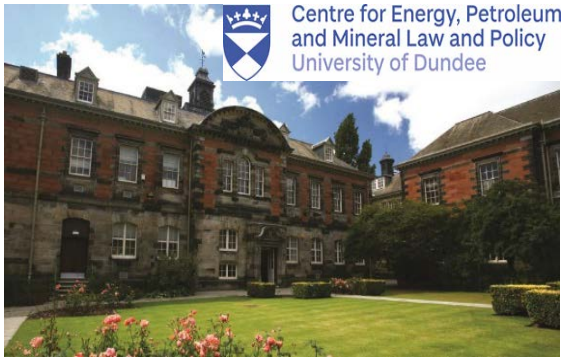
REGULATION CONSTRAINTS FOR RENEWABLE POWER PLANTS IN PERU: WHAT HAPPEN WHEN NO SUBSIDY IS GRANTED TO PHOTOVOLTAIC AND WIND POWER PLANTS?



Mayra Viviana Aguirre Ramírez[1]

ABSTRACT: *Renewable energy has been incorporated in the Peruvian electricity market by virtue of a clear regulatory framework that established a set of benefits in order to make attractive this market to investors. One of the most important benefits is that renewable energy generators have the option to sell their energy to the spot market under an electricity supply agreement entered with the Peruvian government which guarantees such generators an annual income for a certain amount of energy traded annually. However, this power purchase agreement is assigned following an auction mechanism. Hence, this is a benefit only granted to those few companies that met the requirements set forth in the auction summoned by the regulatory agency. Except for this, there is not detailed information about what other options a renewable energy generator may have in order to trade its output in the Peruvian market. Specifically, it has not been established if wind and solar power generators are able to sell their production under a different mechanism.*

The purpose of this research paper is to determine which options do a wind, and solar generator have to trade their output in the Peruvian market and to determine whether there is any regulatory constraint that they may have to face for being able to compete with other generators. In order to assess these queries, this paper has analytically gone through the Peruvian regulatory framework and the information related to renewable energy in Peru. All these led to the conclusion that despite the fact that there are some other mechanisms for wind and solar power plant to sell their energy, none of them can be used due to regulatory constraints affecting this renewable sources.

[1] Miss Aguirre is a Senior Associate at Payet, Rey, Cauvi, Perez Abogados (tier 1 Law firm based in Lima, Peru) in the Regulatory Area where she provides full counsel to companies operating in all areas of the electricity industry, including advice on obtaining permits, licenses and authorizations, counsel in project execution and other regulatory and public law matters. The author is a graduate of Pontificia Universidad Católica del Peru (2010) and obtained an LL.M Degree in Energy Law and Policy from the University of Dundee (2017).

TABLE OF CONTENTS

ABBREVIATIONS

COES	Committee for the Economical Operation of the System (System Operator)
DL 1002	Legislative Decree 1002: Legislative Decree that promotes investment in renewable energy as a generation source
DS 12-2011	Supreme Decree 12-2011-EM: Rule for electricity generation with renewable energy sources
MEM	Ministry of Energy and Mines
OSINERGMIN	Peruvian energy regulatory agency. This acronym stands for Supervisor Entity of the investments on Energy and Mining
PPA	Power Purchase Agreement
SEIN	Interconnected Electricity National System or National Grid

