



Reliability Charge

Regulatory Scheme to Guarantee
the Reliability in the Supply of
Electric Energy in Colombia,
A Long-Term Vision

CREG

Comisión de Regulación
de Energía y Gas

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The Colombian Commission for the Regulation of Energy and Gas (CREG) presents the New Regulatory Scheme to Guarantee the Reliability in the Long Term Supply of Electric Energy in Colombia. This new regulation was approved on October 3, 2006¹ and started to be implemented on December 1, 2006. The purpose of this presentation is to allow existing participants in the Wholesale Electricity Market (Mercado de Energía Mayorista, or MEM, its acronym in Spanish) and potential investors to know the advantages of this new scheme and the commitments it requires from the different parties involved.

After ten years of utilizing an income stabilization instrument known as Capacity Charge, the CREG considered it beneficial to replace it with a market scheme, which conveys a long term signal that promotes new investments in generation resources in Colombia, to guarantee the availability of electric energy at efficient prices in periods of scarcity.

The Wholesale Electricity Market in Colombia

Through Law 142 of 1994, also known as the Law of Public Utilities, and based on the mandates of the 1991 Constitution, the competitive market model for the provision of public utilities in Colombia was introduced. The provision of these services is under the regulation, control and surveillance of the Government. For the electricity sector in particular, Law 143 of 1994 established the scheme that governs the different activities of generation, transmission, distribution and commercialization of electricity as well as the key elements and guidelines creating the MEM, which came into operation on July 20, 1995.

Institutional Structure

The participation of the Government in this competitive market model is done through an institutional structure that has not been modified since 1994, and takes place in three instances, as follows: definition of the energy policy; regulation; and surveillance and control.

The definition of the energy policy is under the jurisdiction of the Ministry of Mines and Energy. A major part of the energy policy is developed through the Planning Unit of the Mines and Energy (Unidad de Planeación Minero-Energética, or UPME), which is a special administrative unit attached to the Ministry of Mines and Energy. This unit has many functions, among others; it is mandated to determine the energy requirements of the country and to elaborate, in concordance with the country's National Development Plan, the National Energetic Plan and the Expansion Plan of the Electricity Sector, which are both of indicative nature.






The regulatory function is exercised by the CREG, which is comprised of eight members:

- ▶ The Minister of Mines and Energy, who acts as its president
- ▶ The Minister of Finance and Public Credit
- ▶ The Director of the National Planning Department
- ▶ Five experts in energy matters, who are required to render exclusive service to the CREG and who are appointed by the President of the Republic for a period of four years.

The task of surveillance and control over the provision of public utility services is carried out by the Superintendency of Public Utility Services. The Superintendent is likewise appointed by the President of the Republic.

In addition to these governmental institutions, the MEM also relies for its effective operation on a central agency called Administrator of

Table 1. Institutional Structure of the MEM

Policies	Ministry of Mines & Energy	
Planning	Planning Unit of the Mines and Energy	
Regulation	Commission for the Regulation of Energy and Gas	
Control & Surveillance	Superintendency of Public Utility Services	
System Operation	CND	
Market Administration	ASIC	

¹ CREG Resolution 071 of 2006 was approved on October 3, 2006.

the Commercial Interchange System (Administrador del Sistema de Intercambios Comerciales, or ASIC), which is in-charge of the registration of contracts, the settlement and billing of all the transactions that take place in this market.

The planning, supervision and control of the integrated operation of resources for generation, interconnection and transmission of the National Interconnected System (Sistema Interconectado Nacional, or SIN) are exercised by the National Dispatch Center (Centro Nacional de Despacho or CND), which together with ASIC, are dependencies of XM, a public utility corporation regulated by the CREG.

General Characteristics of the Wholesale Electricity Market

The MEM is composed of systems of information interchange between generation and commercialization companies operating in the SIN. These systems are designed to enable the market participants to make energy transactions of short-term and long-term nature.

In this market, all the electric energy required by end-users connected to the SIN, whose demand is represented by commercialization companies, and all the supply offered by generators, whose plants or generation units are connected to the SIN, are traded.

The designated participants of the MEM are generation and commercialization companies. The generation companies are required to participate in the MEM with all their generation plants or units with capacities equivalent to or exceeding 20MW connected to the SIN. All these electricity produced should be dispatched centrally by the CND. All commercialization companies, which deal with final users connected to the SIN, are obliged to make their energy transactions through the MEM.

The transactions in the MEM are carried out under the following modalities: i) transactions in the Energy Spot Market; ii) bilateral financial contracts; and iii) Auctions to allocate the Firm Energy Obligations (Obligaciones de Energía Firme or OEF) under the Reliability Charge scheme, which replaced the Capacity Charge scheme². This new pricing mechanism will be discussed in more detail in the following sections.

All generation companies in the MEM can freely participate in any or all of the above mentioned transactions under conditions of equality.

The framework and the rules for operation and participation have remained stable since the introduction of the MEM, undergoing only the necessary modifications to further promote market competition and efficiency.

Since the initial implementation of the Capacity Charge scheme in 1996, it was determined that its validity will be for a period of ten years ending on November 30, 2006. After this date expired and following extensive studies, proposals and discussions with the industry and other interested parties, which lasted for a period of two years, the Capacity Charge was replaced with the actual Reliability Charge beginning December 1, 2006.



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Transactions in the Energy Spot Market of the MEM

The MEM in Colombia relies on a single node system. In this market, the transmission network is neutral, which implies that the generator makes its daily price offer and its hourly availability declaration, without taking into account the physical and technical restrictions in the transmission network. In this market, the energy resources to be dispatched at a particular time are selected based on the lowest price offers. This mechanism is known as the **ideal dispatch** and this differs from the real dispatch because the latter takes into account the restrictions that may occur in the transmission network. In other words, the ideal dispatch, determined by the CND, is obtained ex post by considering the real demand and the real supply offered by generation plants or units, without taking into account the existing physical and technical restrictions in the transmission network.

