PERU: RENEWABLE ENERGY AUCTIONS

2013

CHAPTER 4: Policy and Regulatory Mechanisms in Support of Renewable Energy

PERU: USING AUCTIONS TO PROCURE RENEWABLE ENERGY SUPPLY

2013 Case Study by Jorry Mwenechanya

Peru's land area of 1.29 million square kilometers makes it the third largest country in South America, after Brazil and Argentina. For nearly ten years, Peru's economy has grown between 5 and 9% annually underpinned by mineral exports, which places the country among the fastest growing economies in South America. Over this same period, average poverty in Peru has fallen from more than 60% to less than 30%. The decrease in poverty levels correlates well with increasing numbers of households that can access electricity. Between 1990 and 2011, the average access to electricity increased from 45% to 89%[1], with many urban centers approaching 100%. Although the electricity access rate in Peru's indigenous communities falls below 5% and poverty levels exceed 50%, the overall picture is one of continuous progress. To focus attention on the electrification of rural areas, the government established the Executive Project Directorate (DEP)[2] in the Ministry of Energy and Mines. The DEP undertakes several functions: to define and implement the rural electrification plan, to finance or co-finance the projects, and to implement them by contracting construction firms. The government's emphasis on rural electrification followed power sector reforms of the 1990s, reforms that were aimed at reversing poor utility performance and tackling capacity stagnation resulting from a lack of investment.

POWER SECTOR REFORMS

The Electricity Concession Law (LCE)[3] of 1992 unbundled the wholly state-owned utility into generation, transmission and distribution. This ended its monopoly status by introducing competition in generation and open access to the transmission grid. The reforms significantly expanded private-sector participation in the electricity supply business through ownership of assets and through operational control. As a result, the private sector now generates 80% of the electricity, is responsible for more than 50% of the distribution and controls the operation of the interconnected system.

INSTITUTIONAL FRAMEWORK

Since 2000, when the previously separate northern and southern networks were interconnected, the main Peruvian power system has consisted of the National Interconnected Electric System (SEIN)[4] which serves the urban population centers along the coastline.

The rural areas, on the other hand, are served by isolated grids. A Committee on Economical Operation of the System (COES)[5], with the status of "a private, non-profit entity with public legal capacity"[6] , acts as the system operator mandated to ensure security of supply at efficient cost to the consumer. With a membership dominated by private sector participants in the SEIN, the COES performs several functions: it manages the wholesale electricity spot market

and directs the operation of the transmission grid; it administers rules and standards approved by the regulator, and it plans for the reinforcement and expansion of the transmission network to meet future demand and to maintain grid reliability.

The main function of the regulator, known as Supervisory Agency of Investment in Energy and Mining (OSINERGMIN)[7] is to is to oversee, on behalf of government, operators' compliance with the legal, technical, and commercial provisions in state contracts and concessions. In addition, OSINERGMIN has responsibility for setting electricity rates for regulated consumers and handling their complaints. The energy consumed by regulated consumers is about 54% of the total energy sent out, the remainder going to 'free consumers' supplied under bilateral contracts with generators or distribution companies.[8]

The Peruvian electricity industry allows significant participation of the private sector not only in the generation and delivery of electricity to consumers, but also in the management and control of the system. Such a diversity of players in the industry requires close and competent monitoring, supported by clear and comprehensive regulations. The government ensures this through regular review of the laws and the supporting rules and regulations, along with input from industry participants. The partnership between the state and private enterprise enables Peru to generate a high level of investor interest in new projects.

CAPACITY

In 2012, the installed generation capacity of the SEIN was 7.62 GW, to which thermal plants contributed 4.29 GW, or 56.3%, the remainder coming mainly from hydro plants. However, in any given year the hydro plants deliver more energy than the thermal plants because of their lower costs. Driven mainly by industrial expansion, but also by rural electrification plans, electricity demand between 2013 and 2017 is expected to grow by an average of 5.8% per year. To meet the demand, the government in 2012 planned for an additional 4.3 GW by 2016.[9] As in the past, most of the additional capacity will come from thermal and large hydro power plants. However, Peru has significant hydropower potential that could play an increased role in future. This would enable the country to mitigate the disadvantages associated with conventional sources, especially CO_2 and greenhouse gas emissions from fossil-fueled thermal plants.