LIST OF FIGURES

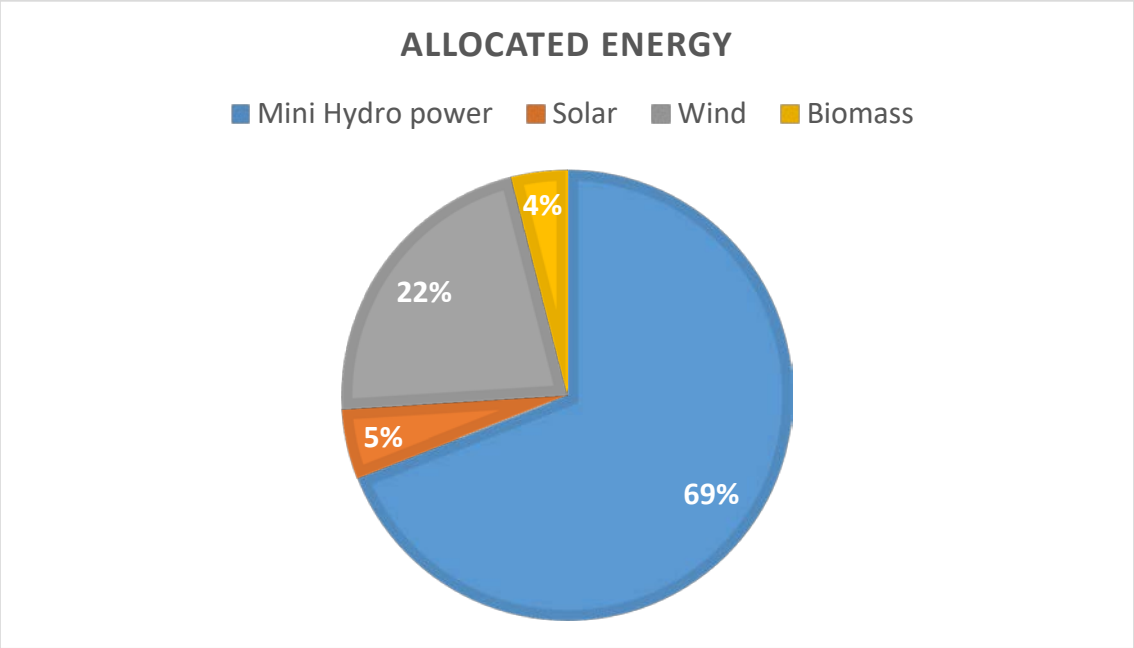
1. Introduction

In order to diversify the Peruvian electricity matrix, in 2008, the Peruvian government enacted a set of rules that composed a clear regulatory framework, aiming to introduce renewable energy sources. For enhancing such purpose, a set of benefits were offered so renewable energy generation can be attractive for investors. One of the most important benefits that was enacted was a tariff benefit that would be awarded through a bidding process.

Basically, participants on this bidding process were offered a twenty (20) year term contract by virtue of which was granted an annual income for a certain amount of energy to be delivered to the spot market. Therefore, awardees were guaranteed a payment as long as they provide the energy that they offered within the bidding procedure.

These auction process scheme had a successful outcome given that by 2014, the energy allocated through the bidding process was of 4,401 MWh.

Figure 1: Allocated energy 2014



Source: Oficina de Estudios Económicos OSINERGMIN. Reporte de Análisis Económico Sectorial: Sector Electricidad. Year 3, Nº 4. November 2014 http://www.osinergmin.gob.pe/seccion/centro_documental/Institucional/Estudios_Economicos/RAES/RAES_Electricidad_Noviembre_2014_OEE.pdf (accessed 24 January 2016).

Nonetheless, no much has been said about any other mechanism being available to renewable energy generators for selling their output. Hence, the purpose of this research paper is to investigate if it is possible for renewable energy generators to trade their energy outside the bidding process and to determine whether there are any regulatory constraints that may prevent them from selling their energy through different market mechanisms.

The research paper is divided into three (3) sections: (i) Chapter 2 will provide information about the regulatory framework for renewable energy. (ii) Chapter 3 will explain the contracting mechanisms offered to renewable energy generators. (iii) Chapter 4 will address the regulatory constraints that wind and solar power face when selling their output. Finally, after a thorough analysis, it is concluded that due to regulatory constraints wind and solar power generators cannot sell their output through any other mechanism than the bidding process.

2. Peruvian Regulatory Framework for Renewable Energy

On 2 May 2008, the government issued Legislative Decree 1002: (DL 1002). DL 1002 aimed to promote investments in renewable energy, which was the first rule enacted in order to introduce renewable energy as one of the electricity generation sources within the Peruvian market. It should be noted that this rule was passed in 2008 which was a year of substantial importance for the Peruvian electricity market given that Peru faced some issues related to the availability of natural gas and the lack of enough hydroelectric power generation[2]. Together with this situation, and considering the importance of having a broader electricity matrix, the Peruvian government established a proper framework seeking to introduce electricity generation with non-conventional and conventional renewable sources.[3]

