LESSONS FROM FIVE YEARS OF EXPERIENCE IN ENERGY CONTRACT
AUCTIONS IN SOUTH AMERICA

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1- Introduction

Ensuring generation adequacy is a critical problem for emerging countries in Latin America and Asia due to the combination of high load growth rates, constrained access to private equity and low generation security margins. Although market schemes designed solely around spot prices could in principle provide the correct economic signals for the entrance of new generation capacity \cite{1}, their actual track record is somewhat mixed. For example, a 2005 World Bank report \cite{2} surveyed the experiences of nineteen countries which implemented market reforms and faced supply difficulties afterwards. These difficulties, backed up by theoretical arguments \cite{3}, contributed to a growing consensus that more effective measures to ensure supply adequacy are required. As a consequence, a number of countries early adopted some forms of capacity markets or payments. For instances, Chile, the United Kingdom, Argentina, Spain, Colombia, Peru, Italy, South Korea and US markets such as PJM, NEISO and NYISO have established regulated capacity payments at some stage \cite{4}.

Furthermore, nowadays several emerging economies have adopted supplementary mechanisms to stimulate the entrance of new capacity. In South America, for example, Brazil (2004) \cite{5}, Chile (2005) \cite{6}, Peru (2006) \cite{7} and Colombia (2008) \cite{8} have implemented energy forward contract auctions, which are carried out from three to five years ahead of delivery – a highly desirable feature to foster the competition among new entrants and existing suppliers. These auctions offer long-term contracts, which play also a key role in providing financial security for newcomers. This is essential for project financing purposes of new generation assets. This mechanism for competitive energy procurement removes barriers to entry and therefore makes the market more contestable. For these reasons, among others, this scheme has been gaining momentum around the world and drawing the interest of many countries in the developing world.

Although theoretical studies of auction design started long time ago in the early 60’s by a pioneer paper of Vickrey \cite{9}, moving from auction theory to real life implementation is not an easy task. Further individual markets’ peculiarities may call for particular specifications in their auction design and implementation which may not be applicable to all. In the power sector, energy auctions in day-ahead markets have been on place for many years. However, their use as a regular mechanism for procurement of new generation capacity is a relatively new phenomenon and the rules are still being written and re-written as lessons are learned.

After five years of implementation, there is now a considerable amount of relevant experience at the level of accomplishment of energy auctions as a mechanism for competitive energy procurement. Practical results have shown that judgment has not yet been finalized concerning a number of issues such as (i) the most suitable auction design, (ii) the effectiveness of the auction mechanisms to attract least-cost green-field generation (or demand resources) and (iii) how to price it efficiently. This is of special interest to the growing number of places that consider the implementation of similar mechanisms, which definitely can benefit from the experience on the design and operations of existing auctions and the resulting best practices that can be observed from it.

The objective of this work is to examine the role of energy auctions as mechanisms for efficient procurement of new generation capacity, focusing on lessons and experiences from the energy auctions implemented in South America, namely in Brazil, Chile, Peru and Colombia - in essence countries with high (and volatile) load growth, limited
access to financing and where generation capacity expansion is a main concern. This region has moved from more traditional energy procurement mechanisms – such as bilateral contracting and centralized calculation of regulated prices – to sophisticated energy auctions, e.g. simultaneous descending clock auctions, involving multiple buyers and sellers. Brazil, Chile, Peru and Colombia have accumulated so far (2010) six, five, four and three years of auction experience, respectively, albeit the learning process is not over.

Despite the countries analyzed, note that this practical knowledge may be useful for regulators and policy makers not only in developing countries, but also in the developed world in which authorities have already shown interest for these mechanisms. As an example, the United Kingdom’s regulator (Ofgem) has recently shown interest in mechanisms such as capacity auctions and long-term contract auctions to foster generation investment and therefore achieve targets for renewables [10].