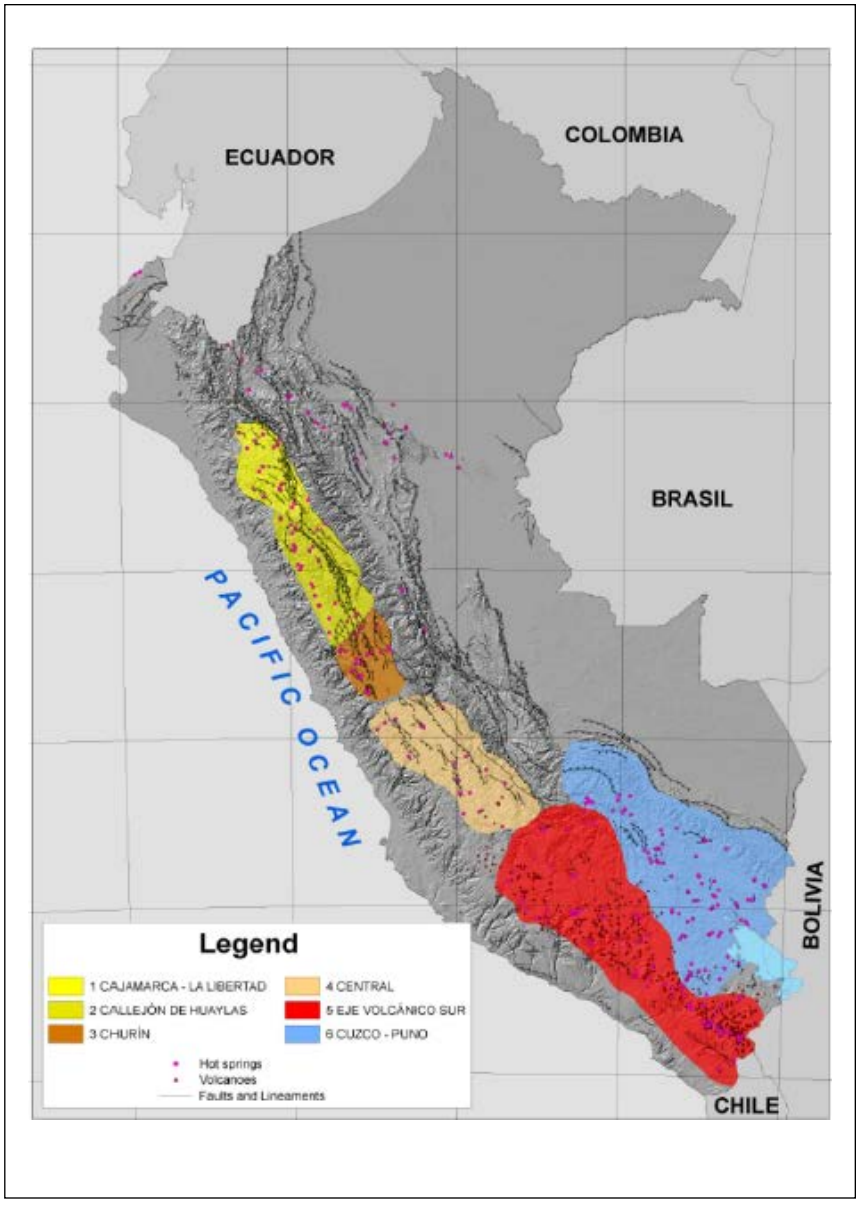
Peru has another important reason for its interest in renewable energy. Distributed generation will help to maintain the correct voltage levels throughout the system, which currently is a challenge due to the long lines between the generators and the centers of electricity consumption. Additionally, renewable sources offer the only solutions for electrifying rural communities that are far from the grid, in which an inhospitable landscape means expensive line construction costs.

The government estimates that the country uses only 4.7% of its hydro potential. A survey by The Ministry of Energy and Mines (MINEM)[10] estimated that for sites with up to 100 MW potential capacity each, the total unused potential countrywide was 70,000 MW. For wind, out of an estimated of 22,000 MW usable potential, only 0.65% has been exploited. Similarly the usage of solar and biomass potential is 1% and 6.1%, respectively. In addition, as much as 6,000

MW of geothermal capacity remains untapped (See Figure 1). Peru clearly has considerable scope for increasing the contribution of renewable energy sources to electricity generation.

PROMOTION OF RENEWABLE ENERGY

Peru aims to increase the contribution of renewable energy to the total of electricity generation and thereby enhance security of supply through a more diversified energy base. To this end for the period up to 2018, the Ministry of Energy and Mines, (MINEM)[11], has set a target of 5% of the projected electricity demand in any planning period to be generated from renewable resources. This target excludes hydro plants of greater than 20 MW capacity.