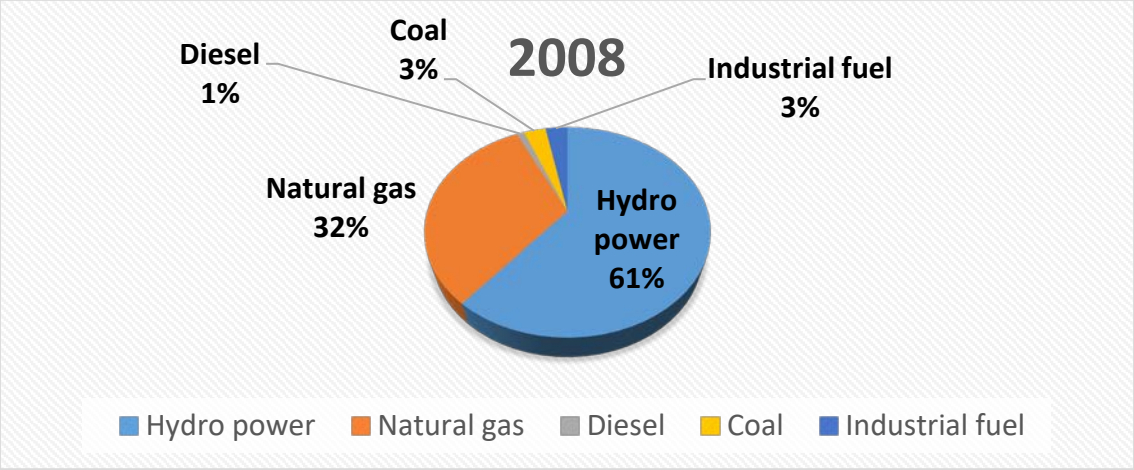
For determining what would have been the best set of policies which would have allowed Peru to enhance the promotion of renewable energy, it was considered that Peru has an energy production based mainly on hydroelectric power. As a matter of fact, in 2008, 61% of the electricity market share was composed by hydroelectric power.[4] This meant that the policy that was to be launched needed to make renewable energy sources as competitive as other sources.

[2] FERRARI, Ursula. Perú: Problemática de Congestión del Ducto de Gas de Camisea y su impacto en la operación del SEIN. Sector Electricidad, 10th August 2013, http://www.sectorelectricidad.com/5251/peru-problematica-de-la-congestion-del-ducto-de-gas-de-camisea-y-su-impacto-en-la-operacion-del-sein/ (accessed 20 January 2016)

[3] OSINERGMIN. Introducción a las Energías Renovables. [website], 2012, http://www2.osinerg.gob.pe/EnergiasRenovables/Contenido/IntroduccionEnergiasRenovables.html (accessed 19 January 2016)

[4] *Ibid.*

Figure 2: Energy Production in Peru During 2008[5]



Thus, the purpose behind DL 1002 was to set a proper regulatory framework that would make renewable energy a profitable and competitive business and contribute to diversifying the Peruvian energy matrix. This would have a positive impact on Peru's energy security policy.[6]

Accordingly, renewable energy was declared of national interest and a public need.[7] DL 1002 also established that wind, photovoltaic, geothermic, biomass and tidal wave energy are considered as a source for renewable energy. Hydroelectric plants will also be classified as a renewable energy source when its installed capacity is not greater than 20 MW.[8]

Under the new legal framework, Peruvian policy towards renewable energy aimed to create a market share for renewable sources within the electricity market. To enhance such purpose, a public tender procedure was created seeking to allocate a certain share of renewable energy in the market. Some other policies were also underlined in DL 1002

[5] Figure obtained from http://www2.osinerg.gob.pe/EnergiasRenovables/Contenido/IntroduccionEnergiasRenovables.html (accessed 18 January 2016)

[6] Legislative Decree N° 1002, Considerations
"That, promoting renewable energy by removing any barrier or obstacle that prevents its deployment will consequently imply to promote a diversification on the energy matrix. This will also have a positive outcome towards promoting energy security and environmental policy. Thus, it is of public and national interest to provide a legal framework for this new technologies (…)" Translated from its original text.

[7] Cfr. Legislative Decree N° 1002, Article 2.

