

Serious Problems with CREG Document 070 Facing Colombia's Energy Market

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1. Executive Summary

This past July, the Comisión de Regulación de Energía y Gas (CREG) issued Document 070 proposing to alter the method for promoting new entry into the competitive Colombian electricity market. In particular, the CREG proposed (1) a new auction intended to encourage low-variable-cost generation to enter into the market and (2) a modified method of allocating Firm Energy Obligations (known as OEFs) to existing power plants (together, the **“Proposed**

Rules”). In this paper, we describe and document serious shortcomings in the Proposed Rules that would damage—inefficiently and without justification—a segment of the existing competitive power generation market and undermine both the foundation and creditworthiness of the Colombian competitive electricity market, which is otherwise internationally well-respected. In other words, imposing such rules would hurt the broader electricity sector in Colombia and raise costs for electricity consumers.

We conclude that the problems we describe in this paper fall into three areas:

- Unlike the existing market design, the Proposed Rules are unsupported by accepted scholarship and international experience in electricity markets;
- The Proposed Rules create harmful costs and unnecessary risks for an industry that depends critically on the confidence of markets and investors to supply the capital for efficient investment, and;
- Quite apart from the first two problems, the Proposed Rules cannot achieve the stated goals in Document 070.

From the broadest perspective, the Proposed Rules advance a policy that is inherently unreasonable: purportedly, to pursue an efficient power sector by favoring power plants with low variable costs (irrespective of the unavoidable capital costs involved) by discriminating against plants with high variable costs. The cost characteristics of the basic array of generation resources, upon which the electricity industry rests (i.e., “base load,” “intermediate” and “peaking”), have been known for a very long time and inform every modern power market—whether competitive or not. The role of peaking plants, which include the high-variable-cost plants that Colombia currently relies upon, is the same in every electricity market—to minimize the overall cost of supplying consumers with power to meet their variable demands. An efficient generation portfolio uses such plants to meet demands that occur infrequently—i.e. demand at peak times and, in Colombia and elsewhere, demand in years when output from hydro resources is low.

The economic concepts and regulatory/institutional practices supporting modern competitive electricity markets are well known. Indeed, Colombia consulted respected international power market experts (both scholars and respected industry experts, including our late colleague at NERA, Sally Hunt) in the design, implementation and modification of power

market rules and regulations. Against that backdrop, a signal deficiency of the Proposed Rules is that they have no scholarly or respected international support among that community of experts.

We, who have dealt with electricity and related energy markets extensively around the world, know of no precedent for the Proposed Rules. Indeed, successive authors in the field of electricity market analysis have concluded that paying a common capacity fee or reliability charge to all generation capacity, including “peaker units,” supports cost recovery and investment incentives in a competitive and efficient market. Deviating from this model, by paying different reliability charges to different technologies offers no such guarantee of cost recovery or efficient investment in a competitive electricity market. It is therefore wrong to suggest that “peaker” units have no place (or a subordinate place worthy of discrimination) in the country’s generation mix. It is also unreasonable to expect that the composition of the power generation fleet can be re-oriented in a working competitive power market without incurring unreasonably high costs.

Compounding the immediate disruption caused by the Proposed Rules is an important lesson for international capital markets (for both creditors and investors): long-term capital devoted to power generation in Colombia is not safe. The ability to attract capital represents a critical feature of any competitive power market. It lies at the foundation of Colombia’s well-designed and supported Reliability Auction, which the CREG proposes to retain. However, the Proposed Rules change the economic environment for a class of investor-owned power plants in a manner which we expect will drive them out of business and destroy the value of their capital—not for competitive reasons but simply because of poorly-justified regulatory action. Such a move will be well-understood in both Colombian and international investment circles as an unjustified “regulatory taking” of the value of property that investors have devoted to supporting the Colombian electricity industry.

Such “regulatory takings” are barred by various constitutional or legal means in countries around the world. But even where constitutional or legal prohibitions are lacking, regulators and legislatures know that the goal of “capital attraction” for a power sector critically depends on assuring creditors and investors that their investments are safe from such peremptory “regulatory

taking.” Indeed, we understand that the mere publication of the Proposed Rule for comment has already caused a Colombian lender to refuse to extend a letter of credit for existing power generating assets. Given our extensive experience with the capital markets that support regulated energy markets, we find such a move by Colombian lenders unsurprising—we would expect the lending community to be justifiably worried. We would fully expect implementation of the Proposed Rules to be followed quickly by default and possibly bankruptcy at various combined-cycle generation plants, especially those whose variable costs are inflated by Colombian government policies that keep their fuel prices high.

