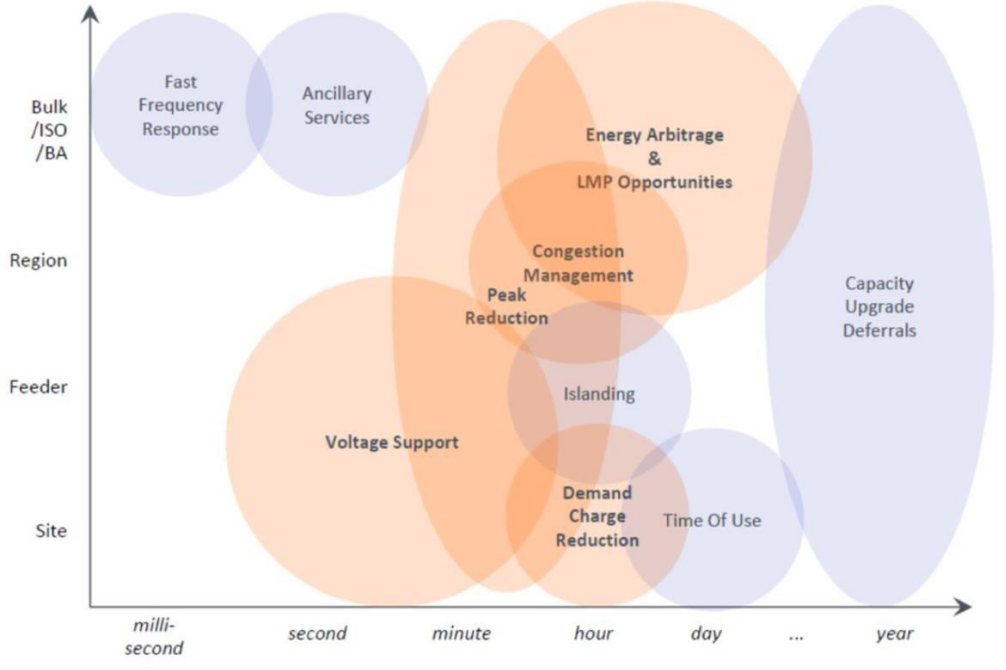
16 Energy Storage News. India's first grid-scale storage project launches: 10MW li-ion system will 'pave way' for the future. 13 February 2019.

17 Energy Storage News. India takes 'long-awaited step' for large-scale solar and energy storage. 28 February 2019.

18 IEEFA. Advances in Electricity Storage Suggest Potential Rapid Disruption in US Electricity Sector. June 2019.

meet system peak need and this is seen today in California with the replacement of a two-unit Mandalay natural gas peaker plant[19] with a battery system. Figure 3 below illustrates battery storage uses and combinations, as outlined by the US Department of Energy's SHINES program, part of a modernization initiative to improve the resilience, reliability and security of the power grid.

Figure 3. Potential Battery Storage Uses and Combinations



Source: United States DOE's SHINES program

Recommendations for the Green Energy Pricing Program

The Green Energy Tariff Program is an opportunity to use auctions to address the shortcomings of previous policies to create a system that promotes competition and flexibility. Lessons learned from other countries can be found in Appendix 2.

The planning stage of the Green Energy Tariff Program is exceptionally important and requires resource assessments to design an optimal framework for implementation and execution of the auction scheme. The platform must enable the winning developer to execute the project with full government support for it to be constructed with minimum delay. The following requirements will require considerable resources, but they are essential to the effective implementation of an auction scheme:

[19] IEEFA. Advances in Electricity Storage Suggest Potential Rapid Disruption in US Electricity Sector. June 2019.

Resource mapping to identify the best usable technology in the allocated area. This can be scaled from a site-specific project right through to a whole country's resource potential, stipulating a terrestrial and spatial analysis and a technical application; for example, wind, solar or hydro resources.

Under the current Green Energy Tariff Program, the onus lies with the developer to identify high resource potential for the type of renewable energy project it is considering, with a potentially significant impact on its risk and return on investment. It would be worthwhile instead for the DOE to plan an optimal roll out of auctions by identifying areas of high resource availability along with existing transmission lines, prioritizing these areas under the initial First Wave Projects auction.

System Impact Study (SIS) is the official distribution impact study (DIS) or grid impact study (GIS) required under EPIRA. The distribution utility (DU) or electric cooperative (EC) must determine the adequacy of the transmission system and its capability to accommodate a request for a power project, and costs that may be incurred in providing a power delivery service to a transmission customer. A developer applying for a connection to the grid must take all necessary measures to ensure that the proposed power project meets grid code and distribution code requirements. It is imperative to understand the grid's ability to absorb the type and quantity of power generated (including any foreseen transmission upgrades in the near future).

Global experience clearly shows that injecting distributed energy resources (DER) potentially results in grid congestion thus the appropriate measures to synchronize capacity additions with grid capacity need to be incorporated into the formulation of Green Energy Tariff Program at the planning phase, and must be addressed in the bidding documents as well.