[8] Cfr. Legislative Decree N° 1002, Article 3.

and Supreme Decree 12-2011-EM (DS 12-2011), attempting to establish a clear framework for new investors in this market.

This regulatory framework also introduced the following set of benefits aiming to make this field attractive to investors:

- Priority in the daily dispatch of energy
- Tariff Benefits: assignment of a premium tariff[9]
- Accelerated Depreciation
- Priority in the Connection

3. How Renewable Energy Generators Sell Their Output in the Peruvian Electricity Market?

This section aims to explain what possibilities does a renewable energy generator have for selling their output. A renewable generator can trade its output in the pool market or under a bilateral agreement. However, given the features of these energies sources, there are some constraints to be considered when contracting in the Peruvian electricity market.

3.1. How Renewable Energy Generators Trade Their Output in the Pool Market: Renewable Energy Auctions

As any generation company, renewable energy generators can deliver and sell their production in the spot market which will be paid under the current marginal cost that has been set by the Committee for the Economical Operation of the System (COES).[10] However, it is less likely that renewable energy generators such as photovoltaics or wind power will be interested in trading its output in the spot market, given that there is no fixed price or any guaranteed price. Furthermore, marginal cost are usually set below their production price.[11]

[9] Tariff benefits and the tender procedure to allocate renewable energy will be explained in Section 3.1
[10] Cfr. Decree Law 25844, Article 43.
[11] According to COES web site, marginal cost in the spot market during years 2012, 2013, 2014 and 2015 where the following:

- 2012: 23.88 US$/MWh

In order to make this market attractive to renewable energy generators, DL 1002 established a tariff benefit to be granted through a bidding procedure. This tariff benefit consists of receiving a fixed payment for a fixed amount of energy being delivered into the spot market.

This section will disclose how the public bidding process works and will describe the payments made to renewable energy generators that have been awarded an Energy Supply Agreemen in the tender process.

3.1.1. Auctions for Allocating Renewable Energy to the Pool Market

As stated in DL 1002, the Peruvian energy regulatory agency (OSINERGMIN) will summon a public tender every two years.[12] Furthermore, before when the auction process is held, the Ministry of Energy and Mines (MEM) should establish how many MW of each kind of renewable sources will be offered under the bid process.[13]

The public tender seeks to allocate the market share stablished for renewable energy sources by granting a tariff benefit. The energy that it is being allocated will be directly delivered to the spot market and will be paid at a marginal cost. Nonetheless, the awardees companies will receive additional payments when the marginal cost does not compensate them for their costs.

- 2013: 26.52 US$/MWh
- 2014: 24.57 US$/MWh
- 2015: 14.70 US$/MWh

Whilst prices for photovoltaic plants and wind power plants that participated in the auction summoned by Osinergmin where the following (it is only being considered prices for photovoltaic and wind due to the fact that this research paper aims to focus in this kind renewable sources):

- Photovoltaic (e.g. Majes Solar 2009: 225 US$/MWh and Moquegua FV 2011: 119 US$/MWh)
- Wind (e.g. Cupisnique 2009: 85 US$/MWh and Tres Hermanas 2011: 69 US$/MWh)

Thereto, it can be concluded that trading the energy produced by this generation companies in the spot market without having any kind of subsidy do not provide them with a proper revenue.
Information obtained from:

- COES website: http://www.coes1.org.pe/post-operacion/informes/WebPages/eval_anual.aspx (accessed 22nd January 2016)
- OSINERGMIN website: http://www2.osinerg.gob.pe/EnergiasRenovables/contenido/Actas/Acta-Adjudicacion_y_Buena_Pro.pdf (accessed 22nd January 2016) http://www2.osinerg.gob.pe/EnergiasRenovables/contenido/Actas/Acta-Adjudicacion_y_Buena_Pro.pdf (accessed 22nd January 2016)

[12] Cfr. Supreme Decree N° 12-2011-EM, Article 9.
[13] Cfr. Supreme Decree Nº 12-2011-EM, Articles 4-5

All auction participants must submit their bids indicating: (i) the installed capacity of their power plants, (ii) the amount of energy (in MWh) that they will force themselves to inject annually into the system and, (iii) the price in which that energy will be sold (in dollars)[14]. In order to determine the awardees, OSINERGMIN shall approve a base tariff which will be calculated considering investment and operation and maintenance costs for each one of the renewable energy sources being considered in the auction. The base tariff will be deemed as a top price, hence any of the bidder's offer would be accepted if the price on their bid is above the base tariff.[15]

Once OSINERGMIN determines the list of awardees, they will be entitled to enter into an electricity supply agreement with the Peruvian government by virtue of which awardees will be enforced to deliver the energy offered in the auction process.[16] This supply agreement will guarantee them to receive a fixed payment for the amount of energy that they will be delivering to the spot market.