Leaving aside the problems with lack of scholarly/expert support and the failure to anticipate the damage to the creditworthiness of the Colombian power industry, the market design set out in the Proposed Rules cannot work as intended. Pushing out high-variable-cost plants in favor of low-variable-cost substitutes, without considering the incremental capital needed, will not free Colombia from the basic shortage of resources that has pushed competitive spot prices to unprecedented levels just last week.

On the basis of these considerations, we conclude that adopting the Proposed Rules is distinctly unwise. We would propose that the CREG either decline to issue them or to send the rules back for further re-consideration, demanding a re-examination of its purported economic motivation and a reasonable explanation of its expected consequences. Otherwise, we anticipate that the consequences for the Colombian power sector, and ultimately for electricity consumers in Colombia, will be immediate, costly, and long-lasting.

2. The Proposed Rules are not Supported by Scholarship or International Experience

Colombia’s power market is a straightforward and objective example of accepted electricity market design. Colombia’s is a basic model, operating without some features of more complex electricity markets around the world (e.g., nodal pricing, day-ahead markets, etc.). But those basic features within the Colombian power market regime have incentivized reasonably efficient power production to fit Colombia’s particular environmental and institutional arrangements.

2.1. The Colombian Electricity Market

Colombia restructured its electricity sector in 1995,¹ adapting the market model that had been introduced in the United Kingdom and elsewhere.² With restructuring, the market went from a *vertically integrated* structure (in which customers bought power at regulated prices from a local utility that individually owned and managed the whole supply chain) to a *competitive* structure (in which customers buy electricity from a trading business or retail provider of their choice, who procures that electricity from generators on a competitive basis and delivers it to customers through an open-access wires network). Familiar features of the Colombian market—for those who are familiar with other electricity markets—are as follows:³

- Colombia partially deregulated and unbundled the market, allowing for a mixed ownership structure, with various restrictions (e.g., incumbents were permitted to own both generation and distribution entities, but with “Chinese walls” between them).
- Colombia instituted day-ahead centralized scheduling and dispatch of generation, regardless of short-term bilateral agreements between agents.
- Colombia sets the spot market price of electricity ex post, based on actual supply and demand conditions (ignoring transmission constraints) in real time. This spot price is defined by the variable cost of the “marginal” unit of generation (i.e., the most expensive unit required in a least-cost supply that meets demand).

In addition, Colombia initially offered an “optimal” capacity payment based on a set of modelled scenarios and focusing on a “worst case” scenario.⁴ The CREG changed the capacity market in 2006, adopting a “Firm Energy Obligation” auction, as proposed by economists Peter Cramton and Steven Stoft,⁵ which replaced the capacity-payment mechanism with the current “Reliability Charge”.⁶

¹ Via Laws 142 and 143 of 1994.

² Larsen, Erik, et al. (2004) “Lessons from deregulation in Colombia: successes, failures and the way ahead” *Energy Policy* 32: 1767-1780, pp. 1768-69. See also: Pombo, Carlos and Taborda, Rodrigo (2006) “Performance and efficiency in Colombia’s power distribution system: Effects of the 1994 reform” *Energy Economics* 28: 339-369, pp. 339-40.

³ See: Larsen, et al., pp. 1768-69.

⁴ Ibid.

⁵ Cramton, Peter and Stoft, Steven (CREG: 2006) “Colombia Firm Energy Market”, 18 December 2006.

⁶ See CREG, “What is Reliability Charge”, accessed from http://www.creg.gov.co/cxc/english/que_es/que_es.htm on 28 September 2015.