This paper is organized as follows: Chapter 2 merely describes auction design in the targeted countries as background information to then, in Chapter 3, develop the analyses, comparisons and lessons learnt so far (2010). Finally, Chapter 4 summarizes main conclusions.

2 - Auction Experiences in South America: Overview of Current Frameworks
This section describes the key aspects of each country with respect to the design and functioning of their contract auctions. We do not provide in this section the economic rationale for the adoption of the auction scheme.

2.1. Common points
The four countries studied have basic common roots concerning auction design such as: (i) competition is based on long-term energy commitments (forward contracts or options), (ii) demand is to be served various years after the auction occurs, and (iii) power plants do not need to be built at the time when the auction occurs, among others. In addition, all auctions foster the involvement of many participants, ensure competition and allow efficient price discovery. The product being auctioned – a supply contract – provides the revenue stability that is needed for financing and thus reduces risks for newcomers.

The general and common mechanism consists of calling energy auctions subjected to terms and conditions such as:

- winners should have enough time to develop their investment and a minimum revenue guaranteed for a number of years;
- regulator or distribution companies should have a measure that allows the valuation of the different offers received so that it can be guaranteed that the winners are those who offer reliable capacity at efficient prices.

2.2. The Brazilian case
In Brazil, auctions are jointly carried out by all distribution utilities adding their demand needs. Hence, this joint contracting scheme is a mechanism which takes account of economies of scale in the contracting process, benefiting small distributors as well as equalizing tariffs among consumers. Each winner of an auction, i.e. generator or new investor, will separately sign individual bilateral contracts with each distributor participating in the auction, being the energy amount of each contract proportional to the distributor’s declared demand. Equivalently, the net volume of energy ultimately specified in generator’ contracts matches its offered (and allocated) quantity.

Although a “central procurement” is made, distributors are liable for deciding how much energy they want to contract (i.e. liable for load projections). This fact avoids the ‘optimistic’ government bias that in many countries has led to over-capacity and expensive energy contracts. It is important to notice that this is not a single buyer model since the Government neither interfere in the contracts nor provides payments guarantees.

Auctioned demand is divided mainly in two products: new and existing capacity. In both existing and new energy auction, the objective is to contract energy at the lowest net cost after generation companies have bid. In order to do so, auctions are divided into a two-phase hybrid mechanism: in the first phase an iterative descending-price clock auction design is applied in order to classify generators which will ultimately compete in a second phase. The aforementioned second phase is a simpler auction based on a pay-as-bid scheme. Bid prices in the second phase are limited by the final price of the previous descending-price clock auction (further details in [11]).

Overall, from 2004 to 2009 Brazil has carried out 16 contract auctions involving the contracting of 37,000 aMW of firm energy including new capacity additions and contract renewals. These contracts involve different conditions (e.g. 6 months, 1 to 30 years) and financial transactions of about 300 billion USD. In terms of new energy, more
than 20,000 MW of capacity was acquired during 2005 – 2009 for delivery during 2008 and 2014. A summary of the auction prices is depicted in Figure 1.

2.3. The Chilean case
In Chile, the regulator allows auctions to be jointly carried out by various distribution utilities but also allows auctions to be done on an individual basis. In the case of doing a simultaneous procurement among several distributors, distributors’ demands are not added, i.e different contracts are simultaneously allocated according to a combinatorial design instead.

One of the most important aspects of the Chilean framework is that distributors design and manage their own auctions. Distributors are free to call auctions whenever they want subject to having 100% of their demand contracted for, at least, the next 3 years. They are also free to design the product auctioned (contract type, terms, conditions, etc). Given all these, the current regulation dictates that all proposed mechanisms and contracts must be revised and ultimately approved by the regulator before the auction occurs.

As mentioned, the Chilean bidding process allows distributors to auction their demand in one single simultaneous process, in which every generator bids for a specific set of contracts. In addition, so as to increase the level of competition, generators can bid for a net amount of demand higher than their informed generation capabilities. However, the auctioneer must take consideration of these informed capabilities in order to ultimately allocate contracts.