Awardees are entitled to receive:[17]

(i) a payment equivalent to the price offered as long as they comply with supplying the energy offered in the auction process;

(ii) additional income equivalent to the additional energy supplied in the spot market, valued at marginal cost and;

(iii) a payment for reactive power.

The additional income to complete the price for the energy being delivered is called "premium". Such premium is the government's subsidy that it is only granted to those awardees that have entered into the electricity supply agreement. Therefore, the premium is what makes feasible for renewable energy companies to cover their costs. This payment will be guaranteed during the enforcement term of the Supply Agreement.

[14] Cfr. Supreme Decree Nº 12-2011-EM, Article 12.
[15] Cfr. Supreme Decree Nº 12-2011-EM, Article 14.
[16] The terms and conditions of the electricity supply agreements are established in the Terms of the Bidding Process. This are standardized terms that has been set forth according to regulations. Information obtained from OSINERGMIN website: http://www2.osinerg.gob.pe/EnergiasRenovables/contenido/Documentos/4taSubastaRER.AvisosConvo2015/Bases%204ta%20Subasta_MEM. (Accessed 23rd January 2016).
[17] Cfr. Supreme Decree Nº 12-2011-EM, Article 19

Electricity supply agreements will have a validity term of 20 years counted as of the date in which commercial operation date takes place. According to DS 24-2013-EM, supreme decree that amended some terms established in DS 12-2011-EM, the operation date should take place no later than two (2) years after the electricity supply agreement was entered into by both parties. Hence, if the renewable energy generator breaches this obligation, it will be penalised by having a shorter period for receiving the premium payments.[18]

Strictly, the benefit that underlies in this regulatory framework is providing a premium to all those generators that have been awarded a contract in an auction process. Thus, renewable generators will be guaranteed a fixed tariff covered by a premium for a twenty (20)-year period.

3.1.2. Tariff Regime

Once the winning bidders are considered awardees, the energy offered in the bidding process will be considered to be "allocated energy" and the price offered for such energy will be considered an "allocated tariff". Accordingly, each month those generators will be receiving a "guaranteed income" which will be calculated by considering the amount of delivered energy to the spot market (which should not be less than the allocated energy) times the allocated price.[19]

Figure 3: Calculation of Guaranteed Income

$$AE \times AT = Guaranteed\ Income$$

The allocated tariff will be paid through the following values: (i) energy injected into the spot market valued at marginal cost and (ii) a premium which is paid to awardees when the marginal cost does not fully pay the tariff offered on the auction process.

The premium is paid through a premium surcharge, which will be charged to the final consumers of the electricity market through an additional specific charge included in the

[18] Cfr. Supreme Decree Nº 24-2013-EM, Article 1.
[19] Cfr. Supreme Decree Nº 12-2011-EM, Article 1.

transmission toll.[20] The premium surcharge will be collected by electricity generation companies.

The premium will be calculated by subtracting: (i) marginal cost paid for the allocated energy delivered to the spot market from (ii) the allocated tariff.[21]

Figure 4: Premium calculation

$$(AT - Cmg) \times AE = Premium$$

As abovementioned, the premium will be paid by virtue of the premium surcharge that will be calculated within a tariff procedure held by OSINERGMIN on a yearly basis. Nonetheless, renewable energy generators will be entitled to receive a monthly payment of the premium surcharge.[22]

3.2. Renewable Energy Generators and Bilateral Agreements

Pursuant to article 19 of Supreme Decree Nº 12-2011-EM it has been established that renewable energy generators that have not been awarded an electricity supply agreement can sell their production either in the spot market or under a bilateral agreement.