The price offers of generation companies that participate in the MEM should reflect the variable costs of generation as well as the opportunity costs.

The price of the last resource used to meet the total demand in each hour is the one that sets the price to be used to pay all the inframarginal resources³ in this same hour and is known as the **spot price**. Energy demand from commercialization companies that is not covered by bilateral contracts will be settled at this same price.

The settlement of financial obligations and debts of participants in the Energy Spot Market is done by the ASIC.

Bilateral Contract Transactions in the MEM

Bilateral financial contracts are agreements reached by generation and commercialization companies to sell and purchase energy at prices, quantities and contractual conditions negotiated freely between the contracting parties. The market for bilateral contracts is fundamentally a financial market. The purpose of these contracts is to reduce the exposure of both the supplier and the end-user of energy to price volatilities in the short-term market. The physical delivery of the energy committed in these contracts is done through the Energy Spot Market by the generation company, which initially subscribe to these contracts, or by other generators determined by the ideal dispatch.

² The Capacity Charge was the previous managed remuneration mechanism of the MEM for the generation capacity, which guaranteed a fixed annual income per megawatt installed. This scheme paid on average a total of US\$500 million annually to those generation companies that made available their generation resources.

³ Inframarginal resources have marginal costs less than the market clearing price.



There is no restriction whatsoever on the energy that a generation or commercialization company can commit to these bilateral contracts and neither on the time period to be covered by these agreements. The only requirement is for the contract to specify the quantity of energy that will be used on an hourly basis to enable ASIC to do the settlement.

The energy purchased by commercialization companies through bilateral contracts to cover Regulated Users' demand⁴ is covered by rules that guarantee competition between generators, while energy acquisitions by commercialization companies which will go to Non-Regulated Users⁵ are negotiated at prices and under conditions agreed upon by the involved parties.

OEF Auctions in the MEM

The purpose of these auctions in the MEM is to allocate the OEFs among generators and investors to guarantee the reliability in the supply of firm energy in the long-run at efficient prices. This type of transaction will be discussed in more detail in the next section.

Reliability of Supply of Electric Energy

The electric energy in Colombia comes mainly from hydro-generation plants (77%) and a minor proportion from thermal-generation plants (18%)⁶. The dependency of the Colombian electricity market on hydraulic resources makes it necessary for the electric energy sector to have enough generation plants with firm energy to replace

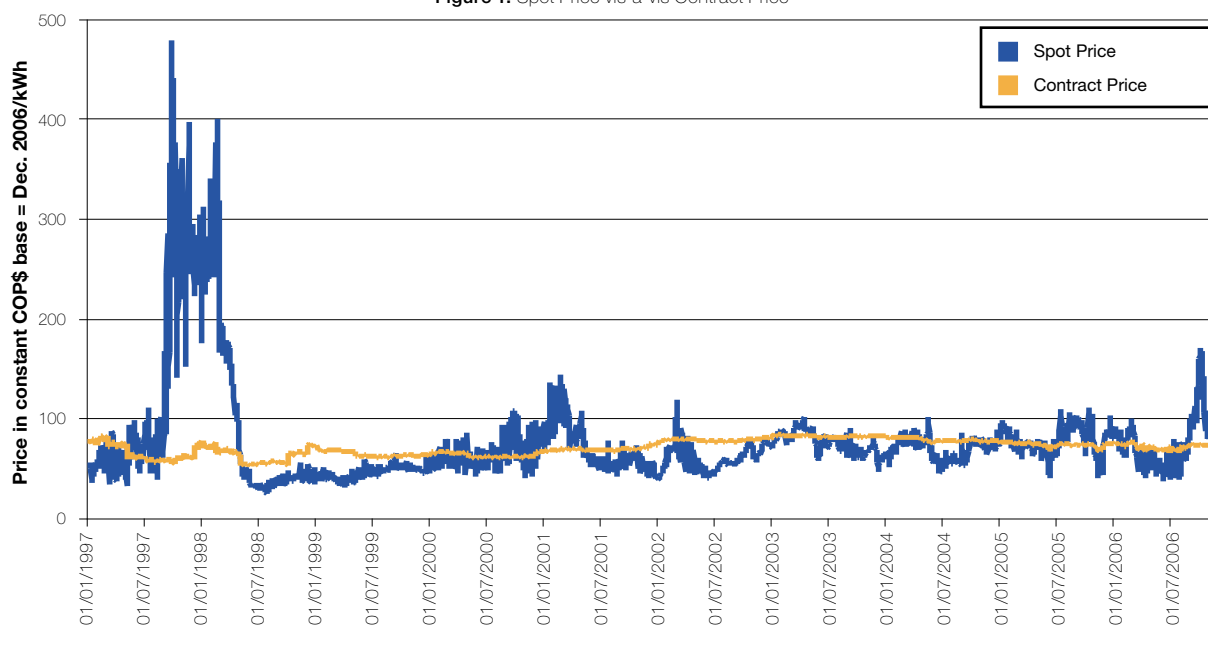
hydro-generated energy in dry periods that occur during phenomena like the El Niño⁷. Without these alternative resources, demand would have to be rationed, implying high costs on the national economy and on the well being of the population.

One of the principles behind the price system that was designed for the Colombian MEM is to guarantee long term economic signals to encourage the expansion of the installed capacity of generation plants to meet the country's development needs. By encouraging investments in power projects and guaranteeing supply reliability of firm energy in the long-run, price volatilities should be mitigated and the evolution of prices should reflect the end-users' level of confidence on supply reliability and their willingness to pay for this firm energy.