Qualification of bidders means the technical and commercial requirements are crafted so that bid submissions will exclude those parties simply not qualified to competently deliver and operate a project. This means bids must meet a minimum quality threshold, but the technical requirements should not limit the number of potential bidders to just a few, which could encourage collusion and the auction process's ultimate failure.

Bid process and winner selection should be clear, transparent and timely, providing the bidders with enough information to meet the auction's intended outcome. This process also needs to manage information from bidders and minimize the opportunity for bidders to exchange information in order to lower the risk of collusion. This can be done through a two-step bid process where bidders initially provide a technical offer for evaluation and if successful, a secondary commercial offer (price) is provided. After this, the winning bid can be announced and agreements finalized in the formal award.

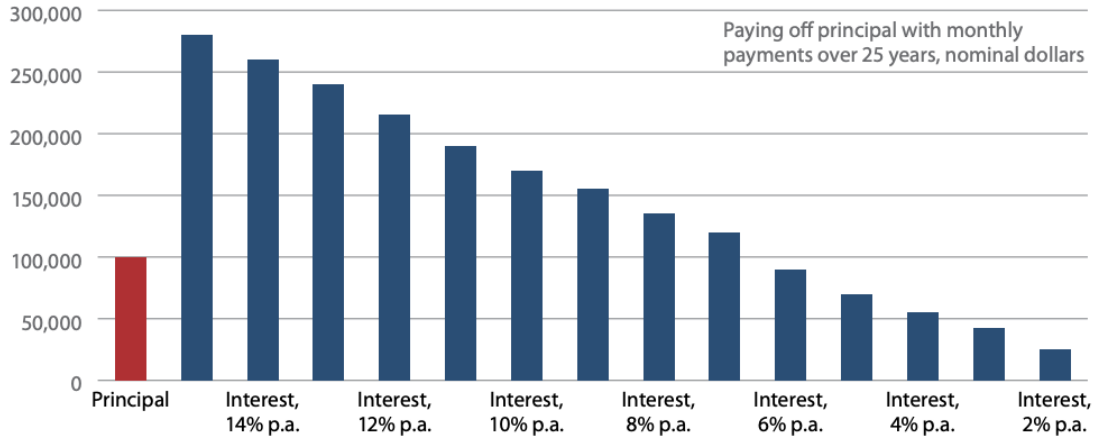
Improving bankability is important to secure financial close by ensuring contract duration is compatible with the duration of the typical financing maturity given by

banks20. Loan terms in renewable energy are typically 8 to 15 years. It is also important to note that the debt service cover ratio should be at least 1.3, ensuring the developer has enough cash to meet all obligations.

Cost of capital concerns for small and medium enterprises (SMEs) is an issue. It important to realize that developers with access to cheaper capital, meaning lower interest rates on debt and lower equity hurdle rates will be able to bid at lower prices. SMEs typically face higher interest rates and higher hurdle rates than large enterprises or conglomerates. Capital-intensive investments like renewable energy in a high cost of capital environment would reduce the financial viability of projects. Amortization of up-front capital investments is extremely sensitive to the cost of capital. For example, the total of capital expenditure plus cost of finance would be reduced by 50% with an effective interest rate of 6% versus 12% (refer to Figure 4) [21].

It would be beneficial for Government financial institutions (GFIs) such as the Development Bank of the Philippines and the Land Bank of the Philippines, multilateral development banks, and the Green Belt and Road Initiative to provide financing to reduce the cost of capital for projects in island grids and off-grid areas.

Figure 4. Effect of Interest Rate on the Financial Viability of Renewable Energy



Source: UNDP. Catalyzing Climate Finance. 2011

Lifting or limiting terms of foreign ownership restrictions is key to attracting low-cost capital from the global markets. It may be beneficial for the Philippine government to reconsider ownership either by lifting the restrictions or limiting foreign ownership terms to the same duration as a power purchase agreement of 8 to 12 years, for some energy sources such as solar panels and kinetic energy from water and wind.

[20] IRENA and CEM. Renewable Energy Auctions – A Guide to Design. 2015
[21] UNDP. Catalysing Climate Finance. 2011

Moreover, to enable a well-structured auctions process, the GETP may benefit from also addressing operating, pricing and potential dilemmas that may arise:

Pricing: The Initial Market Value (price ceiling) of the Green Energy Tariff for the peak and off-peak power supply should not be determined by the ERC, but instead be a ceiling price based on expected prices in the market[22]. The finalized price will then be determined by a bidding process.

Operator: Instead of creating a Green Energy Auction Committee (GEAC), responsibility for the auction process can be taken on by the Independent Electricity Market Operator of the Philippines (IEMOP), a non-stock, non-profit corporation established in May 2018 to assume the market operator functions of the Philippine Electricity Market Corporation (PEMC) for the Wholesale Electricity Spot Market (WESM)[23].