Because the auction trades different contracts, these are allocated to every generator at the same time by means of a combinatorial sealed bid mechanism as shown in Figure 2.

This mechanism has led to a large price differential among different contracts and geographical areas, as generators can choose different price-volume strategies for each auctioned contract. This phenomenon will be analyzed later on in Chapter 3.

Overall, from October 2006 (first auction) to 2009, 3 auction processes have been carried out trading an average demand of 28 TWh/annum to be served between 2010 and 2025. A summary of these results is shown in Table 1.
Table 1. Contracted energy and prices per generator (up) and distributor (down).


<table>
<thead>
<tr>
<th>Generation Company</th>
<th>Average Price US$/MWh</th>
<th>Contracted Energy GWh/annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Gener</td>
<td>74.4</td>
<td>5,419</td>
</tr>
<tr>
<td>Campanario</td>
<td>95.5</td>
<td>1,750</td>
</tr>
<tr>
<td>Colbun</td>
<td>74.6</td>
<td>6,782</td>
</tr>
<tr>
<td>Endesa</td>
<td>63.0</td>
<td>12,825</td>
</tr>
<tr>
<td>Guacolda</td>
<td>66.9</td>
<td>900</td>
</tr>
<tr>
<td>Emelda</td>
<td>95.0</td>
<td>200</td>
</tr>
<tr>
<td>EPSA</td>
<td>98.1</td>
<td>75</td>
</tr>
<tr>
<td>Monte Redondo</td>
<td>92.7</td>
<td>275</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distribution Company</th>
<th>Average Price US$/MWh</th>
<th>Contracted Energy GWh/annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilecra</td>
<td>58.7</td>
<td>12,000</td>
</tr>
<tr>
<td>Chilquinta</td>
<td>62.0</td>
<td>2,567</td>
</tr>
<tr>
<td>EMEL</td>
<td>68.8</td>
<td>2,007</td>
</tr>
<tr>
<td>CGE</td>
<td>90.1</td>
<td>7,220</td>
</tr>
<tr>
<td>SAESA</td>
<td>65.9</td>
<td>4,432</td>
</tr>
</tbody>
</table>

2.4. The Peruvian case

The Peruvian regulator implemented an auction-based contract mechanism in 2006. The implementation followed the Chilean approach, in which distribution companies can design their own auctions and products. The regulator sets a maximum price, i.e. reserve price, in order to limit bid prices, which should encourage efficient investment in generation. The aforementioned maximum price is only revealed if bids cannot cover all auctioned demand when accepting prices below or equal to this maximum price. Then, in the event that 100% of the demand required is not covered in the bidding process, this will be declared partially or totally cancelled and a new invitation to bid will be made with the intention of contracting the shortfall. In this new process, the maximum price is different. Furthermore, currently there is no obligation to participate in the second round, i.e. if a company participates in the first invitation to bid, it is not forced to participate in a potential second round.

The main characteristics of auctions in Peru are: (i) sealed envelope bidding in which each participant may submit more than one bid; (ii) new invitation to bid if the tender does not cover all the demand required; (iii) disclosure of the maximum price if the auction is annulled and at least one of the bids has exceeded the maximum price.

Overall, three auction processes have been carried out since 2006. Two basic outcomes were observed: (i) a high number of auctions that were annulled, and (ii) a significant number of invitations to bid for the same tender, with the subsequent revelation of the maximum adjudication. These results showed that the design is not efficient and did not successfully contract the volume of energy auctioned. Consequently, in 2008, this scheme was replaced by a centralized auction following the Brazilian approach, but there is no experience so far (April 2010) with this new design.

The Peruvian regulation also allows procurement of specific generation technologies if there is public interest. Consequently, in 2008 Peru organized an auction only dedicated to hydropower, without great success. In February 2010, a similar mechanism was applied again in an auction to contract renewables under the Legislative Decree 1002. About 150 MW of wind power were competitively contracted at an average price of 80 USD/MWh. In addition, contracts for 160 MW of small hydro and 90 MW of solar plants were allocated. These contracts last, at most, 20 years and their delivery are for 3 years ahead. These plants are also entitled to receiving regulated capacity payments.