Today in Colombia, retailers procure the majority of their power through two markets: (1) an hourly spot market with a bidding system for providers and (2) a forward contract market. All physical delivery takes place through the hourly spot market, which operates on a single exchange. Through the forward market, retailers can hedge against variations in the hourly spot market price, by bilaterally negotiating for delivery of some part of their load at pre-set prices. In addition to these two markets, the Colombian system ensures availability of supply during scarcity periods by procuring Firm Energy Obligations, known in Colombia as “OEFs”. The regulator arranges an auction to procure OEFs whenever the supply of “firm energy” from existing generation capacity is insufficient to cover demand. OEFs are obligations on the part of generators to supply energy during scarcity periods, for which they receive a fixed fee—the Reliability Charge—which is determined within the auction mechanism specified by Cramton and Stoft. OEFs are allocated to new generators through a descending-clock auction and to existing generators based on their proportional share of available firm energy. OEFs are options to buy electricity at a “scarcity price”. They are constituted as contracts-for-differences, i.e., they are settled by financial payments rather than by the delivery of electricity. In any risk-management portfolio they perform a hedging role that substitutes for other forms of contract.

2.2. Peculiar Features of Colombia’s Electricity Market

Colombia has a power-generation sector that is dominated by hydroelectric resources but supported by thermal generation, and idiosyncratic internal markets both for natural gas and diesel fuel. We understand that combined-cycle generation plants were constructed in Colombia on the premise that gas would be available from fields that did not in fact develop as planned. Diesel provides the substitute fuel for those plants, but prices for the diesel used in combined-cycle generators are tied to an internal “stabilization” prices that have not followed the drop in world prices for crude oil or oil products—keeping the fuel cost of such plants artificially high compared to the cost of fuels that might otherwise be available to those plants from other sources. This policy has resulted in the “scarcity price” lying currently below the variable cost of some generation plants. This situation may have adverse incentive effects that require a revision of certain market parameters (e.g., a lower fuel price or a higher scarcity price), but it does not indicate any major flaw in the design of the market or in the structure of generation capacity.

2.3. CREG Document 070

On 30 July 2015, CREG issued Document 070 entitled “Proposals for the Entry of New Generation Plants and the Assignment of Reliability Charges to Existing Plants” (our translation). The document contemplates changing the market for OEFs in two important ways:⁷

- **Conduct an additional OEF auction for new plants in order to encourage new low-variable-cost generators to enter the market.** This additional auction would have three significant characteristics that distinguish it from the format of the current OEF auction: (a) it would be a sealed-bid auction instead of a descending-clock auction; (b) bidders in the auction must offer new capacity with a variable cost of operation less than or equal to 80 percent of the scarcity price, and (c) the price for OEFs would be capped at the current Reliability Charge.⁸
- **Modify the methodology for assigning remaining OEFs to existing plants.** Currently, the CREG allocates any remaining OEFs—i.e., those not assigned through the auction—among existing plants in proportion to each plant’s Firm Energy. The CREG proposes to change this policy through one of two alternatives:
 - 1) First: allocate the remaining OEFs *pro rata*—up to 100%—to the firm energy of existing plants with average offer prices that are less than or equal to the average scarcity price; then: if any OEFs remain unallocated after the first step, allocate them *pro rata* to the firm energy of existing plants with average offer prices that are greater than the average scarcity price (here, the offer price and scarcity price are averaged over spot market values for the previous 12 months);⁹ or
 - 2) Assign OEFs through an annual auction in which both new and existing plants would participate. The auction would have the same rules as the current OEF auction insofar as certain rules would condition the participation of existing plants, but would be sealed-bid instead of descending-clock.¹⁰

The result of these two actions, in the CREG’s words, will be as follows:

Since plants involved in the [revised] CxC, both through the auction and through the administrative allocation, are the same as those involved in the short term energy market and bilateral trading, the expansion signal provided by the CxC will affect the outcome of prices in these two markets. Therefore, the proposals concerning the administered allocation and auction allowances are intended to create regulatory mechanisms through the CxC scheme, on one hand, to allow the

⁷ Document CREG-070 of 2015, p. 49.

⁸ Ibid., p. 50.

⁹ Ibid., pp. 51-52.

¹⁰ Ibid., pp. 52-53.

entry of new generators for the progressive replacement of plants with high variable costs and, on the other, the assignment of obligations to existing plants that appropriately reflect the signals of abundance or scarcity of firm energy in the reliability market.¹¹ (our emphasis)

Thus, by adopting either form of these Proposed Rules, the CREG hopes to remove generation plants with high variable costs and to encourage their replacement by generation plants with low variable costs (without consideration of their respective capital costs). The intended result is to lower prices in the short-term energy market (the spot market) and bilateral trading (contracts).