According to the Peruvian regulatory framework, electricity contracting operates under two (2) regimes: (i) non-regulated prices applicable to those sectors where competition rules are applicable and; (ii) tariff regulation applicable to those sectors that are not subject to competition[23]. Furthermore, the Electricity Concession Law itself has established that generation is an activity open to competition whereas transmission and distribution, are both activities that are considered non-competitive.[24] It should also be mentioned that retailing activity is not open to competition due to the fact that distribution companies are obliged to carry out this activity.[25]

Accordingly, generators are enabled to trade power and energy to large consumers under a non-regulated price. However, when generators sell their output to distribution

[20] Cfr. Supreme Decree Nº 12-2011-EM, Article 21.
[21] Cfr. OSINERGMIN Resolution Nº 1-2010-OS/CD
[22] Section 8.3.4 of the electricity supply agreement obtained from the Terms of the Auction Procedure.
[23] Cfr. Decree Law 25844, Article 8.
[24] Cfr. Decree Law 25844, Article 3.
[25] Cfr. Decree Law 25844, Article 34.

companies, they will be subject to a regulated tariff because such energy will be then sold to regulated or domestic consumers[26].

Therefore, a renewable generator company may sell its production to (i) the spot market, (ii) large consumers or (iii) distribution companies. When selling their output in the wholesale market, generators will necessarily have to enter into a bilateral agreement.

Peruvian regulatory framework has not developed the types of bilateral agreements that can be entered into by generation companies. Nonetheless, considering the principles that underlies the Peruvian electricity market, generation companies usually select a long-term agreement such as a power purchase agreement (PPA)[27] by virtue of which generation companies sell a specific quantity of capacity and the output that can be produced with such capacity.

As an example, it is being quoted one of the sections of a PPA that was entered into by one of the biggest generation companies in Peru with a mining company:[28]

> *"4. Purpose of the Agreement*
>
> *By virtue of this Agreement, the* ***Generator will directly supply or will cause the supply, to the Buyer, of Power and the Related Energy to such Power.*** *The supply will take place in the Metering and Supply Point that has been established in Annex 2 of this Agreement. The supply shall not be for a quantity above the Maximum Demand set forth in this Agreement. Whereas,* ***the Buyer will be obliged to buy to the Generator, Power and its Related Energy that will be delivered or will be ordered to be deliver by the Generator.*** *(…)"(emphasis added).*

[26] SANTIVAÑEZ, Roberto. "Deregulation and Political Process: Regulatory Opportunism in Peru's Electricity Industry Reform. LL.M Thesis. University of Stanford. 2001. pp. 23-25.

[27] In OSINERGMIN web site it is possible to find all the Bilateral Agreements that has been entered into with large consumers. Also, it is possible to have access to the information related to the bilateral agreements that have been entered into with distributors. According to such information it is possible to conclude that generators only undertake PPA with their clients.

[28] Power Purchase Agreement entered into by ENERSUR S.A. and Xstrata Tintaya S.A., dated as of 25 April 2008. Information obtained from http://srvgart07.osinerg.gob.pe/SICLI/principal.aspx (accessed 24 January 2016).

As abovementioned, there is no specific disposition that forces generation companies to sell their output through a PPA. However, it should be bear in mind that the Peruvian electricity market has a specific design that is close to a wholesale competition model[29] (considering the models suggested by Hunt for structuring electricity industry)[30]. The structure chosen for the Peruvian electricity market divides the market in two:

(i) Mandatory pool: The transactions within this market happen in real-time. The mandatory pool is managed by COES who will be in charge of coordinating that demand meets offer. COES has to determine when a generation plant will start producing energy considering the real-time load.[31]

(ii) Financial Transactions Market: This market is related to the transactions that are settled under a specific agreement. In this agreement, generators establish the quantity of power and electricity that will be sold to their clients. Furthermore, it is also established responsibilities, payments schemes and obligations that will undertake each party.[32]

Despite the fact that these markets are divided, they should be somehow connected. This means that when generators undertake a bilateral agreement to sell their output, it is important that they sell power and electricity according to what they are able to produce or what they can sell to the system. This ensures that no generator will overload the system by having customers that will require a certain quantity of energy or power above from what the system can provide on a real-time basis.