The DOE faces a potential dilemma in attempting to create a competitive auction process, because both electric cooperatives and distribution utilities alike must meet the renewable portfolio standards. While a distribution utility is a completely private entity operating on the premise of market-based economics, some distribution utilities in the form of electric cooperatives are hybrids. Even though an electric cooperative is owned by its constituents, it operates under a zero-profit model and thus lacks incentive structures comparable to a fully private entity. Moreover, even though an EC can be penalized if it does not meet the renewable portfolio standards requirement, it may not have the savings to pay the penalty. It would be good, therefore, to know whether the National Electrification Agency (NEA), as its supervisory board, would bail out an electric cooperative in a crisis.

Tapping Into Resources and Capital

Box 1 highlights an example of the mechanics that can be used to facilitate an auction process in coordination with the Asian Development Bank (ADB) or the Asian Infrastructure Investment Bank (AIIB). The ADB for example, facilitated the auction process in Cambodia that attracted 26 initial bidders including global investors and yielded a final bid of USD0.03877 per kWh, equivalent to PHP1.93 per kWh.

It is important to realize that auctions should take into account resource-efficiency by being technology-specific and location-specific, in coordination with the transmission operator for grid access. The auction process should be run by the Independent Electricity Market Operator of the Philippines.

[22] IRENA and CEM (2015), *Renewable Energy Auctions – A Guide to Design.*
[23] WESM. Homepage. 2019

Box 1. Example of Auction Mechanics With Support from the Asian Development Bank (ADB) Or the Asian Infrastructure Investment Bank (AIIB)

1. The distribution utility issues a call for energy demand to install a certain amount of electricity.

2. The Department of Energy (DOE) vets this in accordance with the Distribution Development Plan.

3. The DOE engages the ADB or AIIB for resource assessments in coordination with the transmission operator to identify technology that is location-specific for a potential auction.

4. The DOE, with assistance from the ADB or AIIB, sets guidelines from pre-qualification to ensure all bidders are technically qualified.

4. The Independent Electricity Market Operator of the Philippines (IEMOP) manages the auction process with assistance from the ADB or AIIB.

5. Ceiling prices can be disclosed to project developers that want to participate to ensure price discovery and greater competition. Streamlined administrative procedures, with communication and transparency provided equally to all project developers, are essential.

6. Participating project developers submit a price per unit of electricity at which they will build the project. IEMOP can use one of two ways to entertain submissions:

Option A. Project developers simultaneously submit the price at which the electricity would be sold under a power supply agreement (PSA), with standardized commercial terms made public prior to the call for auction. IEMOP ranks and awards projects until the sum of the quantities that they offer covers the volume of energy being requested. This option has the benefit of simplicity, is easy to implement, fosters competition and avoids collusion. Post-tender award disclosure of all final submissions would promote transparency.

Option B. In the initial round, IEMOP offers a price, and developers submit the amount of power they would be willing to provide at that price. IEMOP then progressively lowers the offered price in successive rounds until the quantity submitted matches the quantity to be procured. This option is more difficult to implement but allows for fast price discovery as well as greater transparency.

7. Each offer is screened by the DOE, IEMOP and ADB or AIIB for viability (including proof of financial capability, secured land, environmental license and , grid connection) and is then selected on price, starting with the least-cost project, until the utility reaches its megawatt-hour (MWh) limit for that round. Each offer is subject to strong compliance rules (including penalties, submission bonds, project completion guarantees) that reduce the risk of under submission, project delays, and project failure.

8. Capacity remaining at the end of each round is added to the next round.

9. Winning submissions will use the standardized PSA from the utility and pre-approved by the electricity regulator, the Energy Regulatory Commission (ERC).