The long-term goal is that one third of all electricity supplied should be generated from renewables. To meet technical standards of reliability and stability, the long term goal will require investments in the transmission grid to increase its absorptive capacity for intermittent

sources, especially wind. These costs will be met by the system operator, COES. The revised regulatory framework guarantees a firm contracted price for up to 20 years, and enshrines in the regulations priority of dispatch and access to transmission and distribution networks. Peru's efforts to attract investors to renewable energy investments rest mainly on these two measures.

The Government of Peru has promulgated a policy and legal framework that seeks to promote sustainable energy production and use. The objectives of the National Energy Policy for 2010-2040 include the diversification of energy sources, the promotion of energy from renewable sources and energy efficiency. The aim of the objectives is to develop an energy sector that has minimum impact on the environment. In addition, Peru's environmental policy gives the following guideline: "promote investment, development, and use of biofuels, renewable energies, and methane gas derived from landfills as alternatives of fossil fuels so as to reduce carbon emissions within a new energy matrix framework." Accordingly, Peru has established a strong framework for renewables development. The key relevant laws are summarized below.

Legislative Decree 1002 of 2008, *the Law on the Promotion of Investment in Electricity Generation through the Use of Renewable Energy*, accords priority to the promotion of renewable energy and sets targets for the percentage of renewable energy sources (RES) to total domestic consumption and gives renewable energy priority of dispatch in the system. Further it provides for supply contracts of up to twenty years during which the off-take tariff is guaranteed. This is the foundation for the renewable energy auctions in Peru. The guarantee on contracted price and its long-term duration gives comfort to investors that they will recoup their investments.

Supreme Decree No. 012-2011-EM, *Regulations for the Generation of Electricity from Renewable Energies,* elaborates the administrative procedures for tenders and for the award of concessions for RES electricity generation in the framework of Legislative Decree 1002 above[12].

Two other pieces of legislation specifically target efficient use of energy:

- Supreme Decree No. 053-2007-EM*: Regulations to the Law on the Promotion of Efficient Energy Use*, which outlines activities directed at consumers and energy intensive economic sectors.
- Ministerial Resolution No. 46-2009-MEM/DM, by which the government establishes a 15% energy savings goal for the period 2009-2018 based on the projected demand.[13]

The laws specify the rights and obligations of all players in the electricity sector. In effect, they constitute the regulatory framework enforced by the regulator, OSINERGMIN. Such a system of regulation gives more certainty to investors by minimizing the scope and opportunity for arbitrary regulatory actions.

AUCTIONS

The LCE of 1992 and Law No. 28832 of 2006 constitute the basic legal framework for Peru's energy sector. In response to rapid demand growth, Law No. 28832 had the objective to "ensure the efficient development of electricity generation," and to this end it mandated the use of auctions by distribution companies for the procurement of supplies to regulated consumers. Peru is among several Latin American countries, including Brazil, Colombia, Panama and Chile that have pioneered the use of energy auctions to procure new generation capacity.

Some general approaches to energy auctions are summarized below.

First-Price Sealed-Bid Auction. When bidders simultaneously submit sealed bids without prior information about other bids, it is known as a First-Price Sealed-Bid Auction (FPSB). The bidder with the lowest price wins the contract. Usually, the auction is for a single product or service which may include a bundle of several elements of generation plant with transmission or distribution lines. Because it is a simple method, the FPSB has wide application and works best when the auctioneer has a fair knowledge of the values of the items in the auction. However, if there is significant uncertainty about the prices of the products on auction, there is a high probability of inefficient procurement.

Descending Clock Auction. One way of discovering the price that the market can bear is to use the Descending Clock Auction mechanism. In this approach, the auctioneer sets an initial high price and receives quantities that bidders are willing to sell at that price. If the bid quantities exceed the total required, the auctioneer reduces the price and repeats the process until the offers match the desired total quantity. All bidders are paid at the clearing price. The premise of the Descending Clock mechanism is that investor interest is sufficient to generate strong competition. An auction with few participants provides opportunity for collusion in order to achieve a high price. It is also important for the auctioneer to be sufficiently knowledgeable about the product in order to set an initial price that generates competition, while shielding consumers from excessive outturn prices. One should also be wary of the risk of a political backlash when contractors who bid lower are paid at a higher clearing price.

