

Choosing the right incentive for Pakistan's renewable energy industry

Renewable energy auctions were mandated five years ago but still haven't materialized

Haneea Isaad, Energy Finance Analyst



Table of Contents

Key Findings.....	3
Executive Summary.....	5
Trends for Renewable Energy Addition in Pakistan.....	6
FiT vs. Cost-plus Regime: Enter Competitive Bidding.....	8
Pakistan’s Readiness for Competitive Bidding.....	9
Response to the RFP for 600 MW Solar Project at Muzaffargarh.....	11
FiT vs. Auctions: Setting the Right Incentive Mechanism for Pakistan.....	12
Recommendations.....	16
Conclusion.....	20
About IEEFA.....	21
About the Author.....	21

Table of Figures

Figure 1: Total Installed Capacity in Pakistan (2022).....	6
Figure 2: Solar and Wind Capacity Additions.....	8
Figure 3: Capacity Additions for Solar Power in Pakistan.....	14
Figure 4: Capacity Additions for Wind Energy in Pakistan.....	14
Figure 5: IEEFA’s Tariff Calculations for Setting a Benchmark Tariff for Solar Power in Pakistan under a range of Financing Scenarios.....	18

Key Findings

The lackluster response to a Request for Proposal (RFP) floated by Pakistani authorities for a 600 MW solar power project at Muzaffargarh indicates a high-risk environment and a low benchmark tariff as the key deterrents to new renewable energy added through auctions.

Renewable energy has been added to the system mainly through an upfront or a cost-plus tariff regime, but both were discontinued in 2016.

Auctions have been ordained in place of these fixed incentives but pending for almost five years now.

IEEFA's assessment reveals an optimum benchmark tariff range of 4.3-5.8 USc/KWh (US cents per kilowatt-hour) for solar power in Pakistan, depending on the type of financing involved.



Executive Summary

Pakistan's flagship solar power project of 600 MWp at Muzaffargarh has been deemed too risky for investment given the country's challenging politico-economic landscape, according to a recent statement by Gerd Schober, Team Leader of the Renewable Energy and Energy Efficiency (REEE II) project at the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). This points to the deeply troubled state of foreign investments in Pakistan, and the country's failure to initiate competition in the power sector.

Struggling with the burden of a heavy import bill and a rapidly deteriorating economy, the Government of Pakistan decided to bring reforms to its power sector by introducing a program designed to replace liquefied natural gas (LNG) and natural gas fired capacity with solar power.

Announced in October 2022, the 'Fast Track Solar PV Initiatives 2022' envisioned the addition of approximately 10,000 MW of solar power to the grid in three phases: 1) 6,000 MW of utility-scale solar as a substitute for imported fuel; 2) Induction of 2,000 MW of solar power into 11 KV feeders; and 3) Addition of 1,000 MW through solarization of public buildings.¹

A request for proposals (RFP) inviting bids for the program was floated on February 15, with an initial deadline to purchase RFP documents until March 10 and an allowance for bid submissions up to April 17. This deadline has so far been extended thrice, owing mainly to a lack of interest from project developers. This is despite the fact that the scheme offers an extremely lucrative package through the provision of land, guaranteed off-take for 25 years, tax breaks and a 70% dollar indexed tariff.²

The latest extension allowed RFP purchasing till May 15 and bid submission up to May 31. However, not even a single bid was received for the project in a shocking development.³

Schober's remarks illuminate exactly as to why this may have happened. He further contended that Pakistan's renewable energy market was not mature enough and other developed markets in Europe offered better incentives. The benchmark tariff of 3.4108 US¢/KWh was also deemed too low, as both international and domestic interest rates have gone up lately.⁴

The German renewable energy industry isn't the only one with these concerns. The sentiment is shared widely amongst local renewable energy developers, who term policy lending rates too high at the moment. They argue that agreeing to the current benchmark tariff would cut severely into profit margins.

¹ Alternative Energy Development Board. [Fast Track Solar PV Initiatives 2022](#).

² Ibid.

³ The News. [Setback as no bids received for 600MW solar power project](#). June 5, 2023

⁴ Business Recorder. [German RE firms show no interest in solar power project at Muzaffargarh](#). May 5, 2023.

Although the success of this venture is yet to be determined, if the rumor mill is any indication, the picture now looks less than rosy.

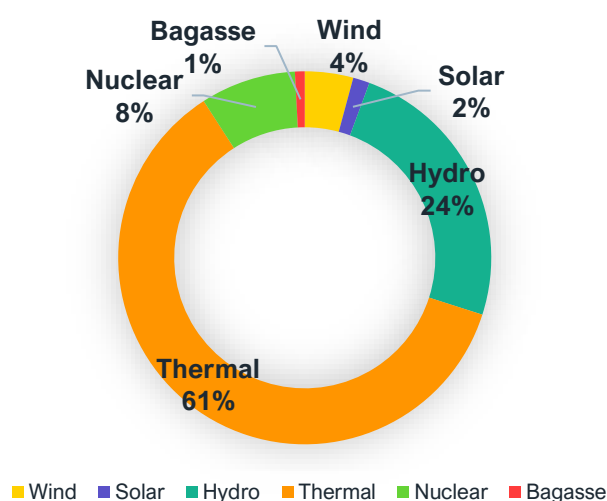
If the market isn't mature yet, is it even practical to move towards competition? Or is it that the government is expecting too much of investors without enough compensation for risk?