10. ADB or AIIB can provide concessional financing to winning bidders.

Scaling Up the Green Tariff Program

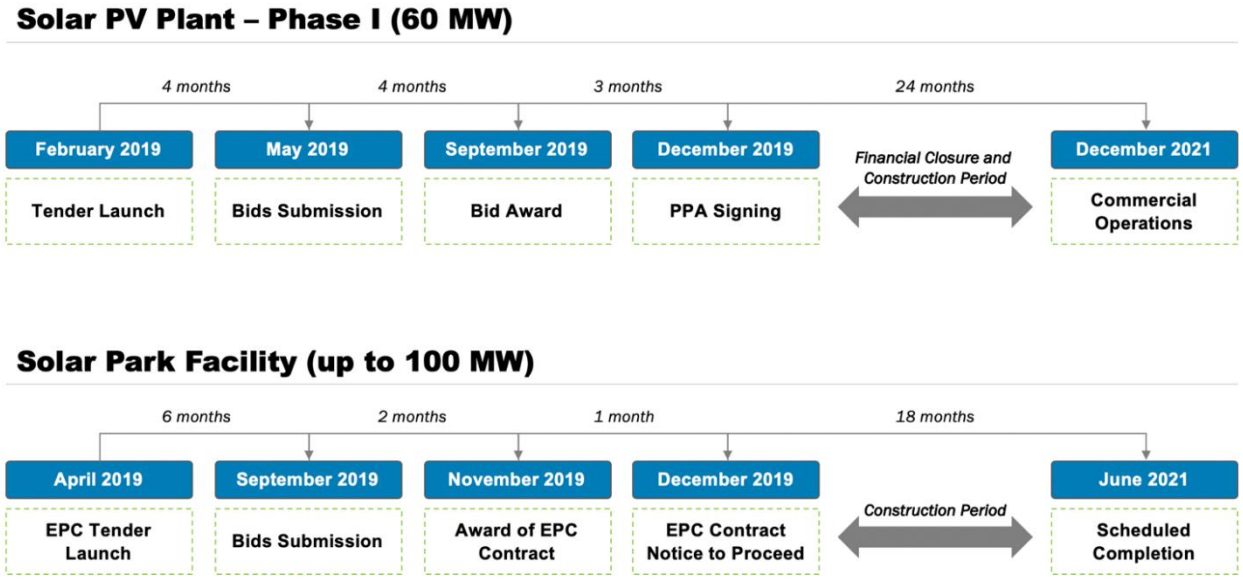
An auction can take many variations in form because nuances in design and execution occur in a specific market context. The Green Energy Tariff Program currently focuses on facilitating RPS compliance. If successful, it could pave the way for significant scaling up of new power generation in the main grids and in areas such as renewable energy parks or off-grid/island grid electrification to reach renewable energy targets.

Renewable energy parks, planned locations for renewable energy generation, have been extremely successful in India, where government bodies have undertaken what would be considered largely the pre-development phase of a project and have then run auctions to bid out parcels of land within the park to developers for construction. Not only is the land developed with the required infrastructure including transmission lines to connect to the grid, but many associated risks are mitigated. But a developer must agree to a strong engineering, procurement and construction (EPC) contract to deliver on a 12- to 20-year power purchase agreement. Large volumes of variable renewable energy have been injected into the grid at a single source through this method, with generation tariffs kept low, given that land costs and project development risks were virtually eliminated.

The Cambodia National Solar Park, supported by the Asian Development Bank, is a recent success story in the Southeast Asia region (refer to figure 4). A site resource assessment confirmed that producing up to 100MW of solar power would be possible, taking into account existing and planned transmission lines and proximity to load centers. In September 2019 it was announced that the auction for first stage of the renewable energy park attracted 26 local and foreign bidders and achieved a winning price of USD 0.03877 per kWh.

Just a year earlier, the Government of Cambodia awarded a 60MW solar PV bilateral PPA at USD0.076 per kWh and the first solar power project in the company received a tariff of around USD0.09 per kWh. The Cambodia National Solar Park had two key components: the Solar Park Facility developed by Electricite Du Cambodge (EDC) and financed through an ADB sovereign loan with concessional finance support from the Climate Investment Funds; and two sites within the park for solar PV power plants, to be awarded to private sector developers undertaking financing, construction and operation of the plants. Refer to Figure 4 of the Cambodia National Solar Park Phase 1.

Figure 5. Timelines of the Cambodia National Solar Park and Phase 1 Plant[24]



Following the tender launch, an initial 148 bidders responded to the pre-bid engagement. Only 26 of the 148 bids passed the financial and technical pre-qualification. This was further reduced to 18 bidders that passed technical evaluation and were invited to provide a financial offer. A best and final offer (BAFO) step saw the lowest offer drop to USD0.04415 per kWh, equivalent to PHP 2.2 per kWh, with a final bid of USD0.03877 per kWh, equivalent to PHP1.93 per kWh. By allowing the state-owned utility to undertake pre-development, the overall costs of the solar plants were minimized, and subsequently provided electricity to consumers at low prices.

Four important factors likely helped in achieving such a low bid, (i) a lower cost of capital for the sovereign borrowing used for civil works and basic site infrastructure including a transmission line; (ii) lower costs and risks for developers so they could focus on bidding for the solar plant without worrying about development, land, civil works and transmission line costs; (iii) a bankable PPA framework; and (iv) The sizeable 60MW capacity was also sufficient to attract interest from a large number of bidders, many of whom may not have participated if the capacity was lower.

The Philippines' DOE has an opportunity to conduct its own resource assessments for renewable energy parks, with access allocated to developers by auction. The DOE may take up such a model based on work undertaken through Department Circular No. DC2018-09-0027, the Establishment and Development of Competitive Renewable Energy Zones (CREZ) throughout the country.

[24] ADB. ADB Cambodia National Solar Park PPT. Shah & Tharakan. 2019.

Off-grid and island electrification can enable renewable energy development via 3 models with leadership from electric cooperatives[25].