Considering the abovementioned, Law 28832 has established the following rule:

> *"Article 3.- Agreements*
>
> *3.1 None generator could sell to Large Users or Distributors more power and energy that the one obtained from their own output or what they can buy from any other generator." (Translated from its original language).*

[29] DAMMERT, Alfredo; MOLINELLI, Fiorella and CARBAJAL, Max. *Fundamentos Técnicos y Económicos del Sector Eléctrico Peruano.* Lima. OSINERGMIN. 2011. p., 136-137
[30] HUNT, Sally. *Making Competition Work in Electricity*. New York. John Wiley & Sons Inc. 2002. p, 45.
[31] DAMMERT, Alfredo; MOLINELLI, Fiorella and CARBAJAL, Max. *Op. Cit.* p., 135.
[32] Ibid. p., 134.

Altogether, this leads to having a market where Bilateral Agreements are mainly a PPA because this type of contract enables generators to not only trade energy but also to trade availability in a long term contract[33].

Hence, when renewable energy generators do not get awarded a contract in the auction process held by OSINERGMIN, they can trade their output to large consumers or distributors by having a bilateral agreement or more specifically by having a PPA.

4. Regulatory Constraints for Photovoltaic and Wind Power Plants for Entering Into a Bilateral Agreement

4.1. Wind and Solar Power Cannot Guarantee Availability

Throughout this paper, it has been explained how renewable energy generators can trade their output in the electricity market. According to the information provided, renewable energy generators' best choice is to enter into an electricity supply agreement by participating in the auction process held by OSINERGMIN. On the other hand, when the renewable energy generator is not awarded a premium in the bidding process, it can sell its output to (i) the spot market under marginal cost or, (ii) the wholesale market in a bilateral agreement.

These constitutes the general rules that could apply to any kind of renewable generator company. However, not every renewable source share the same features which can ultimately lead to some issues when selling their production. Specifically, photovoltaic and wind power deal with peculiar risks given that these kinds of projects utilise cutting-edge technology and both of them relies on energy sources that are subject to exogenous factors.[34] In fact, solar and wind, are both subject to the randomness of the natural phenomenon they are involved to.

[33] HUNT, Sally and SHUTTLEWORTH, Graham. *Competition and Choice in Electricity*. New York. John Wiley & Sons. Inc. 1996. p., 109

[34] COOK, David R. and HALL, Roland. *Financing Renewable Energy Projects In Difficult Economic Times*, Energy Engineering, Vol. 109, nº 3, 2012. p., 43.

For instance, "*wind generation is variable and uncertain, and consequently, its large-scale integration into a power system constitutes a unique challenge for system operators and planners*".[35] Whilst, solar power will be only available during sunlight hours, which derives in having a diminished availability[36]. The described situation means that nor can wind or solar power guarantee availability within the market on a daily basis.

The abovementioned features have been considered in the Peruvian electricity market regulating how to determine the quantity of power that each power plant may have. Determining firm power will allow one to calculate the payment that generators should receive for availability. Article 110 from Supreme Decree 9-93-EM regulates the procedure to calculate the firm power of a power plant.

In 2010, under the first version of this article, it was established that COES should enact a technical procedure for calculating firm power for photovoltaic, wind and tidal power plants. Despite the fact that such procedure was never approved, it was possible to have access to the pre-published version of said technical procedure. In this document, COES established that wind and solar power would have a firm power equivalent to zero (0). In this regard, COES stated that it is not possible to assign a quantity of firm power to wind and solar power due to the fact that these sources cannot guarantee their availability for a whole period of 24 hours.[37]

In 2011, article 110 was amended by virtue of DS 12-2011 in order to specifically set forth -in avoidance of any doubt- that wind and solar power will have a firm power equivalent to zero (0). Later, in 2013, by virtue of DS 24-2013 which amended article 110, it was established that firm power will be determined by COES. Hence, COES enacted Technical Procedure Nº 26: Calculation of firm power[38] in which it has established that wind and solar power will have a firm power equivalent to zero (0).