Trends for Renewable Energy Addition in Pakistan

Renewable energy in Pakistan, in particular solar and wind power, have mainly been added through two regimes: A) An upfront or a feed-in tariff (FiT) B) A cost-plus tariff.

Solar and Wind power together have an installed capacity of 2,468 MW to date, contributing a share of 6% to the total grid capacity.⁵

Figure 1: Total Installed Capacity in Pakistan (2022)



Source: NEPRA's State of the Industry Report (2022)

- A) An **upfront tariff** acts in a similar manner to a feed-in-tariff, providing a fixed price signal over the lifetime of the power purchase contract (25 years in Pakistan's case). The FiT is usually set at an above market rate to attract developers to invest in projects, while both FiT and upfront tariff are usually introduced to initiate development early on in markets for new technologies, then gradually phased out in stages as the market matures.

Pakistan's upfront tariff regime began in 2006, when the first upfront tariff was announced for wind power plants at a levelized tariff of 9.5 US¢/KWh but no wind power projects could be set up under this incentive.

The scheme was re-introduced in 2011 for projects with installed capacity from 50-250 MW. Although interest in the new tariffs was expressed by a couple of developers, the projects failed to reach financial close in time and the scheme expired without any actual capacity going forward under it. Subsequent schemes were then introduced in 2013, 2015 and 2016 with varying degrees of success.

⁵ NEPRA. [State of the Industry Report 2022](#).

Solar power was relatively a late entrant into the market, with an upfront tariff for the technology only introduced into the market in 2014. The tariff was lowered over the years until discontinuation in FY 2016-2017 as the National Electric Power Regulatory Authority (NEPRA) mandated that renewable energy addition shift to competitive bidding.

Table 1: Upfront Tariff Awarded to Wind Power Plants over the Years

Year	100% Foreign finance- USc/KWh	100% Domestic finance- USc/KWh	Capacity (MW)
2006	9.50		
2011	14.66	20.09	50-250
2013	13.52	16.69	50-250
2015	10.45	12.52	50-250

Table 2: Upfront Tariff for Solar Projects in Pakistan

Year	North Region- USc/KWh	South Region- USc/KWh	Capacity (MW)
2014	17.0	16.3	10
2015	14.8	14.2	50-100
2015 (Revised in December)	11.4	10.7	50-100

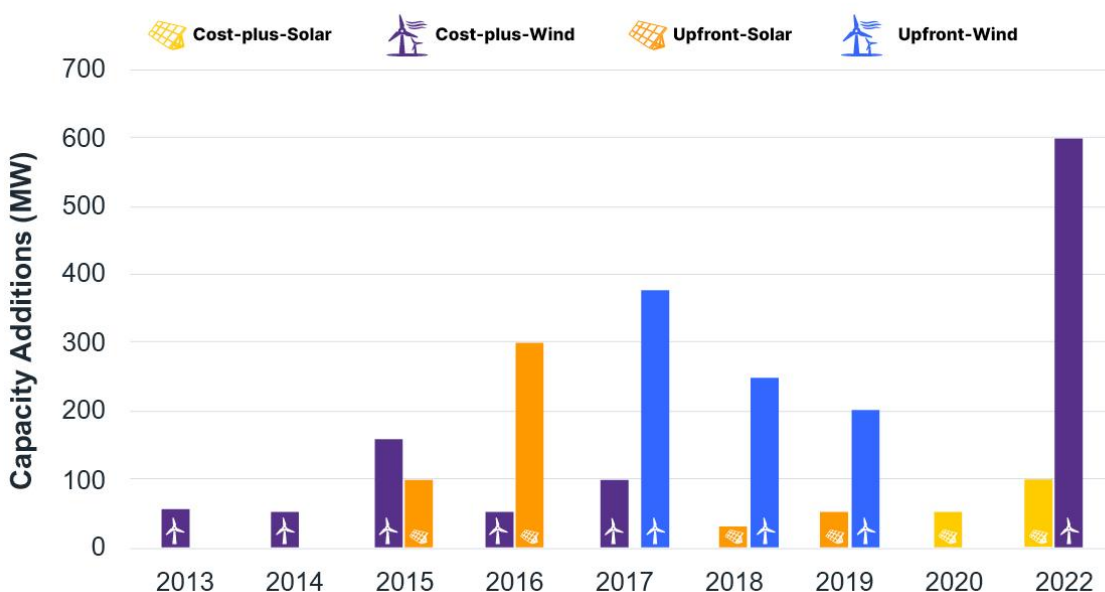
Source: NEPRA's State of the Industry Reports (2011-2017)

- B) Despite provisions of an upfront tariff, most of the present wind power capacity in the country has been installed under a **cost-plus tariff** regime.

A cost-plus tariff, as suggested by the name allows the developer to recoup the original project costs plus a mutually negotiated rate of return between the developer and the off-taker. To obtain a cost-plus tariff, the project developer files a tariff petition with NEPRA, which after careful review and a discussion with the project developer approves a final tariff rate that is applicable to the project throughout its contracted life. A cost-plus tariff regime has always functioned in parallel to the upfront tariff regime, providing policy certainty to unsolicited renewable energy projects during periods where the upfront tariff had been unavailable or expired. In fact, the first wind power project by Zorlu Enerji that was added to the grid in 2013 was on a cost-plus basis.

Lately, a slew of wind power projects was added to the grid on a cost-plus basis as the last upfront tariff available to project developers expired in 2016. The government then decided not to extend this scheme any further and adopted a move towards competitive bidding instead.