Fuel displacement model - On grids where peak demand is now fully met by diesel plants, and where the average cost of renewable energy is less than the variable costs of diesel generation (which consists mostly of fuel and lubricants), electricity produced by run-of-river hydro, biomass, solar, and wind is now positioned to compete economically and to progressively displace imported diesel-fired generation via hybridization. The hybridization can be done through an auction for renewable energy as well as overall management of the hybrid plant's power output. The maximum price at auction can be the variable cost of diesel generation (so the average of cost of renewable energy should be lower than the variable cost of diesel).

Meeting incremental capacity - An incremental capacity approach brings additional electricity-generation capacity at a lower cost than the fuel-displacement model, at a quicker pace, and with a greater degree of stability. Adding solar and wind capacity incrementally to the electricity-generation mix across the many islands of the Philippines makes economic sense, because renewables now offer lower average energy costs than diesel generation. Attracting investment to meet incremental capacity can occur via auctions. The maximum price reached at auction can be the point where the average cost of renewable energy is less than the average cost of diesel.

Full renewable energy - When the average cost of renewable energy technologies. plus capital recovery cost from existing diesel contracts, is less than the true cost of diesel generation, all diesel generation will be displaced. The maximum price at auction can be the point where the average cost of renewable energy plus the cost of capital recovery of existing diesel contracts (known as the capacity fee) is less than the true cost of diesel generation.

Conclusion

Auctions are setting record-low generation prices globally. Sellers, such as generators and independent power producers (IPPs), are able to sell their kilowatt-hours (kWh) to consumers or industry or distribution companies via a bidding process in which the winner is the lowest kWh offer, after meeting technical, financial and legal requirements. In addition to procuring electricity at the lowest price, such auctions have also brought down the cost of capital by ensuring fixed and competitive pricing through transparent grid access. Emerging markets such as the Philippines are well-positioned to attract low-cost global capital to fund the development of renewable energy infrastructure.

Cheaper electricity is key to raising competitive advantage, contributing to growth and improved productivity. The Philippines should move to such auctions quickly, because without more focus on cost-competitiveness, renewable energy policies will fail to meet their long-term potential. The International Renewable Energy Agency

[25] IEEFA. The Philippine Energy Transition. Building a Robust Power Market. 12 March 2019.

(IRENA) says the number of countries that have adopted renewable energy auctions has increased from 9 in 2009 to at least 48 by 2018.[26]

It is clear that the GETP can address the competition shortcomings of previous policies to enable lower prices for consumers and industry. This includes the promotion of competition through improvements in transparency and better resource efficiency, while addressing bankability concerns including grid access and consideration of the cost of capital. **The GETP could be a catalyst for USD 20 billion of renewable energy and energy efficiency investment over the next 10 years.**

Appendix 1: Deliver and Execute Transmission Line Planning and Expansion

The Department of Energy must invest in transmission line planning and expansion in parallel to the Green Energy Tariff Program. The Philippines is not the only market to have suffered from limited transmission line planning and investment in the wake of injecting variable renewable energy into the grid. Vietnam has recently had to curtail many commercial and industrial scale solar projects contracted under FiT agreements with Energy Vietnam, reaching up to 60% curtailment of utility scale generation to curb grid congestion. However, it is important to note that curtailment is also a means to balance the grid, thus improving grid security and can be considered a least-cost solution, given that renewable energy has the lowest marginal cost.

The *Greening the Grid* report provides comprehensive modelling of the Philippines Visayas and Luzon grids, producing suggestions for transmission network enhancements to support a variable renewable energy uptake of up to 50%.

Implementing the NGCP Transmission and Development Plan 2016-2040 could ensure the success of the Green Energy Tariff Program and subsequent renewable energy generation development in the Philippines. Box 2 shows an extract from the National Grid Corporation of the Philippines' (NGCPs) Transmission Development Plan 2016-2040.

[26] REN21. Renewables Global Status Report - Chapter 2. 2019.
[26] Interview with Mr. Marcelo Mena-Carrasco: Climate Change Group, World Bank; former Minister of Environment, Chile.

Box 2. NGCP Grid Transmission Line Planning & Renewable Energy[27]

NGCP is currently adapting a market-based planning methodology that will consider the design of the wholesale electricity supply market (WESM) and how variable renewable energy and conventional power plants are being scheduled for supply. NGCP will include in the model the renewable energy variability and the dynamics of the wholesale supply market's generation production cost, demand variance, and outages of network elements. This is to identify possible transmission congestion, lending a more realistic view of the impact of generation projects on the transmission network. The generation projects to be assessed consider the targeted generation mix, renewable portfolio standards and forecast demand. The planning methodology should identify areas to recommend for generation projects and in support of transmission projects.

The reference methodology is from "Greening the Grid Project" by the United States Agency for International Development (USAID) and National Renewable Energy Laboratory (NREL) that conducted a renewable energy integration study for the DOE. The project observed the effects of integrating high levels of variable renewable energy on system operations using a production cost model that simulates the dispatch scheduling of the wholesale electricity spot market. The project also developed a siting algorithm for variable renewable energy projects and compared different siting scenarios, notably high potential areas versus minimized transmission upgrades. This approach can show how to maximize the transmission system's capability by optimally siting new power plants.