The price volatility in the Spot Market (See Figure 1), largely explained by the huge hydraulic component of supply, the seasonal climate (7 months rain and 5 months dry period) and the periodic occurrence of the El Niño phenomenon in Colombia, poses a considerable risk for generation companies that need financing for its projects. This situation calls for the implementation of hedging mechanisms to mitigate the risks for generation companies or investors who engage in energy generation projects.

For these reasons, the CREG considered it fundamental to implement a remuneration scheme that promotes income stabilization, therefore making investment in generation resources viable to cover efficiently the demand requirements particularly during critical periods of low hydraulic supply. This objective is contained in the Colombian legal system, since the enactment of Law 143 of 1994 (article 23).

Figure 1. Spot Price vis-à-vis Contract Price



⁴ This refers to end-users whose electricity consumption is subject to the rates established by the CREG.

⁵ Users with a monthly energy consumption higher than 55 MWh or 0.1 MW of peak demand, and whose energy transactions are done at prices freely negotiated with the commercialization company.

⁶ Source: XM. Composition of the Generation in the National Interconnected System in 2006.

⁷ This is also known as ENSO, which stands for El Niño Southern Oscillation.



Reliability Charge

Following ten years of uninterrupted application of the Capacity Charge scheme, the CREG designed a new method based on a market mechanism denominated Reliability Charge, which has been in place since December 2006. This new mechanism preserves the essential factors of settlement, billing and collection that guaranteed the successful payment to generation companies in the previous scheme.

One of the essential features of this new scheme is the existence of the **Firm Energy Obligation (OEF)**, which is a commitment on the part of generation companies backed by a physical resource capable of producing firm energy during scarcity periods. This new scheme aims to ensure the reliability in the supply of energy in the long-run at efficient prices.

To achieve this purpose, the OEFs needed to cover the demand are auctioned among generation companies and investors. The generator who wins the OEF allocation receives a transparent and stable compensation during a specific time period, and in exchange commits to deliver a determined quantity of energy when the energy spot price is higher than the pre-determined level, the Scarcity Price. Such compensation is settled and collected by the ASIC and is paid by all the end-users of the SIN, through the fees charged by commercialization companies.

The OEF of the new Reliability Charge scheme establishes a legal link between the demand (determined by the end-users of the SIN) and the supply (determined by generation companies) of the MEM. The legal nature of the OEF allows the generation companies as well as the end-users in the system to benefit from a stable scheme in the long-term, which provides signals and incentives for investments in new generation resources. This is vital in guaranteeing the supply of energy necessary to support the growing demand resulting from the country's economic development.

Firm Energy Obligation

The Firm Energy Obligation or OEF, its acronym in Spanish, as mentioned before, is a product designed to guarantee the reliability in the supply of energy in the long-run at efficient prices.

When the spot price surpasses in at least one hour during the day the value previously established by the CREG, which is known as the Scarcity Price, it reflects a critical electric energy supply situ-



The generator who wins the OEF allocations receives a transparent and stable compensation during a specific period, and in exchange commits to deliver a determined quantity of energy when the Spot Price is higher than the Scarcity Price.

ation. When this occurs, it serves as a trigger factor for generation companies with OEF allocations to produce, as required in the ideal dispatch, a determined daily quantity of energy.

The OEF can be acquired through centralized transactions in the ASIC. The OEFs are auctioned and allocated uniquely among generators or investors that have or are planning to own generation resources. Only those generators with their corresponding firm energy at a determined time period can participate in the OEF auction.



The maximum quantity of energy that each generator should supply in periods of scarcity with its portfolio of generation assets, as well as the remuneration that it will receive for each kilowatt per hour committed though the OEF, will be determined in the auction.

Firm Energy for the Reliability Charge (Energía Firme para el Cargo por Confiabilidad or ENFICC) refers to the maximum electric energy that a generation plant is able to deliver on a continual basis during a year, in extreme conditions of hydro inflows. The formula for this is presented later in this document.

Scarcity Price

The Scarcity Price, which is established by the CREG and updated monthly based on the variation of the Fuel Price Index⁸, has a double purpose. On the one hand, it indicates the time when the different generation units or plants will be required to fulfill their OEFs, which happens when the spot price exceeds the scarcity price, and on the other hand, it is the price at which this energy will be paid.

Commitment Period of the OEF

The commitment period of the OEF is decided by the owner or the commercial representative of the generation resource that backs up the OEF. If the generation plant is new, meaning at the time of the auction its construction has not started, the obligation to generate energy can be between a minimum of one year and a maximum of twenty years. If it is a special resource or at the time of the auction the generation plant or unit is in the process of construction or installation, the obligation to generate energy is between one and ten years and if it is an existing resource, which implies that it is ready to operate (or it is already operating) in the MEM at the time of the auction, the commitment period of the OEF is one year.

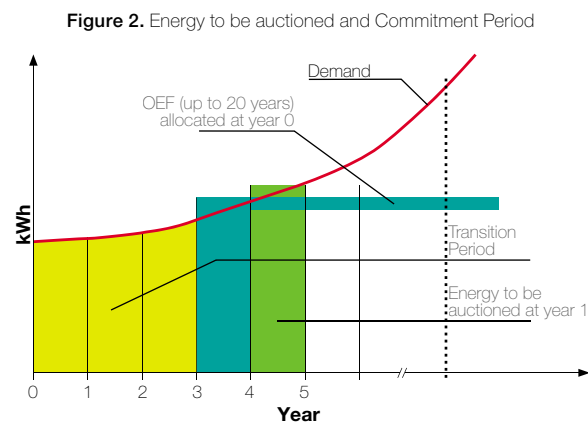
During the commitment period of the OEF, the generator receives the Reliability Charge remuneration, a value that is determined in the auction where the generating company participated to obtain its OEF.