Figure 2: Solar and Wind Capacity Additions



Source: NEPRA’s State of the Industry Reports (2011-2022), Tariff Agreements for Individual Plants

FiT vs. Cost-plus Regime: Enter Competitive Bidding

Looking at absolute numbers, the success of the Feed-in/Upfront Tariff seems to be limited. From 2013-2022, only 829 MW of wind capacity came online under the upfront tariff as compared to 1169 MW under the cost-plus tariff regime. For solar power the situation is a little better: 480 MW came online through an upfront tariff, while only 150 MW has been installed under the cost-plus regime (See Figure 3 above).

However, if we look at the pattern of these additions, all were under the FiT announced in January 2015, and its subsequent revision in December 2015. Once the FiT expired in June 2016, only two new projects came online totaling 150 MW and that too on a cost-plus basis.

The reason behind this is the policy uncertainty created by the government’s abrupt move to end the upfront tariff regime. This was officially promulgated through a decision by the Cabinet Committee on Energy,⁶ which declared the government free of any liability to purchase power from renewable energy projects that did not have an Implementation Agreement (IA) in place. Any future procurement that took place would be based on competition through auctions.

The announcement was met with multiple reservations by various project developers, citing concerns about the move hurting the investors as many of these projects were at advanced stages, with lands sited and feasibility studies carried out. Competitive bidding if to be introduced should

⁶ The Nation. [Power generation contracts to be awarded through competitive bidding](#). December 14, 2017.

only be after the current development cycle was over. This did not deter the government from moving forward from the current regime, but an amendment was made to the decision in 2019 that would allow projects at an advanced stage of development to go forward with commercial operations.

A total of 145 renewable energy projects were packed into three categories based on whether they had a letter of support (LOS) or a tariff determination agreement with NEPRA.

1. **Category I: Projects at LOS Stage (531.02 MW)**

The category had 19 projects: 15 bagasse-fired power plants totaling 489.5 MW, and four solar power plants amounting to 41.52 MW. These projects were allowed to achieve commercial operations on schedule with modifications to the tariff determined, if a year or more had elapsed since the tariff approval.

2. **Category II: Projects with Letter of Intent (LOI) and Tariff Determination (1,199.3 MW)**

The category had 22 projects: two bagasse-fired power plants totaling 90 MW, five solar power plants amounting to 350 MW, and 15 wind power projects with a combined capacity of 759.3 MW. These projects were also allowed to go ahead with modifications to the tariff determined, if a year or more had elapsed since the tariff approval, or if the tariff validity period was over.

3. **Category III: Projects at LOI stage (6,547 MW)**

The category had 104 projects: 31 wind power projects totaling 2,139 MW, 65 solar power projects worth 4,143.5 MW, seven bagasse fired plants with a capacity of 224.5 MW, and a 40 MW municipal solid waste to energy project. These projects could only come online after procuring a spot through competitive bidding that was supposed to take place the following year.

Pakistan's readiness for competitive bidding

The decision to move towards a competitive regime hasn't been met with enthusiasm from the renewable energy development community.

Although competitive bidding had been one of the procurement methods prescribed by the Renewable Energy Development Policy of 2006, the sudden ending of the upfront tariff scheme left the project developers, clueless on how to proceed further.

The categorization of these projects or the formulation of a new policy that formalized auctions couldn't be announced until 2019.

By then, two years had already lapsed, and no new projects entered into operations during this phase, even though the tariff requests to NEPRA echoed some of the lowest renewable energy

prices: roughly 3.2 USc/KWh for solar⁷ and 3.6 USc/KWh for wind.⁸ These were some of the lowest regional tariffs and can only be defeated by results achieved in India's auctions.⁹

With tariffs as low as these, it seems that price discovery has already been achieved. Why did the government then want to move towards auctions?

The reasoning behind this is threefold, according to IEEFA's discussion with Syed Aqeel Hussain Jafri, Director Policy at the Alternative Energy Development Board:

1. In 2015-2016, there was a lot of interest in renewable energy projects in Pakistan. Seeing this, the federal government disallowed issuance of LOIs, but despite this there was almost 6-7 GW of capacity in the pipeline.
2. A lot of this capacity was dependent on NTDC providing adequate evacuation capacity and interconnectivity. The present grid network would not allow such a huge influx of variable renewable energy to be absorbed into the system.
3. The government wanted more control over the volume of renewables that was brought into the grid, so that grid upgrades could be carried out in time. Auctions could allow for this. There were also hopes for further price reductions.

While issues of limited grid connectivity and the possibility of curtailment are valid and have been recognized by renewable energy developers as such too, what has hurt the sentiment of developers the most is the unprecedented delay in the conducting of these auctions.

When the policy for competition was first announced in 2017, the government had allayed concerns raised by the developers by saying that framework guidelines and a mechanism for disposal of existing LOIs would be developed within 10-12 months¹⁰ but almost five years later, that framework is yet to be announced to the public.

Request for proposal (RFP) packages for solar and wind projects falling under Category III were prepared and shared with NEPRA for approval in 2020, but remained unfinalized due to a myriad of concerns raised by the regulator.¹¹ At the forefront of these issues was the fact that the RFP did not define the quantum of capacity that was to be solicited through these packages.