2.5. The Colombian case

Colombia implemented a supply adequacy scheme based on Firm Energy Obligations (OEF\textsuperscript{1}), which is an option product designed to guarantee the reliability of energy supply in the long-run at efficient prices. Hence, in the Colombian system, generation units receive a Reliability Charge, namely CC\textsuperscript{2}, as an availability payment for a commitment to deliver a given amount of energy (physically backed) at the scarcity price whenever the spot price surpasses this price. The scarcity price is fixed by the regulator. This option premium, CC, and the selection of new generators that will receive it, is made in a centrally held auction for OEF to be delivered 3 years after the allocation occurs.

\textsuperscript{1} In Spanish: Obligacion de Energia Firme
\textsuperscript{2} In spanish: Cargo por Confiabilidad
The allocation of OEFs among different generators and investors is done through a dynamic auction type in which bidders participate actively, while the electricity demand of end-users connected to the system is aggregated and represented by a price-quantity function previously established by the regulator (CREG), i.e. elastic demand curve, and publicly published before the auction occurs.

The mechanism used is a descending clock auction and is carried out as follows:

- The auctioneer opens the process at a price equal to two times the Entry Cost (a value calculated by CREG and publicly published before the auction occurs). Likewise, the auctioneer announces the floor price at which this first round will close.
- Between these two prices, bidders draw their firm energy supply curve and then this information is sent to the auction administrator. Figure 4 summarizes the auction methodology.

Prices obtained from auctions are guaranteed to new investors for a period of up to twenty years in order to help them in firming up their cash flows and therefore facilitate project finance.

The first auctions were held in May and June 2008 and allocated OEFs that last for up to twenty years, starting in December 2012. As a result, about 9,000 GWh per year of OEFs were allocated to new generation along with 62,860GWh per year allocated to existing generation plants at an average price of 14US$/MWh, i.e. auction-determined “option” price of US$14/MWh. In addition, an option fee price is also paid. In the future, subsequent auctions will be carried out at CREG’s discretion, i.e. whenever CREG estimates that demand for electricity in future years cannot be covered by existing and new planned generation capacity.

3 - Analyses, Comparisons and Lessons

Despite the differences between the auction models analyzed, a number of important lessons can be drawn out. Experience suggests that many factors can impact on auction performance concerning investment promotion and final prices passed to end clients. Indeed, design elements such as definitions of the product to be auctioned, i.e. standardized contracts vs different contracts; allocation mechanisms utilized, i.e. simple pay as bid or hybrid schemes; and objective function optimized, i.e cost minimization, demand coverage maximization; among others, may be proved to be key if one wants to achieve, for example, energy policy goals (e.g. targeted investment rate). Over 5 years of application, experience also shows the success of auction schemes in attracting private sector participation in local power markets. In almost all of the cases considered, auctions are patronized by a relatively large number and wide range of participants.

Next, five main lessons are identified, centered on the experience of the targeted countries. The aforementioned lessons were chosen due to the importance that these have in promoting new investment, competition and efficiency in the auctions’ outcomes.

3.1. Lesson No. 1: Regarding the outcomes: price and efficiency

Efficiency and final price (i.e. net payments) are the typical criteria utilized to evaluate and compare auction performances. From the distributors’ viewpoint, a natural criterion would be to design and select the best auction format which minimizes net payments. However, from the perspective of the society as a whole, efficiency (i.e. that the contract ends up in the hands of the generator who “values” it the most) may be more important [12]. As electricity supply is of the interest of not only the private sector but also the Government, these both aforementioned characteristics should be considered when evaluating and determining the right design.
In the case of Chile, for instance, the mechanism was designed to reach low prices and high demand coverage. However, based on the recent experiences, this has neither achieved low prices\(^3\) (the rise of high prices in the last Chilean auction has even allowed expensive wind turbines to enter the market when directly competing against conventional plants) nor large auctioned demand coverage (indeed, the last auction in 2009 mostly traded energy which could not be allocated in the previous auctions during 2007-08). In addition, it is very difficult for the auctioneer to define the criterion or set of rules which tune and balance two explicit objective functions being faced. This fact may produce a final outcome merely based on the auctioneer’s (distributor) discretion. Consequently, under this regime both efficiency and low net payments are likely to be seriously jeopardized.