⁸ The Fuel Price Index corresponds to the New York Harbour Residual Fuel Oil 1% Sulphur LP Spot Price.



Table 2. Commitment Period of the OEFs

Generation Plant or Unit	Description	Commitment Period of the OEF
New	At the time of the auction its construction has not started	Between 1 and 20 years
Special	At the time of the auction the generation plant or unit is in the process of construction or installation	Between 1 and 10 years
Existing	At the time of the auction it is ready to operate (or it is already operating) in the MEM	1 year



Duties Associated with the OEF

During the commitment period of the OEF, the generator who acquired this obligation commits to:

- ▶ Generate, as required in the ideal dispatch, the quantity of firm energy associated with its OEF when the Spot Price exceeds the Scarcity Price.
- ▶ Maintain active the fuel supply and natural gas transport contracts (if applicable) to allow energy production in case the generator is required to fulfill its OEF. In case the commitment period of these contracts is not congruent with that of the OEF, the generator should maintain active the compliance guarantees to assure the renewal of these fuel and transport contracts.

Verification of the OEF

The owner of the OEF commits to generate daily, as required in the ideal dispatch, a certain quantity of energy up to the amount specified in the OEF. When the Spot Price exceeds the Scarcity Price, in order to verify that each generator has fulfilled its commitment, all the energy generated from all its plants at each hour of the ideal dispatch are added up. This total energy generated is added to the complementary energy that the generator acquires through the “Contingency Mechanisms”, which will be described later in this document. This total should at least be equal to the generator’s daily OEF; otherwise the generator should obtain the difference in the Energy Spot Market. If the generator has exhausted all the alternatives of the “Contingency Mechanisms” and

the Spot Market and in the extreme case it still can not comply with its OEF, therefore causing a forced demand rationing, the generator is required to compensate the affected end-users.

Generation according to the Ideal Dispatch

In order to incorporate the different profiles of each generation resource (from generation plants or units that are able to produce electricity continuously for 24 hours to those that are dedicated to generating only during peak demand hours), and to promote the optimal utilization of resources to cover the demand, the OEF commits the generation company to produce daily a determined quantity of firm energy, without imposing the time this energy should be generated⁹. Given that generating companies are not in-charge of the transmission network, and therefore are not responsible for the physical or technical restrictions that may occur in this network, the corresponding energy required in the ideal dispatch from each generator will be the one considered in verifying whether the generators complied with their OEFs.

Remuneration of the OEF

The generator who acquires an OEF will receive a fixed remuneration during the commitment period of the OEF, whether the fulfillment of this obligation is required or not. The price for each kilowatt hour of the OEF corresponds to the clearing price in the auction in which the generator sold its firm energy. This price is denominated as Reliability Charge. When this firm energy is required, which happens when the Spot Price surpasses the Scarcity Price, aside from the Reliability Charge the generator also receives the Scarcity Price for each kilowatt hour generated associated with its OEF. In case the energy generated is more than the obligation specified in the OEF, this additional energy will be paid or rewarded at the Spot Price.



The remuneration of the OEF results from the market settlement. The commercialization companies are charged directly and these fees are paid to the generators taking into account the energy that corresponds to each OEF. As with the other transactions in the MEM, this settlement process is done by the ASIC.

⁹ Only when the generator does not comply with its daily OEF, an hourly verification takes place.

Auction for the Allocation of the OEF

The allocation of the OEF among different generators and investors is done through a dynamic auction. In this transaction in the MEM, generators and investors participate actively, while the electricity demand of end-users connected to the SIN is represented by a price-quantity function previously established by the CREG.

For this purpose, an auction to allocate the OEFs is undertaken three years¹⁰ before the firm energy obligation can be called. The time period that runs between the announcement of the auction date for the allocation of the OEF and the end of the commitment period of the OEF, is classified into three stages: i) Pre-qualification Period; ii) Planning Period; iii) Commitment Period of the OEF.

The **Pre-qualification Period** starts once the CREG announces the auction date, and this ends on the day the auction takes place. During this period, both generators and investors, send the information necessary to participate in the auction. Only those that have complied with all the requirements are qualified to offer their firm energy in the actual auction process.



After the auction for the allocation of the OEF has taken place, the generators who have been selected are given three years to build or install their new generation plants or units to ensure that these plants will be ready to deliver firm energy from the first day of the commitment period of the obligation. This period of preparation of generation resources, or in other words the time between the auction and the start of OEF, is denominated Planning Period.

To reduce the income uncertainty of certain projects whose constructions may take longer than the three-year Planning Period, the CREG incorporated a mechanism that allows generators or investors to sell a portion of their future firm energy under special circumstances, in auctions that take place seven, six and five years before the firm energy of their projects become available. Through this, the generator or the investor is given a maximum seven-year allowance to enable it to start delivering its firm energy.

Table 3. Different Stages of the Allocation of OEF

X months before the Auction	Implementation Date of Auction	3 years	December 1 of year t-1
Pre-qualification Period	Auction	Planning Period	<ul style="list-style-type: none"> • 1 year for existing generation resources • Up to 10 years for special generation resources • Up to 20 years for new generation resources
Compliance with the requirements to participate in the Auction	Auction of OEF to be required by year t.	Building of new generation plants or units to deliver firm energy from the first day of the commitment period of the obligation (to deliver firm energy on December of year t-1)	The OEF can be required during this time period
The Auction for the Allocation of Firm Energy Obligations (OEF) is implemented 3 years before this OEF is required.			