It would however be ill-placed to blame this entirely on AEDB. In the matter of defining volumes of solar and wind energy to be auctioned, AEDB has to take direction from the National Transmission and Despatch Company (NTDC), which has been key in holding AEDB back from arriving at an optimal quantum of power that could be auctioned. NTDC carries out an annual generation planning exercise through the Indicative Generation Capacity Expansion Plan (IGCEP), where it optimizes new

⁷ NEPRA. [Tariff Petition for Siachen Energy](#). June 25, 2020

⁸ NEPRA. [Tariff Determination for Moro Power](#). August 7, 2020

⁹ Bridge to India. [India RE Navigator](#).

¹⁰ NEPRA. [Decision of Authority in the Matter of Solar PV Power Generation Tariff](#). March 3, 2017

¹¹ NEPRA. [List of Issues in the RFP Documents submitted by AEDB for Wind and Solar PV Power Projects under Category-III](#). October 10, 2020.

generation capacity on a least-cost basis. The first IGCEP was approved in September 2021,¹² so any auctions to follow would only come at a later stage.

In addition to this, according to Jafri, other reasons for the delay in auctions include the country's inexperience with competitive bidding in the power sector, and a difference of opinion amongst the provinces on finalizing the auction design. Pakistan has traditionally followed a thermal IPP model, where projects have come online unsolicited on a cost-plus or upfront tariff basis. Transitioning to a more liberal system has come with design challenges and requires careful planning.

Response to the RFP for 600 MW Solar Project at Muzaffargarh

The recent opening of the RFP for the 600 MW solar project at Muzaffargarh under the fast track can safely assumed to be Pakistan's first attempt at introducing competition to the market through auctions.

Unfortunately, the response it has received has been only lukewarm so far, which is indicative of the meek confidence investors have in Pakistan's power markets right now.

Project developers revealed upon consultation that holding auctions for an entirely new scheme, while Category III projects still waited in the pipeline, had led to disappointment amongst the development community.

The project capacity of a contiguous 600 MW was deemed to be too large. As a result, local developers who had more experience with smaller project sizes of 50-100 MW felt excluded from the process, since investment of this scale could only be arranged through foreign investment.

Meanwhile, the benchmark tariff set at 3.41 USc/KWh was considered too low. Many stakeholders felt that this did not reflect the high cost of capital associated with a high-risk market like Pakistan, nor did it take it into account the post-COVID increases in technology costs.¹³

More importantly, the financial health and in-ability of the Central Power Purchasing Authority (CPPA) to pay projects on time as the sole off-taker of power from these projects has severely dampened investor interest due to a large volume of receivables unpaid towards IPPs by CPPA at present. This is despite the fact, that these projects have extremely secure PPAs on paper, with sovereign guarantees in place. The fact that even protectionary mechanisms as such do not ensure revenue stability, can be a huge deterrent towards financing new projects.

¹² The News. [NEPRA approves IGCEP 2021-30, envisions RE share of 60 percent](#). September 25, 2021.

¹³ Mr. Abubakar Ismail from Amreli Steels felt that the project in its current design was only suitable for bi-lateral lenders such as the UAE or Qatar. He also shared that the benchmark tariff would need to be increased to 6 USc/KWh for the local market to be responsive.

As the government waits on the outcome of yet another extension of the RFP, there are clear takeaways that could be incorporated into the next round of auctions to be carried out for the Category III projects:

1. Seeking inputs from stakeholders such as bi-lateral investors, local developers, investors and energy think tanks alike to gauge what could be improved upon in the next round
2. Setting a realistic benchmark tariff, that allows for price discovery, yet offers reasonable margin for returns
3. Bringing innovation to PPA design so a reasonable balance can be struck between the off-taker (CPPA) and the project developer for risk sharing

FiT vs. Auctions: Setting the Right Incentive Mechanism for Pakistan

The debate between setting the right incentives to establish new generation technologies into a market, whether it be via a Feed-in tariff or auctions really depends on the local context and settings of that market. The United Kingdom (UK) and Vietnam are great examples of countries where a Feed-in tariff has worked out really well for providing renewable energy a platform to take off.

In the UK a FiT was offered for nine years from 2010-2019, starting at 40 pence/KWh (49 USc/KWh) and ending at 0.15-1.33 pence/KWh (0.18-1.64 USc/KWh). Despite the project size being capped at 5 MW, the FiT led to an addition of 12.5 GW of utility-scale solar to the UK's grid.¹⁴

Vietnam's 18.5 GW of installed solar capacity is also a testament to the success of the 9.35 USc/KWh FiT, which the country introduced in 2017.¹⁵¹⁶ The scheme was highly accessible to small and medium enterprises and led to a boom of rooftop solar PV across South Vietnam. The FiT has gone through subsequent revisions and currently stands at 5.02 USc/KWh.¹⁷

On the other hand, countries like South Africa and India have had remarkable success with reverse auctions, resulting in record low tariffs. South Africa first experimented with a FiT but switched over to auctions when it didn't work out.¹⁸ The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) has concluded its sixth round of auctions since 2011, resulting in the addition of 2.37 GW of utility-scale solar PV and 2.9 GW of On-shore wind capacity to the grid

¹⁴Sugandha Srivastav. [Bringing Early-Stage Technologies to Market: Evidence from Utility-Scale Solar and Feed-in-Tariffs](#). January 2023.

¹⁵ International Trade Administration. [Vietnam Solar Power Sector](#).

¹⁶ PV Magazine. [Vietnam sets ceiling price of \\$0.0502/kWh for 'transitional' PV projects](#). January 18, 2023.

¹⁷ Ibid.