In Luzon, grid development is driven by incoming large capacity coal-fired and natural gas power plants mainly concentrated in Batangas, Quezon, Bataan, and Zambales. A new 500 kilovolt (kV) transmission system for bulk power delivery within Metro Manila and three additional 230 kV drawdown substations will improve power quality and reliability. Looping configuration development for the 230 kV and 500 kV system, as well as the installation of reactive power compensating equipment at various substations, is also needed to enable the supply of power to customers from either direction of the loop. Part of the long-term plan is a 500 kV backbone extension for both the western and eastern sides of northern Luzon to serve as power generation highway.

In Visayas, the reinforcement of the existing 138 kV Cebu-Negros-Panay submarine cable interconnection, the development of 230 kV transmission backbone from Cebu up to Panay Island (Cebu-Negros-Panay 230 kV Backbone), and the development of the new 230 kV backbone up to Bohol are intended to accommodate conventional and renewable generation projects. To complement to the development of a 230 kV Visayas Backbone, gradual establishment of a looping configuration for the 138 kV transmission system to improve system reliability will also be implemented.

In Mindanao, several coal-fired power plants with potentially large expansion of capacity and forecasted load growth require the development of various 230 kV transmission lines—including the 230 kV Mindanao Backbone that will serve as the island's bulk power highway from north to south Mindanao, upgrading and extension of 138 kV lines, and looping of 69 kV lines. The implementation of the Mindanao-Visayas Interconnection Project (MVIP) will also allow export of power to the other major grids. In the long term, additional drawdown transformers for bulk power delivery in various substations and the interconnection of various islands to the main grid are expected.

Fundamentally, the grid is planned to be able to supply electricity consumers in the most economic manner at an acceptable level of reliability. The same objectives are applied with the addition of variable renewable energies (VRE) resources. However, variable renewable energy brings challenges that require improved transmission planning, including:

- Location of renewable energy projects being site specific and thus "further out" than conventional power projects and lines with limited transfer capacity
- The shorter construction period for renewables, thus transmission lines are "catching up", as in the case of Negros Occidental
- Voltage and reactive power adjustments of lines with "new renewables" being injected into the grid
- Improvement in collaboration between NGCP and the various RE developers and planning agencies.

Chile's first renewable energy auction offering solar power achieved a stunning 50% reduction in the price of electricity. But Chile did not recognize the need for firm capacity, and solar PV outbid pumped storage and solar hybrids as well as hydro and solar hybrids. **A lesson learned is to recognize the value of firm capacity and understand the difference between variable renewable energy and firm renewable energy, specifically dispatchable renewable energy. This can be done through allowing a portfolio of technologies to bid to enable dispatchable renewable energy.**

Another key development in the Chilean market was the introduction of a carbon price to recognize harms to health, among other negative externalities, from burning coal. Chile also improved power plant emission standards, which with the carbon tax raised the cost of coal by 30%. The final key development is a third-party institution responsible for dispatch priorities with representation from the government, the private sector, and consumers with terms that extend beyond the cycle of presidential administrations, enabling an impartial and competitive market. **In the case of the Philippines, the Independent Electricity Market Operator of the Philippines (IEMOP) is a third-party institution that can be utilized for this function.**

The Philippines began discussing deregulating its energy sector to attract private sector capital in the 1990s. At around the same time Brazil[27] privatized its energy sector to attract the private capital needed to meet supply requirements aligned with 5% demand growth, equivalent to 5GW of power[28] per year.

Brazil's transmission system is operated by 64 companies that bought permits via public auctions promoted by Brazil's electricity regulator, Agência Nacional de Energia Elétrica (ANEEL). The Philippines, on the other hand, has a transmission system operated by the privately-owned National Grid Corporation of the Philippines through a 25-year franchise. NGCP is 60% owned by Filipinos Monte Oro Grid Resources Corp. led by Henry Sy Jr. and the Calaca High Power Corp. led by Robert Coyiuto Jr., while the State Grid Corporation of China (SGCC), serving as a technical partner, owns 40%.

Mapping the grid and understanding the implications of technology such as storage is crucial because grid investment shapes future options, and grid investment can also become stranded. Brazil's transmission market with auctions allows it to remain highly competitive and attractive to the private sector, enabling improved reliability and availability. Moreover, Brazil's distribution system is operated by 63 companies with the top 5 responsible for 40% of the 61 million customers, although there is competition between them nonetheless. But in the Philippines the 120 distribution utilities (DU) or electric cooperatives (EC) all have franchise territories, monopolizing retail to an extent.

[27] IRENA. Renewable Energy Auctions in Developing Countries. 2013.
[28] Energy and power shouldn't be used interchangeably. Energy is a unit of energy measured in kWh. Power or demand is the peak consumption rate that the facility will experience in a 30-day period – how fast you turn it on – in kW.