[35] CONEJO, A. J. et al., Decision Making Under Uncertainty in Electricity Markets, International Series in Operations Research & Management Science 153. Springer Science+Business Media, LLC 2010. p., 407.
[36] PIMENTEL, David. *Renewable and Solar Energy Technologies: Energy and Environmental Issues.* In PIMENTEL, David (ed). Biofuels, Solar and Wind as Renewable Energy Systems: Benefits and Risks. New York, Springer Science+Business Media. 2009. p., 5-7.
[37] Letter Nº COES/D-1990-2009 dated as of 4 February 2009
[38] Technical Procedure Nº 26: Calculation of Firm Power enacted by virtue of Resolution Nº 322-2011-EM/VME, dated as of 17 July 2001. Its last amendment was enacted by virtue of Resolution Nº 153-2012-OS/CD dated as of 22 July 2012.

Regardless of any change in regulation, it is clear that for COES, the system operator and the regulatory agency in Peru, wind and solar power has a firm power equivalent to zero (0).

4.2. Consequences Related to Having a Firm Power Equivalent to Zero (0)

Having no firm power will not only mean that wind and solar power are considered as sources that cannot guarantee availability to the system but also it will mean that wind and photovoltaic power plants are not entitled to receive any payment for power.[39] This situation will have an impact on how wind and photovoltaic generators can trade their energy in the electricity market given that this restriction prevents them from entering into a regular PPA like other generation companies. Furthermore, it will affect any income they might receive for trading power in the spot market since they still will not receive any payment for any amount of power that they can actually sell or trade.

As aforementioned, the Peruvian electricity market has a specific design which has driven generators to undertake PPAs when selling their output to the wholesale market. Specifically, bilateral agreement are required to guarantee power and electricity which means that by virtue of this agreement generators sell their availability to produce a certain amount of energy. This is the rule that has been set forth pursuant to the regulatory framework applicable to the Peruvian electricity market.

This situation may be related to what has been stated in article 3 from Law 28832 which has specifically established that no generator can sell power and energy for a quantity above the power and energy that they can produce or that can be obtained in the market.

Thereto, considering the market features, wind and solar power plants will face some issues when selling their energy through a bilateral agreement given that under a regulatory rule, none of them are able to provide power to their clients. Ultimately, this will mean that wind and solar power cannot undertake a PPA since they are no able to provide power. This lead to arise the following question: is it possible for wind and photovoltaic power plants to sell their output through a different contract? Although there is no specific disposition that obliges generators to only enter into a PPA, it is likely that

[39] According to electricity supply agreements, renewable energy generators are only obliged to deliver energy but no power. Thereto, they are not entitle to receive any payment for power or availability.

due to the market design generators and consumers prefer to undertake a PPA rather than any other agreement.

Furthermore, it is important to state that as of now, no renewable energy generator has sold its energy in the wholesale market under a bilateral agreement.[40]

5. Conclusion

Regardless of the fact that the Peruvian regulatory framework has established a clear set of rules which has led to a successfully introduction of renewable energy sources in the electricity matrix, there are some issues that has been left unattended.

Renewable energy generators such as wind and solar power have the following options concerning how they can trade their output: (i) get awarded a premium in the bidding process held by OSINERGMIN, (ii) sell their output in the spot market valued at marginal cost and, (iii) enter into a bilateral agreement with large consumers or distributors. However, even though, pursuant to the regulatory framework, they are entitled to trade their output under any of the prior mentioned options, there are some constraints that make impossible for them to choose freely from any of these options.

The best and clear option for a photovoltaic or wind power plant is to be awarded a premium because they will receive a fix income for a twenty (20)-year period. Nonetheless, are there any real options for them when they are not awarded a premium? Although the regulatory framework enables them to sell their output in the spot market or to the wholesale market, they actually cannot sell their power and energy in the wholesale market because wind and solar power are not able to guarantee availability. This constraint is not only due to technical facts; it is also, and more importantly, due to regulatory rules.

Thereto, when wind or/and solar power plants get no subsidy from the Peruvian government, they have narrow options to participate in the electricity market and compete

[40] Accordingly, by virtue of the information that has been obtained from public sources, there are no agreements entered into by renewable energy generators such as wind or photovoltaic. Information obtained from http://srvgart07.osinerg.gob.pe/SICLI/principal.aspx (accessed 24 January 2016).

with any other generation company because regulatory framework prevents them from entering into a regular PPA with any other clients.

REFERENCE LIST

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