¹⁸ Anton Eberhard, Tomas Káberger, [Renewable energy auctions in South Africa outshine feed-in tariffs](#). April 20, 2016.

with a 100% realization rate.¹⁹ The latest round of auctions in December 2022 delivered prices as low as 2.8 USc/kWh for solar,²⁰ an almost 75% price reduction since the first auction in 2011.²¹

India, too, has a very interesting case, as both mechanisms have proven to be successful given the local context of the state they are being implemented in.

The state of Gujarat, for instance, has had a very aggressive FiT program since 2011, and has received immense government support to bring about almost 8 GW of solar PV capacity to the grid. In parallel, auctions continue to drive down renewable energy prices down centrally and in states like Maharashtra, Andhra Pradesh, Karnataka and even Gujarat itself.

By the end of FY 22, almost 16 GW of wind power and 35 GW of solar power capacity had been tendered successfully under central auctions carried out by the Solar Energy Corporation of India (SECI) alone, of which 5.7 GW of wind and 12.5 GW of solar power had already become operational.²²

SECI accounts for only 46% of the renewable energy tendered in India so far, while other provincial agencies have carried out their own auctions to fulfill their renewable energy targets.²³

Whatever the case maybe, there have been strong policy directives and financial incentives that have made these programs successful. In Vietnam's case it was a combination of attractive returns, policy certainty, accessibility and financial credibility of the off-taker that led to such a widespread uptake of solar PV in the system. For South Africa, it was a strict compliance package and intense due diligence by commercial banks that led to a perfect realization rate.

India's success with auctions can also be attributed to a combination of clever auction design and generous incentives. Renewable energy purchase obligations (RPOs) mandated the distribution companies to procure a fixed portion of their power from renewable energy, while financial incentives like capital subsidies, reduced wheeling charges and tax rebates offered an attractive investment package. Wind power development, in particular, benefited from a scheme that offered accelerated depreciation on assets, thereby reducing the taxable income of these projects.

While local developers were encouraged through provisions for local content in auction design, international developers were also favored. The solar parks scheme, for example, offered a plug-and-play model, where land acquisition and transmission infrastructure were already taken care of.

¹⁹ Mordor Intelligence. [South Africa Solar Photovoltaic \(PV\) Market Size & Share Analysis, South Africa Wind Energy Market Size & Share Analysis](#).

²⁰ PV Magazine. [South Africa's sixth renewables auction concludes with lowest bid of \\$0.02689/kWh](#). December 12, 2022.

²¹ Lena Kitzing, Muhammad Bilal Siddique, Ivan Nygaard, Wikus Kruger. [Worth the wait: How South Africa's renewable energy auctions perform compared to Europe's leading countries](#). May 2022.

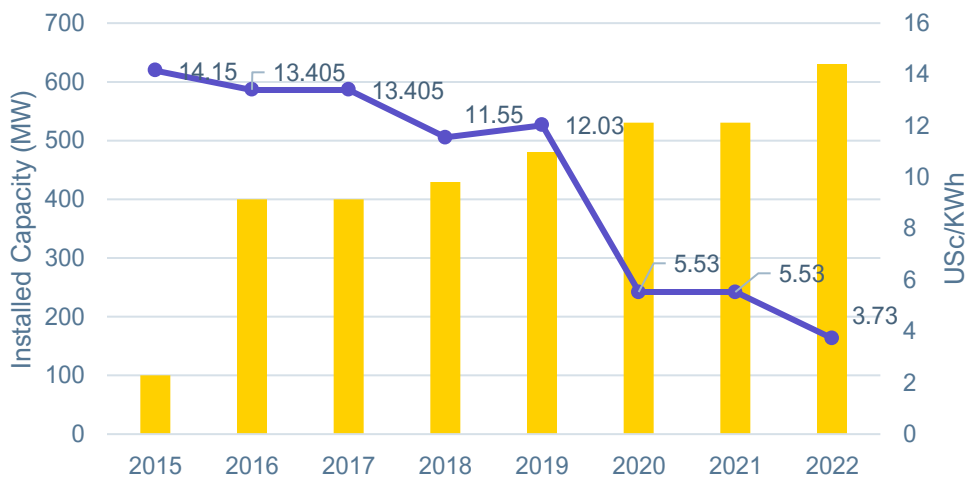
²² Ministry of New and Renewable Energy India. Annual Report 2022-2023.

²³ IEEFA, JMK. [Renewable Energy Tenders Issuance in India Not in Tandem with Government Targets](#). February 2023.

Packaging solar power with cheaper coal power in a bundled power purchase agreement (PPA) also resulted in lower end-user tariffs.