In Resolution 109 of 2015, CREG invited interested parties to submit comments on these proposals within 30 business days of the publication of the resolution. CREG subsequently published Resolution 142 of 2015, which extended the comment deadline on the proposal to modify the OEF allocation among existing plants to 50 business days from the publication of Resolution 109, but maintained the 30-business-day deadline for comments on the proposed additional auction.

2.4. CREG Document 070 has No Scholarly Support

The signal goal of the Proposed Rules (“the progressive replacement of plants with high variable costs”) is not a feature of any accepted competitive electricity market. Well-designed markets seek to incentivize the participation of existing plants, and the entry of new plants, by setting a competitive price for the output and capacity of all generation resources. That is the point of the Reliability Auction introduced in 2006. Barring the exercise of market power or other unexpected faults in the market, such an auction sets the price upon which the plans of both existing and new entrants depend. Without the ability to plan on the basis of such known rules, electricity markets cannot aspire to be efficient or respectful of the value of capital upon which any modern power market relies.

It is well-known that any power market (whether competitive or not) is served by plants displaying a mixture of fixed and variable costs. The high-fixed-cost resources efficiently recover those costs by producing the greatest number of kilowatt-hours, due to their low variable

¹¹ Ibid., pp. 36-37.

costs. The low-fixed-cost plants are less costly to stand in reserve, devoting their output to the peak demands and other periods of relative shortage. Modern power markets, both in spot prices and reliability/capacity prices, cover the reasonable cost of both types of plants. In no electricity market model, of which we are aware, is a spot price coupled with a reliability or capacity auction tied to another auction that makes it difficult for an existing sector of the power generation mix to sustain its operation. Yet, that is the practical effect of the Proposed Rules.

Document 070 of 2015 refers to a paper by Peter Cramton in 2015 as support for the introduction of an annual auction. Peter Cramton, an advisor to the CREG and a Professor of Economics at the University of Maryland, is a world-renowned expert in electricity markets. However, Peter Cramton's paper notes only that other countries have adopted annual auctions and provides no detailed analysis of the effect of shifting to annual auctions in Colombia.¹² He mentions that the value of the Reliability Charge would vary from year to year, but he does not discuss whether such variation is desirable. As he notes at the start of his paper, the Colombian system was explicitly designed to reduce market risk, given that the purpose of capacity markets is to provide a more stable revenue and to reduce market risk.¹³ Compared with the current system, annual auctions would expose generators to wider variations in the Reliability Charge, and hence to more market risk, which would discourage investors. The paper makes no mention of the revenue stabilizing features that are frequently adopted in capacity markets with annual auctions, such as "capacity price floors", "sloping demand curves" and other constraints on price variation. These features are missing from the current Colombian system and from the Proposed Rules. Therefore, Peter Cramton's paper does not provide a full analysis of the proposal to introduce annual auctions, or of the additional measures needed to stabilize revenues. It does not consider the impact on investment incentives in Colombia of changing the rules towards a less stable system. It does not therefore provide analytical support for the annual auction element of the Proposed Rules.

¹² Cramton, Peter (CREG: 2015), "Colombia Firm Energy Auction: Descending Clock or Sealed-Bid?", 19 July 2015, p. 12.

¹³ Ibid., p. 3.

Incidentally, when discussing the difference between the auctions for new plants and allocations for existing plants, Peter Cramton writes explicitly in favor of offering the same price to all plants and avoiding discrimination:

Importantly, both existing and new resources receive the same prices in the long run. There is no discrimination against existing resources.¹⁴

The same point arose in an earlier paper that Peter Cramton and Steven Stoft, another acknowledged expert in electricity markets, wrote for the CREG. In 2006, when describing the market for “firm energy” (i.e., reliability) that Colombia adopted at that time, they wrote:

In this design, there is a single product and a single price. Remarkably, this is all that is needed for efficiency. The reason is that in Colombia’s hydro-dominated system, there is a single reliability constraint: having sufficient firm energy to cover a dry period. This single constraint implies single product and single price. (our emphasis)¹⁵

In other words, these respected experts explicitly linked achieving an efficient outcome to the payment of a single reliability charge. The first proposal, which segments the allocation of OEFs between generators with low and high variable costs, implicitly awards different generators a different value for their firm energy. By segmenting the reliability market and setting different values for new and existing capacity, this aspect of the Proposed Rules would undermine the basis for efficient outcomes in the Colombian electricity market.