Pay-as-bid or Discriminatory Auction. Another method is the Pay-as-bid or Discriminatory Auction, which is often used when the auction consists of multiple units of the same product, such as several contracts for power supply. The auctioneer totals up the bids starting with the lowest bid and continues until the supply equals the bids, at which point the clearing price is decided. All bidders below the clearing price can contract according to their financial offer. Peru adopted this basic approach and adapted it through a strong reliance on of financial guarantees instead of technical and financial due diligence procedures. By so doing Peru achieved a simplicity that is one of the strong points of its auction system.

PROCURING RENEWABLE ENERGY CAPACITY IN PERU

The government, through The Minitsry of Energy and Mines (MINEM), determines the total energy to be auctioned and sets quotas for each energy type. Acting on the government's behalf, OSINERGMIN establishes an Auction Committee which includes representatives from

MINEM and COES. The Auction Committee sets the maximum price applicable to each quota, but keeps these values confidential. Once the Auction Committee receives the bids, it proceeds as follows:

- Bids are sorted by price offered, starting with the lowest. Bids exceeding the maximum price are rejected.
- If the total energy (MWh) offered is less than the required energy, the Committee accepts all the bids.
- If the bids exceed the MWh energy requirement, the Committee may accept partial bids (partial adjudication) or call for a second round of the auction.

Renewable Energy Resources Auctions

Between 2008 and 2012, OSINERGMIN conducted two auctions. During the first auction, held between August 2008 and March 2009, the government of Peru set out to procure 1,314 GWh from biomass, wind and solar PV. Chart 1 shows the target for each energy type and the realized values.[14] The aggregated energy allocated by the auction was 887 GWh, or about two thirds of the required energy. Wind, which contributed 571 GWh, exceeded its quota of 320 GWh, which, under the auction rules was allowed (since the aggregated bids fell below the total required energy). In contrast to wind, biomass, which had been assigned 813 GWh, produced bids for only 143 GWh. In addition to the energy requirement, the auction had included 500 MW capacity from hydro plants each of which had to be less than 20 MW. The winning hydro projects totaled 162 MW.

After the initial auction, a second round called to contract the shortfall produced the results shown in Chart 2.With wind energy excluded, there were no successful bids for solar PV, and biomass realized only 12 GWh out of the available 419 GWh per year.

At the end of the two rounds of the auction contracts were signed for 899 GWh per year from wind, biomass and solar PV; and 181 MW from 17 hydro plants. The size of the hydro plants fell in the range from 1.8 MW to 20 MW.

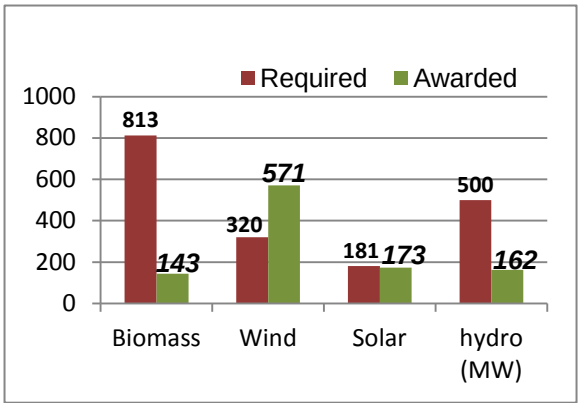


Chart 1: Auction 1 First Round

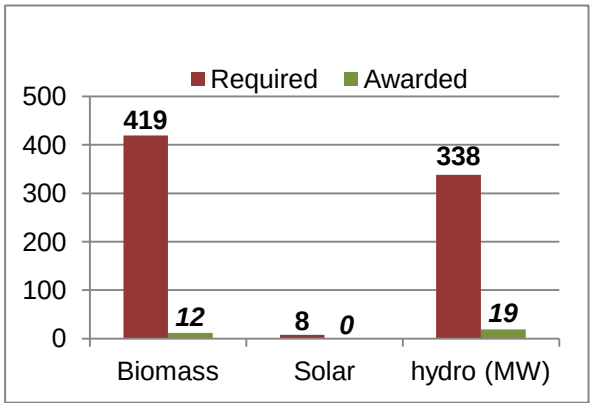


Chart 2: Auction 1 Second Round

Prices

The results of the two rounds of the first auction provided Peru with useful lessons for the future. The first lesson was that second round auctions should not be used because the awards from the first round revealed the benchmark prices. In these circumstances, bidders would aim for the prices from the first round, thus removing the essence of competition. The Auction Committee found that even as it lowered the maximum prices, bidders stuck to the revealed first round prices, leading to a significantly lower number of awards. The second important lesson was in the treatment of biomass technology. The first round made no distinction between biomass as solid waste and biomass as agro-industrial waste, yet electricity production from the two can differ widely.