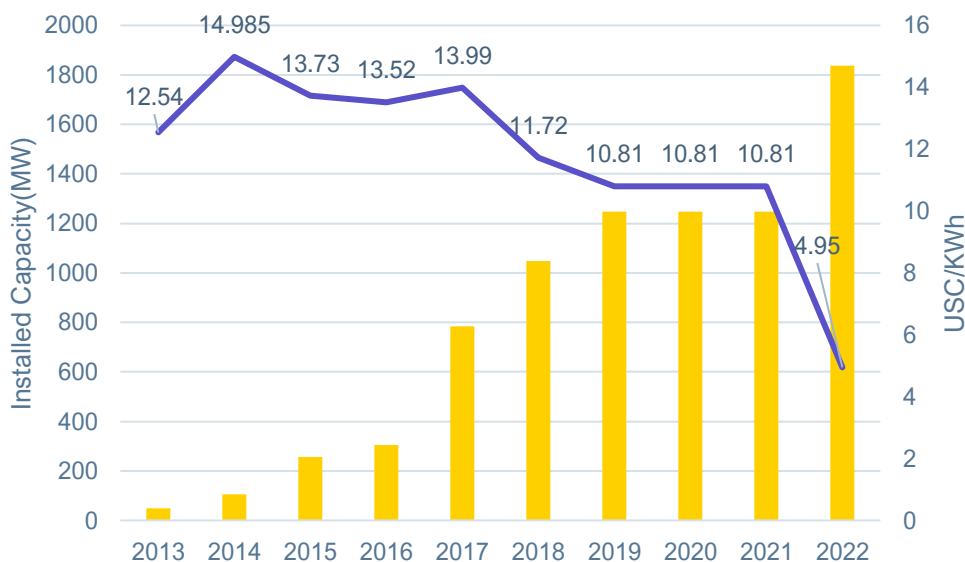
Although Pakistan has attempted to mimic some of these elements into its auction design, such as tariff indexation and guarantees for payment, outstanding issues like the financial health of CPPA and shortage of Forex may outshine these benefits resulting in low participation overall.

Figure 3: Capacity Additions for Solar Power in Pakistan



Source: NEPRA, IEEFA Estimates

Figure 4: Capacity Additions for Wind Energy in Pakistan



Source: NEPRA, IEEFA Estimates

Hopes for further price discovery may be too optimistic at the present as well. Even though latest project realization indicates an almost 74% reduction in solar tariffs and a 67% reduction in wind tariffs, the learning rates for both technologies have been extremely low (See Figures below).

IEEFA's calculations reveal a 1% learning rate for solar and a 0.3% learning rate for wind which points towards the immaturity of the market.

There are several reasons which explain these low rates:

1. Most of the capacity additions under the FiT occurred during a single round of the tariff scheme for both solar and wind energy, even though project realization happened over a range of years.
2. The overall small volume of installed capacity did not lead to much local learning happening, rather the reduction in tariff that can be seen as of late is mainly due to a decrease in technological costs globally.
3. Capacity additions plateaued from 2018 to 2021 leading to a stagnancy in renewable energy markets.

The limited size of the solar and wind energy market in Pakistan indicates that the FiT scheme may have ended prematurely in the country. Policy uncertainty, created by the abrupt removal of the upfront tariff scheme and the delay in initiating auctions, has led to a loss of investor confidence in the stability of renewable energy markets in Pakistan, as evident with the lackluster response to the RFP floated for the 600 MW solar power project in Muzaffargarh. Had this change been attempted in a gradual manner, with the FiT phased out in a manner that allowed the market to adjust to the reduced incentives, things would perhaps have been much different.

Although it may not be wise to switch back to a FiT/Cost-plus regime for new power projects at this point in time, as it would add to the policy uncertainty that exists currently in the market, a good auction design with a realistic benchmark tariff can deliver price stability that project developers desire, while introducing healthy competition into the market that the government wants.

Subsequent rounds of auctions, supported by a healthy policy environment over the years which yield actual progress, may even lead to true learning in the market, driving down prices further as consumer uptake becomes more widespread.

Recommendations

While fully fleshing out an auction design might be out of this report's scope of the analysis, here are three broad recommendations that IEEFA believes may strengthen the auctioning process in Pakistan:

1. Setting the right benchmark tariff

As the country deals with political upheaval and civil unrest, while fighting off the possibility of an economic default, the market becomes riskier for foreign investment. Under such circumstances, risk premiums have to be reflected in any benchmark tariffs that have been set up.

Previous tariff reductions that have happened for solar and wind energy projects were realized when policy lending rates were much lower both globally and locally. London Interbank Operating Rate (LIBOR), which is the lending rate adopted for foreign debt servicing, trended around 2%, while Karachi Interbank Operating Rate (KIBOR), mostly adopted for local policy lending, ranged between 9-11%.²⁴ Currently, LIBOR trends around 5.5% while, KIBOR has seen a nearly 100% rise to 21%.²⁵

In addition, projects on domestic financing had access to concessional financing of 6% through State Bank of Pakistan's (SBP) renewable energy financing scheme. The scheme although recently extended, is not functional because of limited fiscal space in the country's budget due to the current economic crisis. Such a huge subsidy would lead to the exchequer bearing heavy losses.

The situation at hand leads to the conclusion the government will have to either remove the benchmark completely so that the market can signal its risk appetite on its own, or offer an attractive one at least initially to account for the high cost of capital at the moment, along with a reasonable margin.

IEEFA models various underlying conditions to assess what an optimum tariff could look like for solar projects at the moment, given the high-risk policy lending environment. A risk premium of 4.25% has been incorporated along with LIBOR for foreign investments which has been the norm for tariff structuring in Pakistan. Project information for Zhenfa Solar, the latest solar power project to come online has been used for our calculations.

²⁴ Trading Economics. [Pakistan Interest Rate](#).

²⁵ Ibid.