It is not inherently unreasonable to wish for plants with the lowest variable costs possible within an efficient power plant fleet. But a policy to pursue such a goal is unreasonable if it does not address two obvious questions:

- *Can a move to incentivize low-variable-cost plants come without unduly disrupting cost recovery and efficient operations in the generation industry?*
- *Can a change in one part of the power market rules be invoked without damaging the credibility of the power market regime itself?*

¹⁴ Ibid., p. 3.

¹⁵ Cramton, Peter and Stoft, Steven (CREG: 2006) “Colombia Firm Energy Market”, 18 December 2006, p. 7.

It does not appear that the CREG addressed these two follow-up questions. From what we understand, the consequences for various investor-owned combined-cycle plants will be an immediate cessation of, or a substantial reduction in, the reliability payments upon which they depend. At no point was any change of this nature signaled when the reliability payments were first awarded. The CREG is now proposing it for opportunistic reasons—to lower prices by reducing the revenues available to some existing generators. As such, the answer to both follow-up questions is “No”: the move disrupts the industry and it damages the credibility of the rules. In other words, the Proposed Rules are an in-house, idiosyncratic, and unprecedented rule change that has no objective support of any kind.

- The Proposed Rules violate basic and widely-accepted principles of power markets.
- They ignore the role of high-variable-cost peaking plants in an efficient generation portfolio. Such plants have been a recognized feature of modern power systems for many decades (even before the advent of competitive generation markets). They have a necessary role to play in any efficient power market.

3. The Proposed Rules Create Harmful Costs and Unnecessary Risks in a Power Market that can Ill-Afford them

For a country where approximately half of its exports constitute crude oil or refined petroleum products, the trade and budgetary situation in 2015 is understandably difficult. Nevertheless, as other resource-rich countries in South America have discovered over the past two decades, the health of the local economy depends critically on uninterrupted access to international capital markets, particularly to support the energy sector.

3.1. Colombia, an oil exporting country, faces difficulties generally unconnected to its electricity sector

We understand that the Colombian budget rests on an oil price of about US\$80/bbl. The consequence of an unanticipated oil price decline from about US\$100/bbl to about US\$48/bbl in the past year is that the projected government revenues from oil taxes and receipts in the coming year could be about one-tenth of the same government revenues in 2013. One of the consequences of the drop in oil prices, for Colombia as an oil-exporting country, is a fall in the

value of the Colombian peso against the US dollar, from about 2,000 pesos/dollar to about 3,000 pesos/dollar in the past year.

Quite evidently, as a country where oil and oil products constitute a large proportion of exports, Colombia faces difficult conditions in the balance of payments and government revenues as long as oil-commodity prices remain depressed. However, the fall in the exchange rate will help other exporters. Furthermore, the electricity component of any Colombian exports is very small, as the great majority of exports reflects oil, coal, metals, coffee and other food and raw materials—not products for which electricity is a material share of input costs. Thus, low oil prices and Colombian’s balance of payments problems, and the value of the Colombian peso, are not significantly tied to conditions in the Colombian electricity sector.

3.2. The proposed rule unduly threatens capital values in the Colombian power market

The entire electricity sector, in Colombia and in the world at large, is highly dependent on its access to the uninterrupted flow of credit and investor capital. That is true for any competitive power market, particularly markets (like Colombia’s) where the market architecture is specifically designed to encourage efficient competitive entry. Indeed, in his 2015 report for the CREG, Peter Cramton wrote:

Forward procurement—conducting the auction several years in advance of the commitment period—allows new projects to compete in advance of entry. This makes the market contestable and allows the cost of new entry to be properly reflected in the clearing price. New projects are bid before major investment costs are sunk. In this way, forward procurement improves competition in the market and the pricing process. Forward procurement also coordinates entry. This results in less uncertainty in achieving the clearing target. The tendency for a pronounced boom/bust cycle is reduced. Finally forward procurement can offer a long-term commitment for new resources. This reduces investor risk and sends a better price signal for new investment.¹⁶

New investment is an integral part of Colombia’s power market. But any new investment quickly becomes an existing investment. New investment, at reasonable cost, depends on

¹⁶ Cramton, Peter (CREG: 2015), “Colombia Firm Energy Auction: Descending Clock or Sealed-Bid?”, 19 July 2015.

investor confidence that the rules for existing investments, based on well-supported electricity market design, will be reliably obeyed by the CREG.