For these cases, the special treatment of up to four additional years (the maximum seven-year allowance minus the normal three-year planning period) consists of giving the generator or the investor the possibility, once it knows the energy clearing price in auctions being undertaken during this time period, to express its interest to the CREG of selling part of its future firm energy but acting as observer and price taker in these auctions.

When the auction which takes place three years before the initial date of the commitment period of the OEF is undertaken, the generator or investor who has sold part of its future firm energy by making use of the special circumstances privilege, should participate with its firm energy which has not been committed, under the same rules for all the participants that are selling their firm energy in these auctions.

Description of the Auction Process

The Auction for the Allocation of OEF is a one sided process. This means that the generators and potential investors, who have complied with all the requirements necessary to participate in the auction, can bid actively. On the other hand, the demand of end-users connected to the SIN is represented by an aggregate demand curve that is previously established by the CREG and made known to the public before the auction is conducted.

Descending Clock Auction

The mechanism employed is the descending clock auction and is carried out in the following manner:

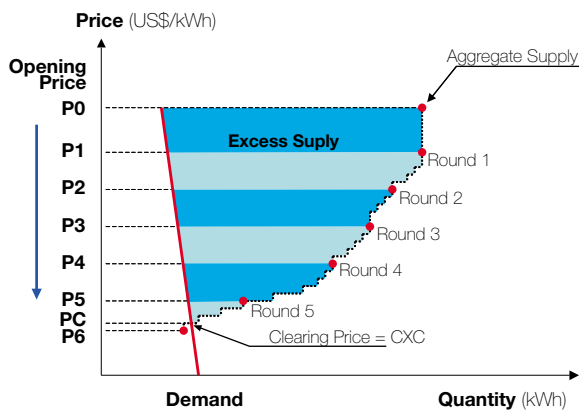
- ▶ The auctioneer opens the auction at a price equivalent to two times the Cost of Entrant; a value calculated by the CREG and made known to the bidders (generators and investors) before the auction. Likewise, the auctioneer announces the floor price at which this first round will close.
- ▶ Between these two prices the bidders build their firm energy supply curve and this information is sent to the ASIC, the auction administrator.

¹⁰ The CREG can modify this term if and when necessary. The first auction will take place on May 5, 2008 to allocate OEFs with Commitment Period beginning on December 1, 2012.



- ▶ The ASIC receives all the supply curves and based on these, builds an aggregate supply curve. The ASIC plots this aggregate supply curve with the aggregate demand curve and it calculates the resulting excess supply at the previously determined floor price and conveys this information to the auctioneer.
- ▶ Based on this, the auctioneer determines the floor price of the next round, which is lower than the previous one. The auctioneer announces the new floor price and the excess supply to the bidders.
- ▶ The bidders send their second firm energy supply curves, this time between the floor price of the last round and the new floor price, and eliminates their generation plants and units which will not supply firm energy at these new prices. An important feature of this auction is that suppliers can only maintain or reduce quantity as price falls, or in other words, the quantity offered is consistent with an upward sloping supply curve.
- ▶ This process continues until the excess of supply over demand becomes minimal.
- ▶ The point where supply and demand balance is the **clearing price** of the auction, and therefore, will be the price to be paid to all the OEFs that are allocated to the selected generators to cover the demand (Figure 3).

Figure 3. Descending Clock Auction



The auction has the objective of allocating directly the OEFs among the generators. Once the auction is concluded the market transaction between the demand (end-users) and the supply (generators) is made and by virtue of this transaction, as provided in the CREG Resolution 071 of 2006, the legal link is established. This link, on the one hand, obliges the end-users to pay the charge, and on the other hand, commits the generators to have the capability and to generate the firm energy corresponding to its OEF allocation, according to the requirements of the ideal dispatch.

The generators or investors, who comply with the stipulated conditions within the indicated time period, will receive a certification from the ASIC attesting that a dynamic process of negotiation to allocate the OEF was conducted. This certification contains the following information: the identification of Colombian laws, creating and regulating the SIN and the MEM; the laws authorizing the ASIC to Administrate the Commercial Interchange System of energy transactions in the MEM; the laws imposing the obligation to evaluate the generation capacity that backs up the efficient firm energy offer, which serves as the foundation for the collection and payment of the Reliability Charge; the CREG Resolution governing the Reliability Charge scheme; the CREG Resolution that orders the implementation of the respective auction to allocate the OEF. This certification also specifies the OEF allocated to the respective generator or investor; the commitment period of the allocated OEF; the Scarcity Price and the Clearing Price of the Auction.

The objective of this certification is to preserve the essence and improve the mechanism of the MEM which has allowed the generators, during the past ten years of application of the Capacity Charge, to demonstrate before the courts their rights relating to this remuneration scheme.

Likewise, this certification seeks to grant the generators or investors, who participate in the auction, a legal instrument that will allow them, among other aspects:

1. To have the certainty and proof before any Colombian court on the conditions under which the auction was implemented, conditions that can not be altered during the commitment period of the OEF (Article 33 CREG Resolution 071 of 2006);
2. To have the certainty on the Colombian laws mandating the rights and obligations associated with the OEF allocation;
3. To establish the legal rights arising from the generators' participation in the auction and the fulfillment of their obligations;
4. To demonstrate that the OEF was obtained to cover the demand of the SIN, through the MEM, which is under the regulation of the Colombian government according to the Colombian Law;
5. To recognize that the conditions regarding price and quantities were decided through a transparent and efficient market mechanism, legally established in Colombia.

Periodicity of Auctions

Taking into account that the purpose of conducting auctions is to acquire firm energy, these auctions only take place when it is estimated that the demand for energy three years from now can not be covered during scarcity periods of power supply by the firm energy production of existing generation resources and new resources that will enter into operation during the next three years.