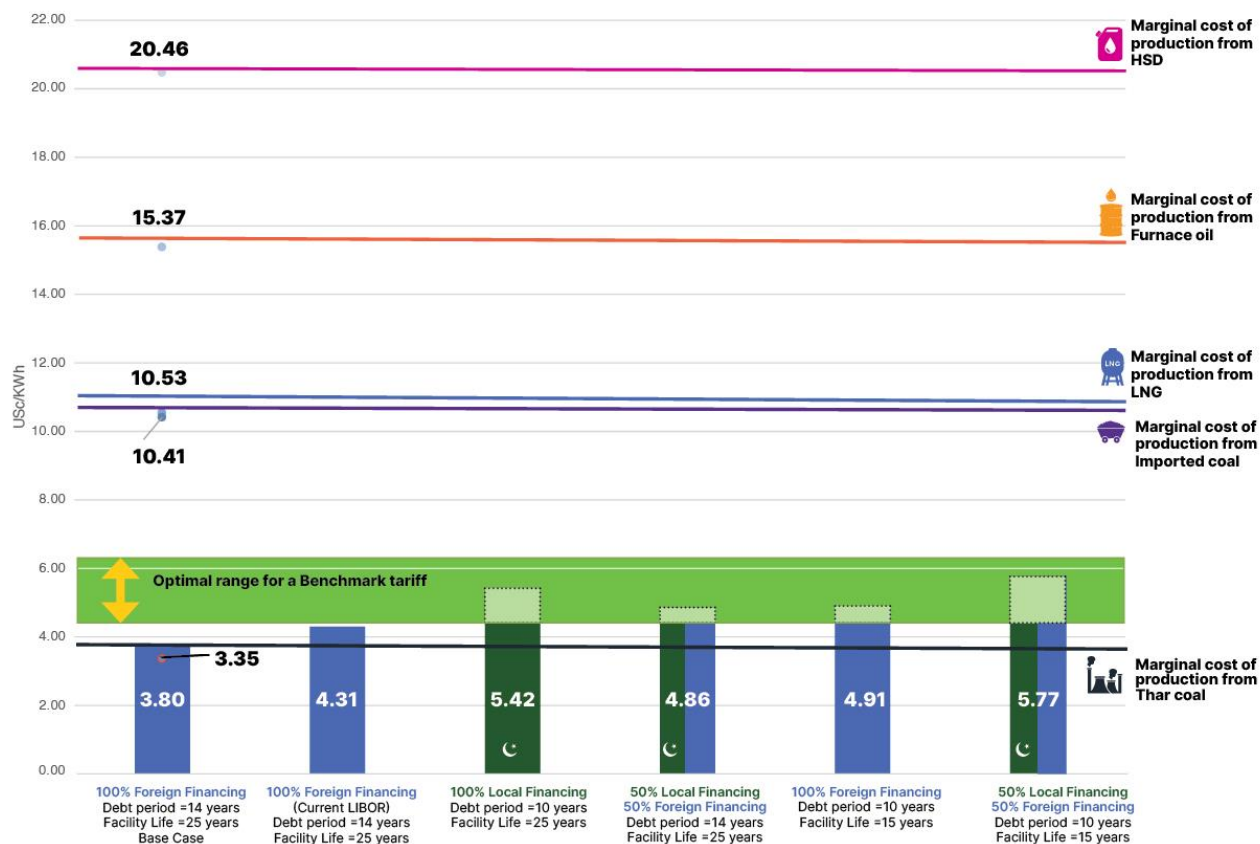
Table 3: Set of Assumptions for IEEFA's model

Inputs	Units	100% Foreign Financing- Debt Period = 14 yrs, Facility life=25 yrs- Base Case	100% Foreign Financing (Current LIBOR)- Debt Period = 14 yrs, Facility life=25 yrs	100% Local Financing- Debt Period = 10 yrs, Facility life=25 yrs	50% Local Financing- 50% Foreign financing Debt Period = 14 yrs, Facility life=25 yrs	100% Foreign Financing- Debt Period = 10 yrs, Facility life=15 yrs	50% Local Financing- 50% Foreign financing Debt Period = 10 yrs, Facility life=15 yrs
Net Facility Output	MW	100	100	100	100	100	100
Capital Cost	\$ M/MW	0.57	0.57	0.57	0.57	0.57	0.57
Annual O&M	\$/MW	9500	9500	9500	9500	9500	9500
Insurance during operation	\$/KWH	0.00114	0.00114	0.00114	0.00114	0.00114	0.00114
Annual Solar Panel Degradation	%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Capacity Factor (2018)	%	22%	22%	22%	22%	22%	22%
Facility Life	Years	25	25	25	25	15	15
Expected Return on equity	%	14%	14%	14%	14%	14%	14%
Foreign Interest Rate (LIBOR + 4.25%)	%	6%	10%	0%	10%	10%	10%
Local Interest Rate	%	0%	0%	21%	21%	0%	21%
Debt (% of CAPEX)	%	1%	1%	1%	1%	1%	1%
Local Debt (% of CAPEX)	%	0%	0%	100%	50%	0%	50%
Foreign Debt (% of CAPEX)	%	100%	100%	0%	50%	100%	50%
Equity (% of CAPEX)	%	80%	80%	80%	80%	80%	80%
WACC of Debt	%	6.2%	9.8%	21.0%	15.4%	9.8%	15.4%
Loan tenor- Foreign	years	14	14	0	14	10	10
Loan tenor- Local	years	10	10	10	10	10	10
Discount rate	%	10%	10%	10%	10%	10%	10%

Source: NEPRA, IEEFA Estimates

An adjustment for current LIBOR and KIBOR while structuring tariffs for solar projects at recently realized project costs indicates a tariff jump from current rates of about 3.8 USc/KWh to a range of 4.31-5.42 USc/KWh depending upon the mix of financing deployed.