In this respect, the Proposed Rules appear to be an opportunistic move by the CREG.

- The CREG’s reasoning overlooks the importance of capital, and capital market confidence, in the outcome it wishes to advance in Colombia’s power market.
- It displays a character of peremptory and unsupported rule-making that damages the value of existing generating property—a type of highly-visible “regulatory taking” of the value of private property that is either outlawed or specifically avoided in other countries.
- Given the threat that this idiosyncratic and unsupported rule change constitutes to the value of investor property, it damages the credibility of Colombian regulatory institutions and will increase the cost of both private and public capital devoted to the power business.

Economist John R. Commons, who wrote America’s original regulatory statute for the State of Wisconsin in the early 20th century (which became the model for those in the other states), wrote that “the most stabilized relations in modern capitalism are those of private property.”¹⁷ Private property has been very clearly defined by the US courts and those principles have spread effectively to other countries. No US regulator can change a style of regulation that would damage the value of the property of those it regulates without due process and appropriate consideration of the consequences. The US Supreme Court ruled famously in 1944 in *Federal Power Commission et al. v. Hope Natural Gas Co* regarding a federal regulatory decision.¹⁸ The *Hope* decision was a landmark event in the history of the economics of utility regulation. It meant that federal tariff regulation for pipelines was to become a highly reliable and predictable affair—a move that opened the door to a rush of investment in regulated utility property in the last half of the 20th century.

Other countries that adopted similar forms of regulation, but which lacked the same protection of property in regulated business, have developed their own means of providing the same kind of support to the value of property in regulated entities. At various times, regulators in

¹⁷ Commons, J.R., *The Economics of Collective Action*, Macmillan, New York (1950). p. 21.

¹⁸ *Federal Power Commission et al v. Hope Natural Gas Co*, 320 U.S. 591 (1944).

the UK, Germany, and Netherlands (to give just a few examples) have shown that they understand how “capital attraction” ultimately rests on investor confidence in the regulatory regime. Driven by the desire to promote efficiency, they have concluded that regulatory decisions must offer sufficient assurance of stability to make investors confident of recovering their capital. Shatter that confidence (e.g., as Argentina did in 2002), and the effects on the ability to attract investor and bank capital will be damaging and long-lasting.

It does not appear that the CREG sufficiently considered the damage to the credibility of the power market rules in Colombia, given that the new rule is aimed at the forced, unjustified, and uncompensated, retirement of a class of power generators.

4. Apart from Lack of Support and Harmful Costs, the Proposed Rules Cannot Achieve their Stated Purpose

Section 2 of this paper highlights the lack of support for the Proposed Rules in scholarship and international experience. Section 3 discusses the reputational damage that introducing the Proposed Rules may cause. In this section, we analyze how the Proposed Rules depart from internationally recognized standards of electricity market design, and their expected effect on the electricity sector in Colombia. We begin by setting out the general economic objectives for Colombia’s electricity market and the stated purpose of the Proposed Rules. We conclude that the Proposed Rules will not achieve their stated purpose and conflict with the general economic objectives.

4.1. Design Principles and the Purpose of the Proposed Rules

Article 23 of Law 143 of 1994 states that the design of the reliability market is subject to two principles:

- i) ensure enough generation capacity to cover demand with firm energy and
- ii) encourage the plants with the most competitive prices for the system given the resources available to them.

The overall objective of applying these principles is to create conditions that ensure an efficient energy supply, including efficient back-up capacity.¹⁹ This overall objective forms the background to the Proposed Rules.

The purpose of the Proposed Rules is not set out explicitly in CREG's documents and must be imputed from various statements and from the design of the proposed scheme.²⁰ The Proposed Rules are intended to encourage the “gradual replacement” of existing generation plants with *high* variable cost, by favoring the construction of new generation plants with *low* variable costs. The CREG notes that these choices will affect prices in the short-term market and in bilateral contracts. The implication is that the Proposed Rule is intended to change the generation plants that set prices in the short-term energy market, with the aim of reducing electricity prices below current levels.