According to the National Electrification Administration (NEA), the Philippines has 16 privately owned DUs, 119 ECs, and 6 government-owned utilities as of 2009. Meralco, the Philippines' largest utility, serves 6.5 million customers with a franchise area of 9,685 square km that spans 36 cities and 75 municipalities[29] that are home to 24.7 million people.[30]

Brazil set up the feed-in tariff (FiT) in 2002 to support investments in wind, biomass, and small-scale hydro. Qualified projects were confirmed in December 2006 with implementation in 2012. The tariff rates were high with floor prices similar to the FiT experience in the Philippines. In 2004, Brazil set up a legal framework for technology-specific energy auctions and began implementing them in 2007. The auctions are intended to introduce new capacity within 3 years (wind, solar, small hydro) or 5 years (large hydro and conventional) and increase the system's reserve margin (via an auction), both of which follow the same process.[31]

Peru reformed and restructured towards privatization and concessions between 1991 and 1993.[32] Specifically, the unbundling of generation, transmission, and distribution via the Electricity Concessions Law of 1992. **The Philippines, which unbundled through the EPIRA law of 2001, though discussions began in the 1990s. This meant a change in the role of governments from owner and operator to policymaker and regulator, and established a tariff-setting formula.**

To promote renewable energy, Peru legislated that 5% of total electricity consumption must come from renewable energy (biomass, wind, solar, geothermal, and small hydro) and had to be procured at a fixed price with costs to be shared among all consumers. Moreover, renewable energy would have priority daily dispatch.

The Philippine approach was very similar, with the FiT implemented at a price fixed by government with costs shared among all consumers and priority dispatch for renewable energy. In theory as well as in practice, zero marginal cost renewables are being dispatched ahead of more expensive marginal cost conventional electricity which has fuel inputs (coal, diesel, natural gas). The reason for this is wind and solar are a low-cost source of marginal supply, which leads wind or solar to being dispatched first. This is the "merit order effect" where an abundant supply of renewable energy pushes down prices at the electricity exchange.

In 2009 Peru implemented an auction system which the regulator determines the technology and price ceiling.

---

[29] Meralco. Corporate Profile. 2017.
[30] Philippine Daily Inquirer. Meralco bills to go down by 19 cents/kWh this month. 8 January 2015.
[31] PV Magazine. Brazil allocates 806 MW of solar in A-4 auction, final average price drops to $35.2/MWh. 4 April 2018.
[32] IRENA. Renewable Energy Auctions in Developing Countries. 2013.

India has been leading auctions policy and has achieved consistently low prices for generation. As of December 2019, India had installed 85.9GW of on-grid renewable energy capacity. Of the 24GW of renewable capacity installed since the beginning of FY2017/18 and an additional 38GW awarded to date, more than 90% of it has been contracted for tariffs between Rs2.43-2.80/kilowatt hour (kWh) with zero indexation for 25 years. This is 25-35% less than average domestic coal-sourced thermal tariffs from India's largest energy conglomerate NTPC, of Rs3.74/kWh for the first half of FY2019/20[33].

Key points of the Indian context include the following: (i) the auctions leverage balance sheets of the Solar Energy Corporation of India (SECI) and NTPC to underwrite the PPAs. This is a way to de-risk the contracts which involves financially stressed state-owned power distribution companies; (ii) Distribution companies with better financial performance underwrite their own PPAs for state-level projects; (iii) the tariffs are not indexed for inflation, so the levelized cost of electricity is lower than the headline tariffs over the period of 25 years; (iv) There is no currency hedging option.

In 2010, the Jawaharlal Nehru National Solar Mission (NSM) set a target of 20 GW of solar PV by 2020. The NSM sought to create energy security, mitigate climate change, improve energy technology, promote India's own solar energy development, and increase connectivity at the extremes of the energy grid. India's Solar PV installed capacity as of May 2019 was 29.41 GW, a significant increase but only meeting 30% of the target of 100 GW by 2022, set by the current Modi administration in July 2015. Notably, in 2016 India's installed capacity was 4.8 GW, with 2.8 GW being installed in the first 8 months of that year. [34]

In phase 1 of 3, NTPC Vidyut Vyapar Nigam Ltd (NVVN), a subsidiary of the National Thermal Power Corporation (NTPC) set the tone for India's auctions, contracting power purchase agreements of 25 years with winning developers, and then resold the power to state utilities under a "bundling" approach. At the time, solar power was far from grid parity and NTPC set a tariff ceiling, bundling it with cheaper unallocated quota of the Ministry of Power, minimizing the burden on the Government.

More recently in India[35], a recent firmed renewables tender (renewables with storage) tender offered set non-peak tariffs and instead asked developers to bid for peak tariffs - price incentives for firming capacity.