Brazil, in contrast, has a better behavior with respect to final prices since the hybrid descending–clock and pay as bid auction permits price discovery, first, and then price minimization, privileging price performance. This design, on the other hand, is unlikely to be proved efficient as is based on a final pay-as-bid round which is, in general, inefficient [12].

Although some aspects of the Brazilian auction can be discussed, the fact that: (i) it is very hard to achieve efficient outcomes for most of the multi-unit auctions [13], and (ii) the Chilean mechanism is unlikely to drive both efficiency and price minimization due to the presence of discretionary rules to balance diverse objectives, suggests that the Brazilian mechanism presents a better performance concerning the discussed topics.

3.2. Lesson No. 2: Regarding the demand auctioned

How demand is bundled is a major concern in countries such as Chile. Likewise, the degree of centralization when aggregating demand (centralized auction of identical or standardized contracts and decentralized auctions of smaller non-identical contracts) produces several differences in both the design of the mechanism and the strategies of participants. For example, in the presence of standardized contracts (as in Brazil, Colombia and now Peru), it is possible to add all demands in one large market demand block, without allowing generators to choose their buyer. In contrast, in the presence of varied contracts (as in Chile and in the 2006-2008 Peruvian auctions), these may present large differences in many aspects such as commitment period, risk, supply conditions etc which finally do not allow the auctioneer to aggregate them in a single market demand block. In this framework, a generator can bid for a specific contract of a distributor following its particular preferences. Thus, while bids for preferred contracts may result to be very competitive, other prices may result to be higher. There are many variables to be considered in order to see the level of preference from generators for a particular contract, for example:

- Quality of the distributor as a payer
- Vertical integration between distribution and generation companies
- Credibility of the amount of auctioned demand (distributors only pay for the consumed energy even if the contracted energy is higher)
- Volume constraints of auctioned demand: some distributors do not offer the possibility of bidding for a sub-volume of the auctioned demand, i.e. bidders must offer supplying the entire amount of demand
- Contracts’ risk profile

In this framework, generators can analyze different bidding strategies according to, for example, their specific financial policies, i.e. desirable contract portfolio or risk profile. Given these preferences, the Chilean mechanism has presented large price differences among auctioned contracts, even for ones held by distribution companies located at the same system area, i.e. same busbar, as shown in Table 2.

\(^3\) High auction prices were also influenced by the projected high spot prices in the short-term
Table 2: Contract prices per distributor in the first Chilean auction. Prices at bidding busbar and not indexed (2006).