Having reviewed the Proposed Rule, we conclude that it will fail to serve its intended purpose and that it will undermine the principles of the reliability market.

4.2. Efficiency of Energy Supply

The Proposed Rule does not promote an efficient energy supply, because it focuses only on measures to reduce variable costs and ignores the associated increase in fixed costs.

Existing generation plant with high variable costs tends to have low fixed costs—it represents an efficient choice of technology for generation plant that needs to run relatively infrequently. Moreover, the avoidable fixed costs of existing capacity exclude its construction cost, which is already sunk. Generation plant can only achieve lower variable costs by incurring

¹⁹ See: Document CREG-070 of 2015, p. 36. See also: Document 077 of 2014, p. 23: “En ese sentido en el mercado de confiabilidad se deben cumplir dos principios: i) tener las plantas de generación para asegurar el cubrimiento de la demanda con energía firme y ii) incentivar las plantas con los precios más competitivos para el sistema de acuerdo con la dotación de recursos con que se cuenta. Estos principios desarrollan lo indicado en el artículo 23 de la Ley 143 de 1994 el cual señala que se deben crear las condiciones para asegurar la disponibilidad de una oferta energética eficiente, para lo cual se debe tener en cuenta la capacidad de generación de respaldo eficiente.”

²⁰ The following explanation is based largely on Document CREG-070 of 2015, pp. 36-37: “Dado que las plantas que participan en el CxC, tanto en la subasta como en las asignaciones administradas, son las mismas que participan en el mercado de energía de corto plazo y de contratación bilateral, la señal de expansión que se dé mediante el CxC tendrá impacto en los precios resultantes en esos dos mercados. Por lo anterior, las propuestas concernientes a la asignación administrada y asignaciones por subasta tienen como propósito la creación de mecanismos regulatorios a través del esquema del CxC, que por un lado, permitan la entrada de nuevos generadores para el reemplazo progresivo de las plantas con altos costos variables y que por el otro, la asignación de obligaciones para las plantas existentes refleje adecuadamente las señales de abundancia o escasez de energía firme en el mercado de confiabilidad.”

higher fixed costs (as a *quid pro quo*). For *new* generation plant, those fixed costs include its construction costs.

Moreover, we understand that a government policy on fuel price stabilization is currently holding the price of diesel fuel in Colombia above international levels. The costs to Colombia of running the generation plants with “high” variable costs—and the savings that would be achieved by closing them down—are less than their accounting costs. Thus, for Colombia, “high-variable-cost” generation plant is actually cheaper to run than its offer price indicates, whilst the total cost of new “low-variable-cost” generation plant includes the substantial fixed costs of construction. Any attempt to appraise the relative efficiency of these plants would have to take such cost differences into account.

In the Colombian electricity market, the variability of hydro resources creates an occasional need for the output of thermal generation plant, which operates as back-up capacity. The efficient choice of technology for back-up capacity minimizes total costs by selecting plant with low fixed costs and high variable costs. Replacing it with new plant that has high fixed costs (a burden that is incurred all the time) and low variable costs (a benefit that is only rarely realized) will most likely increase total costs. This approach would therefore be inefficient.

The inefficiency of this approach is well illustrated by CREG’s need to abandon the common reliability market for all plant (as supported by many leading authorities) in favor of a market that discriminates opportunistically between the different types of plant (and for which there is no intellectual support).

The Proposed Rule will therefore increase total costs and promote inefficiency in energy supply.

4.3. Reliability and Adequacy of Energy Supply

The reliability market was set up to support the revenues of back-up generation capacity during wet years, when its output and revenue from the short term market is very low. The OEFs also prevent back-up generation capacity from profiting in dry years, by capping their earnings at the scarcity price—which is currently below their variable costs. Without the support provided

by the current Reliability Charge, many existing generation plants will immediately face financial distress and pressure to close.