Annually, the CREG evaluates the balance between the supply and demand of firm energy and if the CREG deems it necessary to convene an auction, it communicates this decision through a Resolution, and indicates the timetable of the activities required before and after the auction to enable bidders to participate in the process and to formalize the allocation of the OEFs.

Requirements to Participate in the Auction

To participate with a particular generation asset, the generation company or investor should comply with certain requirements depending on the classification of its resource: new, special or existing resource, within the timeframe indicated by the CREG.

Requirements for generators or investors with new or special generation plants or units:

- ▶ Register the generation project in the UPME and the project should be in Phase 2 of its implementation (See Table 4);
- ▶ Submit to the UPME the feasibility study to connect to the transmission network;
- ▶ Present: i) the guarantee which ensures the payment of success fee to the promoter of the auction¹¹ and ii) an insurance policy which ensures the presentation of a guarantee for the compliance of the starting date of operation of the generation plant or unit to comply with the OEF;
- ▶ For hydraulic plants, to have and present the historical record for, at least, the last 20 years of their water inflows;
- ▶ Report to the CREG the commitment period of the obligation that the generator wants to acquire for each new or special generation resource (limited to 1, 10 and 20 years, depending on the case);
- ▶ Submit to the CREG, the Ministry of Mines and Energy and the ASIC the timetable of the construction of the generation project and the S curve¹².

Requirements for generators with existing generation plants or units:

- ▶ Provide a copy of the environmental license associated with the operation of the plant with the selected fuel;
- ▶ Present the payment guarantee of success fee to the promoter of the auction.

Requirements for all the generators and investors:

- ▶ Declare before the CREG the parameters for the calculation of the ENFICC¹³. This is done only once, before the first declaration of firm energy of the generator or investor;
- ▶ Declare before the CREG the ENFICC of each generation plant or unit which the generators or investors plan to include in the auction;
- ▶ For thermal generation plants or units, submit an insurance policy that ensures the future presentation of a guarantee of fuel supply contracts and natural gas transportation contracts.

The CREG will issue a Resolution, which will define the deadlines for the submission of the required information as well as the date of implementation of the Auction¹⁴.

Table 4. Requirements of the UPME for Projects to Qualify in Phase 2

Hydroelectric Projects	Certificate of finalization of feasibility studies
	Certificate of approval of the Environmental Assessment of Alternatives by the Ministry of Environment or the respective Regional Autonomy Corporation
	Information on the possible financial scheme
	Information on the possible corporation scheme
	Information on the options to purchase lands
	Completed and submitted request form to connect to the respective transmission network
Thermal-electric Projects with Carbon and Gas fuels	Certificate of finalization of feasibility studies
	Certificate of approval of the Environmental Assessment of Alternatives by the Ministry of Environment or the respective Regional Autonomy Corporation
	Information on the possible financial scheme
	Information on the possible corporation scheme

¹¹ The promoter of the auction is a firm contracted by the ASIC to promote investments in new generation resources through the participation in Auctions.

¹² The S curve is a graph which shows in the y axis the estimated percentage of the progress of the project during the implementation period and in the x-axis the time that has lapsed.

¹³ The methodology to calculate the Firm Energy for the Reliability Charge (ENFICC) can be found in the next section.

¹⁴ Pursuant to Article 18 of the CREG Resolution No. 071 of 2006.



Firm Energy for the Reliability Charge

As presented in the previous section, to be able to participate in the auctions for the allocation of the OEF, it is necessary for the generator or investor to report to the CREG the parameters supporting its posterior declaration of ENFICC to enable the CND to verify the declaration.

Although there are various approaches to calculate firm energy, the CREG has established a methodology for each type of generation technology.

ENFICC of Hydraulic Generation Plants

The ENFICC of hydraulic plants is calculated using a computational model (available in the Web Page of the CREG), which maximizes the minimum energy that a hydraulic generation plant can produce monthly during dry periods. This model incorporates the following technical parameters:

- ▶ Historical statistics of average monthly water inflows;
- ▶ Interaction of the generation plant with the water sources, discharges and restrictions in the water conduction systems;
- ▶ Characteristics of the generation plants: average efficiency of the plants, minimum and maximum generation;
- ▶ Water reservoir: i) minimum technical water level, ii) maximum technical water level and iii) other uses of water like aqueduct or irrigation and environmental restrictions;
- ▶ Index of Historical Unavailability due to Forced Outages of the Plants (Índice de indisponibilidad histórica por salidas forzadas de la planta or IHF, its acronym in Spanish);
- ▶ Flow constraints.

The minimum ENFICC that a generator or investor can declare is denominated as **ENFICC Base** and corresponds to the minimum energy obtained from the maximization model. The maximum ENFICC that can be declared to participate in the auction corresponds to the ENFICC with 95% PSS¹⁵, which means, it is the level of energy that the hydraulic generation plants can produce with a 95% level of confidence. If the generator or investor chooses to declare an ENFICC higher than the ENFICC Base to participate in the auction, without exceeding the ENFICC with 95% PSS, the generator should back this difference with a guarantee.

ENFICC of Thermal Generation Plants or Units

The ENFICC of a thermal plant is calculated based on the generation capacity of the plant, the fuel availability, the number of hours per year and an index that incorporates the restrictions imposed on the plant, which limits its maximum energy generation. These restrictions are the historical forced outage rate and the constraints on the supply

and transport of natural gas, in case generators use natural gas for their energy generation.