<table>
<thead>
<tr>
<th>Year</th>
<th>Chilcreta</th>
<th>Saesa</th>
<th>Chilquinta</th>
<th>EMEL</th>
<th>CGE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.5</td>
<td>52.7</td>
</tr>
<tr>
<td>2011</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.8</td>
<td>52.8</td>
</tr>
<tr>
<td>2012</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>54.1</td>
<td>52.8</td>
</tr>
<tr>
<td>2013</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>54.3</td>
<td>52.9</td>
</tr>
<tr>
<td>2014</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.1</td>
<td>52.6</td>
</tr>
<tr>
<td>2015</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.1</td>
<td>52.6</td>
</tr>
<tr>
<td>2016</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.1</td>
<td>52.6</td>
</tr>
<tr>
<td>2017</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.1</td>
<td>52.6</td>
</tr>
<tr>
<td>2018</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.1</td>
<td>52.6</td>
</tr>
<tr>
<td>2019</td>
<td>53.6</td>
<td>50.7</td>
<td>52.2</td>
<td>55.6</td>
<td>53.1</td>
<td>52.6</td>
</tr>
<tr>
<td>2020</td>
<td>53.6</td>
<td>0.0</td>
<td>52.2</td>
<td>0.0</td>
<td>53.1</td>
<td>53.3</td>
</tr>
<tr>
<td>2021</td>
<td>53.7</td>
<td>0.0</td>
<td>52.2</td>
<td>0.0</td>
<td>53.1</td>
<td>53.2</td>
</tr>
<tr>
<td>2022</td>
<td>53.7</td>
<td>0.0</td>
<td>52.2</td>
<td>0.0</td>
<td>0.0</td>
<td>53.3</td>
</tr>
<tr>
<td>2023</td>
<td>0.0</td>
<td>0.0</td>
<td>52.2</td>
<td>0.0</td>
<td>0.0</td>
<td>52.2</td>
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<tr>
<td>2024</td>
<td>0.0</td>
<td>0.0</td>
<td>52.2</td>
<td>0.0</td>
<td>0.0</td>
<td>52.2</td>
</tr>
</tbody>
</table>

Thus, auctioning a single large (added) demand block is likely to be more attractive since promotes price uniformity, interest from large international investors to participate in larger auctions, and economies of scale’s benefits sharing between large and small distributors, among others.

In addition, the amount of auctioned demand should be determined by distribution companies whilst the regulator establishes the right incentives and penalties for over/under predicting. This minimizes the intervention of the regulator and allows market participants to reflect real expectations. Brazil, Chile, Colombia and Peru follow this path.

3.3. Lesson No. 3: Regarding the Indexing formulas

In long-term contracts, indexing formulas are used so as to hedge mid and long-term risks, in particular associated to supply cost variations, e.g. fuel prices. However, the presence of these formulas should force the auctioneer to take a risk position when allocating contracts if the auction design seeks the adequate balance between expected costs and risks.

Failing in properly assessing prices may result in final contracts with either very high risk for the auctioneer, i.e. consumer, or with very high prices. An example which illustrates lack of risk assessment in auction processes is presented by the Chilean and Peruvian scheme. Although indexing formulas are part of the final negotiated contracts, for the sake of simplicity, these are not taken into account by the auctioneer during the allocation process. Furthermore, the mechanism only considers bid (or initial) prices. As mentioned, this approach may drive high net costs (when considering the entire contracted period) as illustrated in Figure 4.

In contrast, Brazil has lately introduced some risk assessment after carrying out some auctions that followed the Chilean and Peruvian approach. Until 2008 fuel price risk was incorporated in the adjudication process through a backward-looking approach: the auctioneer looked at the fuel price historical record of the previous year and used it to “penalize” the different offers. This approach has the clear drawback of using past prices as representatives of future prices and in 2009 it was replaced by a forward-looking approach: the auctioneer now looks at fuel price projection curves to penalize the different offers in the auction. This projection curve is, nowadays, taken from the Energy Information Administration (EIA) projections. EIA was selected as a sensible reference for its transparency, neutrality and recognized expertise.
Consideration of indexing formulas is a key element to ensure a final payment which balances expected costs and risks for consumers over the entire contracted period. This is the main reason of why schemes such as the ones observed lately in Brazil and Colombia are likely to be more correct than the ones used in Chile and Peru concerning risk analysis.

3.4. Lesson No. 4: Regarding the discrimination between types of bidders
In classical theory, markets are to be cleared at one unique ‘market’ price given by the intersection of the supply and demand curve. In turn, maximization of social welfare is automatically ensured by doing so.

However, in many real market environments, price discrimination practices may prove to be positive [14]. Price discrimination should not be understood as a way of monopoly/monopsony power but it applies to the ability of a seller/buyer to price the same product at different levels as a way of increasing/decreasing revenue/cost as shown in Figure 5.