The Philippines took a different approach in its FiT scheme, which led to a boom and bust cycle. In the India case, the final selection of short-listed bidders was made on the basis of the bidder's proposed discount to the Central Electricity Regulatory Commission's (CERC) approved tariffs, effectively an auction. Three key requirements of the tender were: (1) capacity per project set to 5MW, (2) bidders

[33] NTPC Performance Highlights H1FY2019/20, 9 November 2019
[34] The Energy Resources Institute (TERI). Eight years of National Solar Mission: Renewing the renewables target. 24 January 2018.
[35] Mercom Caputal Group. Greenko, ReNew Win SECI's 1.2 GW Solar, Wind Auction with Storage for Peak Power Supply. 31 Jan 2020.

had to use PV modules made in India and (3) no one bidder could win more than a single project; all intended to stimulate competition and growth. The result was 30 solar PV projects commissioned under Phase 1 at an average tariff of Rs12.12/kWh, or USD 0.17. The second wave of projects saw a 27.5% reduction to Rs.8.77/kWh (USD 0.12). The current lowest solar PV tariff for 1.2 GW supply reached Rs2.54/kWh (USD 0.036), priced in February 2019.[36]

The World Bank's *Paving a Way for a Transformational Future, Lessons from the Jawaharlal Nehru NSM Phase 1*[37] report found inadequate commercial bank participation in solar financing, bottlenecks in land acquisition and converting land use designations, approval delays, and underdeveloped transmission lines.

The absence of clear mapping of responsibility in public institutions, payment security for future projects, and unintended technology outcomes over Phase 1 saw the local content requirements constrain competition and have since been removed as a prerequisite. A stressed local solar manufacturing environment, the enforceability of renewable purchase obligations (RPOs) and concerns around solar renewable energy certificates (RECs) added further complexity. The World Bank report recommended the Government of India play an active role in developing solar parks, easing infrastructure-related challenges, and advancing public funds to solar developers.

In the same vein as mandating local manufacture of generating equipment, restrictions on foreign proprietorship can discourage overseas investors. **In other words, restricting foreign ownership can deter foreign capital.** The Philippines restricts foreign participation in renewable energy power companies to 60% Filipino and 40% foreign ownership. The Constitution gives the Philippines government dominion over natural resources such as the sun, water (including non-consumption) and wind. Specifically, "the State shall not be alienated from potential energy sources such as kinetic energy from water, marine current and wind; thermal energy from solar, ocean, geothermal and biomass."[38]

In Chile, there are generally no restrictions on foreign ownership of electricity companies or assets. There are also no restrictions on land ownership. However, all companies must be registered and established under Chilean law. The only restriction on foreign ownership covers transmission and hydro-generation assets[39]. In Brazil, foreign ownership of electricity companies or assets is permitted if the foreign entity registers, is located and established under Brazilian law. This means that foreign investors can be awarded auctions. However, there are restrictions on foreign ownership in relation to the acquisition of rural properties in Brazil, which can affect renewable energy projects.[40]

[36] PV Magazine. Indian government tenders another 1.2GW of solar. 2 July 2019.
[37] World Bank. Paving the Way for a Transformational Future: Lessons from Jawaharlal Nehru National Solar Mission Phase I. No Date.
[38] Securities and Exchange Commission. SEC-OGC Opinion No. 19-24. 24 June 2019.
[39] Thomas Reuters. Electricity Regulation in Chile. 1 June 2019.
[40] Thomas Reuters. Electricity Regulation in Brazil. 1 July 2019.

In Peru, there are generally no restrictions on foreign ownership of electricity companies or assets. However, there are restrictions on ownership of land and water assets within 50km of the Peruvian border[41]. In India, there are no foreign ownership restrictions on electricity companies or assets[42] but foreign ownership of land is restricted to a lease not exceeding 5 years.[43]

Acknowledgements

IEEFA would also like to acknowledge the following people, whether interviewed or not, for contributing to the paper, regardless of their agreement with our conclusions: Marcelo Mena-Carrasco: Climate Change Group, World Bank, former Minister of Environment, Chile; Tristan Knowles, Asian Development Bank; Angelika Marie Davis and Jose Logarta, Jr., Institute for Climate and Sustainable Cities; Alberto Dalusung.

[41] OECD. OECD Investment Policy Reviews: Peru. 2008.
[42] Reserve Bank of India. Foreign Direct Investment Flows to India. 2011.
[43] BusinessWorld. Rethink plan to allow foreign ownership of land. 30 May 2018.

About IEEFA

The Institute for Energy Economics and Financial Analysis conducts research and analyses on financial and economic issues related to energy and the environment. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

About the Authors

Sara Jane Ahmed

Sara Jane Ahmed, energy finance analyst for IEEFA, is the author of several studies on island grid transition to renewables, coal stranded asset risk, and rooftop solar. She is a former investment advisor specializing in originating and structuring energy opportunities in emerging markets.

Colin Steley

Colin Steley, Resource Economist consultant, has worked across public and private spheres in agriculture, carbon and power markets in Southeast Asia over the last 15 years. He has contracted and developed over 53MW of Solar PV in the Philippines from rural electrification projects, commercial & industrial projects and large-scale utility projects.