Index of Historical Unavailability due to Forced Outages – IHF

To integrate in the calculation of the ENFICC the availability of generation plants and units both from thermal and hydraulic resources, the CREG defined the IHF, which considers the observed unavailability of each generation asset without including those events that are not under the control of the generator, such as:

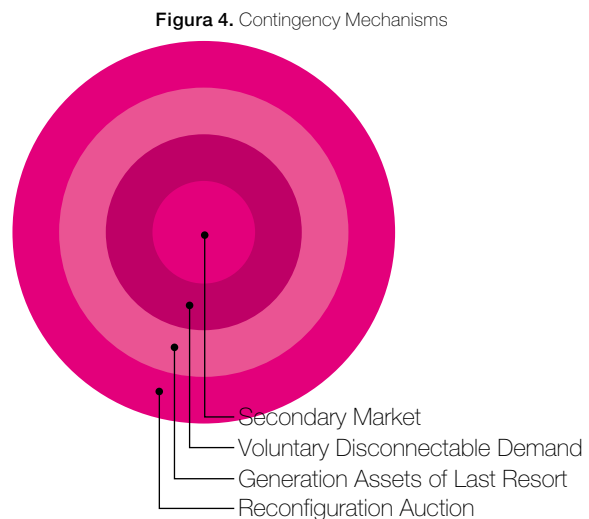
- ▶ Failures in the National Transmission System or in the Regional Transmission System;
- ▶ Rationing of Natural Gas declared by the Ministry of Mines and Energy.

If the generator is interested in increasing its ENFICC through the improvement of this index, the generator can inform the CREG within the timetable specified by the CREG. The generator should submit the project schedule that supports the announced improvement and a guarantee that backs-up the energy difference due to the change in the index.

In the case of new plants, which do not have yet enough historical information for the calculation of this index, the CREG has established certain values applicable to the first two years of plant operation.

Complementary Mechanisms: The Contingency Mechanisms

The “Contingency Mechanisms” are market instruments, which aim to facilitate the coverage of demand in scarcity periods and the compliance of the OEF of the generators (See Figure 4. Contingency Mechanisms).



¹⁵ Probability of Being Exceeded (Probabilidad de Ser Superado, PSS)

These Contingency Mechanisms are as follows:

Secondary Market for Firm energy

The secondary market for firm energy is a bilateral contracts market, where only the generators participate. The ones who offer are those generators with firm energy that have not been engaged in the auction or have not been committed in secondary market contracts¹⁶ and the ones who demand are those that temporarily need ENFICC to comply with their OEFs.

When a generator anticipates that it is not capable of generating sufficient energy to comply with its OEF, or when it schedules the maintenance of one of its generation plants or units, it can go to this market to negotiate with another generator to totally or partially back-up its obligation. The agreement that is formalized in this negotiation is known as **Back-up Contract**. In this market also, the support among generation plants or units of the same owner or commercial representative is registered. These agreements among different generation plants and units of the same owner or commercial representative are denominated **Declarations of Support**.

For these back-up contracts and declarations of support to be considered by the ASIC at the time of the verification of the generator's compliance with its OEF and the settlement of the Reliability Charge, these agreements should be registered in the information system of the secondary market. In this system, the energy offers and the identity of the suppliers are published. The prices of back-up negotiations are also published but the identities of the parties involved are allowed anonymity.



When a generator anticipates that it is not capable of generating sufficient energy to comply with its OEF, or when it schedules the maintenance of one of its generation plants or units, it can go to the Secondary Market to negotiate with another generator to totally or partially back-up its obligation.

Voluntary Disconnectable Demand

To take advantage of the opportunity that some end-users of the SIN have back-up generation equipment or have the possibility to modify their productive process, the Voluntary Disconnectable Demand allows the generator to approach these users, through the commercialization companies, when it anticipates that it does not have the sufficient energy to cover its OEF. In this case, the demand reduction done by the users will be discounted from the generator's obligation and in exchange the generator will remunerate or compensate the commercialization company that represents these users, at a price previously agreed between these two parties.

So that this demand reduction is taken into consideration during the verification and settlement of the Reliability Charge, it is necessary that the contract, between the generator and the commercialization company representing the users who will disconnect from the SIN, is registered in the ASIC

Generation Assets of Last Resort

This mechanism involves generation assets that do not participate in the auction and in the MEM. In other words, these generation resources are utilized exclusively to cover totally or partially the OEF that has already been allocated to a generator.

The generator who foresees that it can not fulfill its OEF can contract or can install its own generation asset of last resort. The generation of these assets will be added to those of the other generation plants and units during the verification of the generator's compliance with its OEF.

Reconfiguration Auctions

In the previous types of Contingency Mechanisms, the initiative to use these different alternatives comes from the generator and the cost of these transactions is borne by the generator and can not be transferred to the users.

In the reconfiguration auctions, it is the CREG (on behalf of the users of the SIN), which determines the necessity to employ these mechanisms when it detects after the Auctions to Allocate the OEFs have already been executed that for a particular year there will be an excess or deficit of firm energy.

Based on the latest energy demand projections for the year t, the CREG will evaluate in years t-2 and t-1 if the OEF allocated for t are sufficient to cover the demand for that year. If the CREG considers it necessary to adjust the OEF allocations, it will announce the implementation date of a reconfiguration auction to purchase (if it is a deficit situation) or a reconfiguration auction to sell (if it is an OEF surplus situation).

These reconfiguration auctions have a more simple operation than the Auction for the Allocation of OEF. In the case of the reconfiguration auction to purchase, each generator that has an ENFICC sends a sealed envelope containing the information on the firm energy quantity it is willing to sell and the minimum price that it expects to receive for this energy. The auctioneer selects from among these offers the most economic (or lowest) price bids to cover the deficit of firm energy calculated by the CREG.

If it is a reconfiguration auction to sell, each generator wishing to reduce its OEF sends a sealed envelope indicating the quantity of ENFICC that it wants to reduce and the maximum price it is willing to pay for this reduction. The auctioneer selects the generators with the highest price offers to eliminate or reduce their OEFs.