	Price set by OSINERGMIN		Average price offered		Projects submitted		Projects awarded	
Round	#1	#2	#1	#2	#1	#2	#1	#2
Biomass (US c/kWh)	12.00	5.50	8.10	0.12	2	5	2	1
Wind (US c/kWh)	11.00		7.92		6		3	
Solar (US c/kWh)	26.90	21.10	22.14	0.00	6	3	4	0
Hydro (US c/kWh)	7.40	6.40	5.99	5.92	17	17	17	2

Table 1: Results from Round 1 and 2 for the first auction:[15]

The essence of the second auction held in 2011 remained the same except for the elimination of a second round and the introduction of two sub-categories for biomass. During the second auction, there were 10 project awards for a total of 1981 GWh per year. Between 2011 and 2014, the two auctions together are expected to add 429 MW to the installed capacity of the SEIN, representing a private-sector investment of USD 1, 466 million.

Resource type	1st Auction average price US c/kWh	2nd Auction average price US c/kWh	MW Capacity (no. of projects)
Small hydro	6.0	5.3	180 (24)
Wind	8.0	6.9	142 (4)
Solar	22.1	12.0	80 (5)

Biomass (agri/ind waste)	5.2	NOT AWARDED	23 (1)
Biogas (solid waste)	11.0	10.0	4 (2)
		Total	**429 (36)**

Table 2: The contracted average energy prices, number of projects and contributions to total capacity by the different renewable energy types from the two auctions[16]

The prices, especially for the second auction compare favorably with the prices for conventional large hydro and thermal plants. This is an important outcome for it raises the prospect that renewable energy projects will be commercially viable, and not require special concessions or state subsidies. Such a result could not have been achieved without recourse to the market. The administrative determination of prices resulting in feed-in tariffs requires assumptions that are often far removed from market conditions.

Some investors in conventional generation have criticized the price guarantees available to renewable energies as being uncompetitive. To this, OSNERGMIN responds that the auction process is in a transitory phase involving relatively small capacities. Such small capacities have little or negligible impact on the average price for regulated consumers. The regulator also points out that the guaranteed prices as decided in the auctions are close to the unit prices of electricity from conventional sources. If these trends continue, the need for guarantees will fall away.

CONCLUSION

The renewable energy auctions in Peru have succeeded because of strong and consistent market policies that govern the electricity sector through a comprehensive legislative framework. Since the reforms of the 1990s, OSINERGMIN, as supervisor of state contracts and concessions, has built confidence and trust among the private sector entrants. OSINERGMIN also considers that the strength of the Peruvian renewable energy auctions lies in the balance that the methodology strikes between minimizing entry barriers and ensuring that participants are serious competitors who have the capacity to deliver projects. The auction process obviates the necessity for many of the standard requirements for market entry such as feasibility studies, planning permits or lengthy legal documentation. The process relies rather on stringent and substantial financial guarantees at every stage, thus placing on the prospective investor the responsibility of determining project feasibility and viability and of securing all the necessary permits, including environmental impact approvals.

[1] http://www.opic.gov/press-releases/2012/opic-board-approves-185-million-two-solar-power-projects-peru

[2] *Direccion Ejecutiva de Proyectos,*

[3] *Ley de Concesiones Eléctricas (LCE)*

[4] *Sistema Eléctrico Interconectado Nacional (SEIN)*

[5] *Comité de Operación Económica del Sistema Interconectado Nacional (COES)*

[6] Honda, Jose Antonio: "*Energy Law in Peru*", Kluwer Law International, 2010, ISBN-10: 9041133747

[7] *Organismo Supervisor de Inversión en Energía y Minería*

[8] Maurer, Luiz T. A. and Barroso, Luiz A.: "*Electricity Auctions – an overview of Efficient Practices*", ESMAP, The World Bank, Washington, 2011.

[9] "*Peru Power Report*", Business Monitor International, March 12, 2013, http://store.businessmonitor.com/peru-power-report.html

[10] Fiorella Molinelli: *"Renewable Energy in Peru"*, Internal presentation for OSINERGMIN, Lima, August, 2011.

[11] *Ministerio de Energía y Minas*

[12] International Finance Corporation: "Assessment of the Peruvian Market for Sustainable Energy Finance, IFC Office, Lima, Peru, 2011

[13] Ibid

[14] Author's calculations based on information provided by OSINERGMIN, 2013

[15] Author's derivation based on presentation by Riquel E. Mitma Ramirez, OSINERGMIN, 2013