Figure 5: IEEFA’s Tariff Calculations for Setting a Benchmark Tariff for Solar Power in Pakistan under a range of Financing Scenarios



Source: IEEFA calculations, National Transmission and Despatch Company (NTDC) Merit Order, May 2023

A comparison with the marginal cost of production for various types of fossil fuel based power plants reveals a difference of 5-15 USc/KWh, even at the highest variation of our calculated tariff range. This cements the conclusion that even at a higher tariff offering the difference between the cost of producing fossil-based power and solar energy would still lead to a net benefit overall.

2. Bringing innovation to PPA design to de-risk the market

When it comes to tariff setting for power projects, Pakistan only has experience with 25-30 year power purchase contracts with a sliding tariff that is higher for the first half of the project life due to debt servicing and becomes lower in the latter half as the project debt is written off. Such longer power purchase periods can prove favorable for the government as it reduces the total tariff on a levelized basis.

However, if a higher tariff than current rates is adopted at present as suggested above, it may lead to a lock-in of costly power generation in the future, especially as the economic situation in the country improves and lending rates come down.

Reducing the duration of power purchase agreements by 5-10 years may lead to a slightly higher tariff now, but would allow the government flexibility to negotiate a lower rate in the future as a new power purchase agreement is signed.

Offering such higher tariffs would also incentivize power developers to invest in the market now when the Pakistani market has such a risky reputation. Putting protectionary mechanisms in place for benefit sharing if the developer is able re-finance at lower cost of capital later on in the project cycle can de-risk the proposition for the government too.²⁶

On the other hand, developers may benefit from such an agreement as well; shorter PPAs would lead to quicker debt re-payment and higher revenue generation in the shorter term. In the longer term, once bilateral markets are functional as envisioned by the Competitive Trading Bi-lateral Contracts Market (CTBCM) mechanism, these projects would have the option to sell power directly to bilateral consumers at their own terms.

Shorter PPAs are not an unusual phenomenon in power markets anymore. Turkey for instance has been regularly issuing 10-15 year PPAs for its renewable energy projects and has still managed to achieve prices as low as 3.1 USc/KWh for solar power.^{27 28}

IEEFA's sensitivity analysis for shorter PPA periods of 15 years on a 100% foreign financed solar power project suggests a tariff of 4.9 USc/KWh, while a 50-50 foreign to local financing ratio results in a 5.8 USc/KWh tariff (See Figure 5 above).

A shorter PPA would also be beneficial from a technological advancement point of view. Renewable energy technologies such as PV systems, wind turbines and Battery energy and storage will get more efficient and cost effective leading to lower tariffs in the future.

3. A strong compliance package and reassurance of payment

Weaker compliance requirements and low penalties for non-project realization often lead to developers bidding aggressively to win projects. However, the unsustainability of these tariffs later on leads to low realization rates.

²⁶ However, if true price discovery is the intended subject of these auctions, then such mechanisms could be a deterrent to good-quality bidders, penalizing those which could execute on time while securing good PPAs, thereby lowering project risk and reducing cost of capital. This situation would of course be more applicable to an environment, where CPPA isn't the sole off-taker which would be the case when CTBCM becomes fully functional.

²⁷ PV Magazine. [Turkey introduces 10-year FIT for solar, other renewables](#). May 2, 2023.

²⁸ PV Magazine. [Turkey's 1 GW PV tender concludes with final average price of \\$0.031/kWh](#). June 29, 2022.

In India, this has been the case of late with tenders floated for wind power projects. Persistent attempts by tendering authorities to drive down prices in reverse auctions forced developers to bid aggressively leading to unsustainably low tariffs, which they were later unable to uphold. As a result, many tenders had to be canceled. To prevent this from happening the government is now moving away from reverse auctions to closed bidding.²⁹

In Pakistan, this hasn't been the case so far, since a successful round of bidding is yet to take place. Nonetheless this is something that planning agencies need to be cognizant of. Since investor confidence is so low in CPPA's ability to pay the producers on time, it will be imperative that guarantees are in place for timely payments and CPPA's credibility as an off-taker improves.

The current RFP package does offer priority payments and dedicated escrow accounts for automated payments. However, while these promises have been made before, the reality remains different.³⁰ This time, the government will have to deliver on these promises first to show its commitment to the success of these schemes.

The auction design should also optimize project size which is more in line with developer experience in Pakistan to ensure adequate local participation.

Conclusion

To conclude, Pakistan's renewable energy markets cannot flourish without first restoring investor confidence in the government's seriousness to develop renewable energy projects. This can be achieved by de-risking the market through innovative project design, and offering price stability at least initially.

As the market matures and Pakistan's economic credibility improves, price reductions will automatically get reflected in the bids that developers put forward during competitive procurement and government support can be phased out.

An honest assessment of the risk associated with the current market needs to be recognized and addressed before putting forward any unrealistic offers to the developers.

The government could start with auctioning a small to medium sized quantity of solar and wind energy with a higher, more attractive tariff. Learnings from the auction could be incorporated into any subsequent rounds. As the ball gets rolling on actual project realization, the market will correct itself on price efficiency and risk mitigation.

²⁹ IEEFA, JMK. [Renewable Energy Tenders Issuance in India Not in Tandem with Government Targets](#). February 2023.

³⁰ Dawn. [Chinese IPP serves notice of payment default on CPPA](#). May 31, 2023.

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About the Author

Haneeza Isaad

Haneeza Isaad is an energy finance analyst at IEEFA. Based in Pakistan, she covers Asian energy markets with a focus on Pakistan's energy transition.

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