¹⁶ The generators with hydraulic generation plants can also make their offers in the secondary market for firm energy with their generation plants' excess monthly supply which cannot be stored. This energy is known as Additional Available Energy.



The resulting prices from these reconfiguration auctions, unlike in the other Contingency Mechanisms, are borne by the users of the SIN.

Guarantees

Guarantees to ensure the compliance of the following are required:

- ▶ Starting operation of a new or a special generation plant or unit;
- ▶ Contracting fuel supply and natural gas transportation required to back-up the OEF;
- ▶ Continuous fuel availability during the commitment period of the OEF for thermal generation plants and units;
- ▶ Declaration of an ENFICC higher than the ENFICC Base for hydraulic generation plants;
- ▶ Declaration of a higher ENFICC due to improvements in the IHF;
- ▶ Payment of the success fee of the promoter of the auction.

These guarantees should:

- ▶ Cover all the concepts arising from the OEF market that are required from the generators
- ▶ Grant the ASIC the prerogative to obtain immediately and unconditionally the payment for the guaranteed obligation when this obligation is executed.
- ▶ Grant ASIC an irrevocable and unconditional capacity to execute the guarantee
- ▶ Be liquid and easy to execute.



In the case of new and special generators who have OEFs with commitment periods superior than one year, the guarantees should cover a maximum period of three years. The coverage should be full for the first year and this will be reduced in the subsequent two years. In any case, the generators should cover three years of its commitment period with the respective guarantees required.

Transition

The migration from the previous managed Capacity Charge scheme to the new market scheme Reliability Charge includes a transition period which will finish just before the beginning of the Commitment Period of OEFs allocated in the first auction.

During the transition period the mechanism to allocate the OEFs is not through Auctions. These OEFs will be allocated annually to each generator, on a prorated basis according to its ENFICC declaration, to cover the projected energy demand for each year.

For the first year of the transition period (December 1, 2006 to November 30, 2007), all the generators with declared ENFICC will be remunerated for the concept of Reliability Charge a total sum of US\$685 million approximately.

Documents for Consultation

For more detailed information on the topics covered in this document please visit and consult the CREG Resolutions (071, 079 and 094 of 2006 and 027 of 2007) at www.creg.gov.co

Acronyms

ASIC:

Administrator of the Commercial Interchange System (Administrador del Sistema de Intercambios Comerciales)

CND

National Dispatch Center (Centro Nacional de Despacho)

CREG

Colombian Commission for the Regulation of Energy and Gas

ENFICC

Firm Energy for the Reliability Charge (Energía Firme para el Cargo por Confiabilidad)

MEM

Wholesale Electricity Market (Mercado de Energía Mayorista)

OEF

Firm Energy Obligation (Obligación de Energía Firme)

SIN

National Interconnected System (Sistema Interconectado Nacional)



Colombia and its Electricity Sector in Figures

Official Name	Republic of Colombia		
Area	1,141,748 km ²		
Population	42 million inhabitants (75% in urban area, 25% rural area)		
Capital	Bogotá (6.7 million inhabitants)		
Official Currency	Colombian Peso (COP\$)		
Exchange Rate, 2006	2,358 COP\$/		
Gross Domestic Product, 2006	US\$136 billion ¹		
Real Growth of GDP, 2006	6.8%		
Annual Inflation, 2006	4.48%		
Proven Reserves of Natural Gas, 2006	4,342.2 Giga cubic feet ²		
Reserves of Coal, 2005	2,328 million metric tons		
Generating Companies, 2006	36		
Transmission Companies, 2006	11		
Distribution Companies, 2006	32		
Commercialization Companies, 2006	67		
Generation Capacity, 2006	13,280 MW		
Composition of the Generation Capacity	66% hydraulic		
	33% thermal		
Energy Demand, 2006	50,815 GWh		
Growth of Energy Demand, 2006	4.07%		
Peak Demand, 2006	8,762 MW		
Growth of Peak Demand, 2006	1.42%		
Firm Energy for the Reliability Charge (declared by generators), 2006	60.6 TWh-year		
Private Participation in the Generation Activity	45% of the installed capacity		
Public Participation in the Generation Activity	55% of the installed capacity		
International Interconnections	Venezuela	import capacity	215 MW
		export capacity	285 MW
	Ecuador	import capacity	205 MW
		export capacity	336 MW
	Next in line Panamá		
Value of Transactions Implemented through the MEM, 2006	US\$ 2,848.4 million		
Value (in Million USD) and Composition of the Transactions in the MEM, 2006	Spot Market	527 (18.44%)	
	Capacity Charge	535.8 (18.83%)	
	Bilateral Contracts	1,614.2 (56.71%)	
	Mustrun Generation	123.4 (4.34%)	
	AGC	47.9 (1.69%)	
Reliability Charge Remuneration for Generation Companies with declared ENFICC, 2007	US\$ 685 million		

¹ Preliminary value reported by the National Statistics Department of Colombia (Departamento Administrativo Nacional de Estadística, DANE).

² Source: Ecopetrol.



**Comisión de Regulación
de Energía y Gas**

The Colombian Commission for the Regulation of Energy and Gas (CREG) presents the New Regulatory Scheme to Guarantee the Reliability in the Long Term Supply of Electric Energy in Colombia. This new regulation was approved on October 3, 2006 and started to be implemented on December 1, 2006. The purpose of this presentation is to allow existing participants in the Wholesale Electricity Market (Mercado de Energía Mayorista, MEM, its acronym in Spanish) and potential investors to know the advantages of this new scheme and the commitments it requires from the different parties involved.

www.creg.gov.co