Following this line, the Brazilian and Colombian mechanism proposes a new politically and technically viable alternative that, in practice, works encouraging new investment and lowering average prices to end customers. In addition, it must be mentioned that, as explained in [14], there is no justification for public policies that prohibit price discrimination in general since the welfare effects of allowing price discrimination are ambiguous and so this is not necessarily bad.

This separation raises concerns in theoretical grounds, but its application has had successful results in a large market like Brazil.

Chile and Peru have taken a more classical approach in which all bidders, i.e. existing generators and new investors, participate in the same clearing process.

3.5. Lesson No. 5: Regarding forwards contracts and options
The great majority of contracting practices in the worldwide energy market are standard financial forward contracts at a fixed (potentially indexed) price. In these contracts, the seller must supply a predetermined amount of energy to the consumer and sell (or purchase) at the spot market the positive (or negative) difference between energy physically produced and energy sold in contracts. Thus, the seller is exposed to a considerable level of quantity-price market risk.

In Latin America, the greatest novelty of the Brazilian and Colombian auctions was, in addition to standard forward contracts, the introduction of energy call options as an instrument to trade energy. An energy call option specifies a quantity, expiration time, location and a strike price ($/MWh) for energy, giving the holder the right but not the obligation to obtain the specified energy at a strike price. It can be exercised physically or financially. A call option acts as a price insurance which guarantees that distributors will not pay more that the strike price for the contracted energy. To obtain such insurance, distributors pay a fixed premium ($/kW.month or $/year) to generators.

In Colombia, call options have emerged as an attractive way to replace the administratively regulated “capacity payments”. In auctions, bidders are only allowed to offer the option premium price (which then becomes the new capacity payment), whilst the strike price is fixed and published in advance. In contrast, in the Brazilian approach generators are allowed to bid not only on the option premium but on the option strike price as well. Hence, this approach introduces an extra challenge for the regulator: the comparison of bids with different strike and premium prices. In addition, this also introduces a second degree of freedom for the auction participants when devising their bidding strategies.
Call options are seen as a complementary financial instrument over the existing forward contract market. The existence of mixed portfolios of option and forward contracts in Brazil and Colombia shows that this coexistence is clearly beneficial for investors.

4 - Conclusions
The experience with energy auctions in South America proves the benefits of auction approaches and provides evidence that these should be consolidated, not just in terms of the rules and procedures of the auctions themselves, but also in terms of the various regulatory aspects that affect their degree of competitiveness. What is more, it is almost unanimously agreed that the auction mechanism for energy procurement is successful and is here to stay.

In general, auctions have established a transparent market mechanism for allocation and procurement of new generation capacity. Also, these have avoided some of the pitfalls and abuses related to single sourcing or direct negotiation between the contracting parties, which reduces the degree of arbitrariness on the regulatory oversight process. Prices resulting from the auctions have also provided an elegant solution to the regulatory challenge of what the “prudent” costs of generation that should be passed to final customers are.

It is also understood that this is a work in progress and adjustments are still necessary. The competitive procurement models adopted in Brazil, Colombia and now Peru are part of the most sophisticated for developing countries. Simpler schemes have also been implemented in Chile and previously in Peru. Despite the positive aspects discussed, there are still areas of concern on the implementation of energy auctions in South America that could distort the outcome and efficient generation deployment.

From these experiences, five points were particularly highlighted to be carefully considered at the stage of design and implementation. These are:

1. Price and efficiency performance
2. How distributors’ demand volumes are bundled
3. Consideration of the indexing formulas in the allocation procedure
4. Discrimination of bidders
5. Financial instruments utilized in the auction process

Finally, it is clear that to achieve good auction performance; careful design of the auction approach must be done. Therefore, every market design must be tailor-made for the country’s conditions and environment. There is no one size that fits all.

This paper illustrates initial thoughts which have been developed further in a larger report [15].

References