On the other hand, the new generation plant favored by the Proposed Rules cannot be constructed for some time (roughly 5-7 years in Colombian conditions, we understand). Imposition of the Proposed Rules will therefore lead Colombia into a period of severe capacity shortages, high market prices for electricity and occasional, or perhaps frequent, blackouts. Therefore, if the Proposed Rules are adopted, it is unlikely that the electricity market in Colombia will have enough generation capacity to cover demand with firm energy for several years to come.

The Proposed Rule will therefore reduce reliability and adequacy of energy supply.

4.4. Failure to Address Current Problems

The CREG's documents imply that high electricity market prices are attributable to the high variable costs of some thermal generation plants, but prices in the electricity spot market have recently risen much higher than those costs, for reasons entirely unrelated to those plants. The thermal generation plants used for as back-up capacity in Colombia have variable costs at or above the scarcity price, which we understand to lie around \$350/MWh. Recently, prices have risen well above \$1,000/MWh. Industry publications²¹ indicate that the cause of such high prices is the high opportunity cost of using hydro resources when the coming year is expected to be a dry one (due to an "El Niño" event).

In these conditions, changing the structure of the thermal generation portfolio will not reduce electricity prices. Indeed, the early closure of some thermal generation plants will increase the demand on scarce hydro resources, leading to even higher prices and more frequent blackouts.

The Proposed Rules do not therefore address the cause of the high prices seen most recently in the electricity spot market.

²¹ See, for example, Boletín Energético #74, 22 September 2015, p. 1. It refers to the forecast of an El Niño event and the need to enter the coming dry season with a certain level of hydro reserves, which requires generators to hold back water.

4.5. Misplaced Hopes for the Forward Market (Bilateral Contracts)

Some statements in the CREG documents express the hope that new generation plant will offer forward contracts for its firm energy. However, potential effects on the forward market do not provide any additional justification for the Proposed Rule.

First, if these contracts simply replace contracts offered previously by existing thermal generation that closes, they represent no additional benefit to consumers. Second, there are good reasons to expect that the Proposed Rule will not dramatically increase the total volume of forward contracts.

We are familiar with many OECD electricity contract markets (in Europe and the US). Very few have created a liquid market comprising not just producers and consumers of electricity, but also financial institutions and other third parties. In a number of OECD electricity markets, producers and consumers come together to fix a price for the future production and sale of electricity. Such contracts reduce both parties' exposure to the risk of fluctuating prices. However, it is rare for third parties to enter such contract markets and to take on risks, because the rules of the underlying markets for electricity and capacity are subject to frequent regulatory intervention. An unexpected change in the rules of an electricity spot market can be enough to drive liquidity out of the forward market.²² Conditions in Colombia's electricity market have not encouraged third parties to enter the forward market – and will not encourage third party participation in the future, if the regulator imposes arbitrary and opportunistic changes on the reliability market.

Finally, we note that the development of forward contract markets faces specific difficulties in electricity markets with a mixture of hydro and thermal generation.

- In wet years, prices are low, with high hydro output and low thermal output.
- In dry years, prices are high due to low hydro output, with output relying (efficiently) on increased output from higher cost thermal generation.

²² The collapse in the liquidity of electricity forward markets in Great Britain in the mid-1990s is well documented and attributed to the regulator's announcement that the two main generator companies would in future have to achieve certain average price levels in the spot market ("the Pool"). This obligation lasted from April 1994 to March 1996. Afterwards, forward market liquidity began to recover slowly, but it suffered another set-back when the new UK government announced in 1997 that it intended to overhaul the spot market rules.

In these conditions, neither hydro generators nor thermal generators can offer long term forward contracts at the low wet-year prices, because of the risk of high prices in a dry year. They cannot even offer a large volume of forward contracts at the average of wet-year and dry-year prices, because their future output is too uncertain to back up such contracts.²³ Instead, if generators wait until the start of a season, hydro conditions are known and they can offer their forecast output at wet year prices or dry year prices, whichever applies.

In these conditions, obliging generators of any kind to offer long term contracts can run counter to their need for risk management (“hedging”). In other words, such contracts can increase the variability of their future profits, instead of reducing it. Imposing additional risks makes investors less willing to enter the electricity market and drives up the cost of new investment, to the detriment of all consumers.

Given the difficulties facing any forward electricity market, but particularly one facing large hydrological risks, it would be unjustifiable speculation to assume that the Proposed Rules will promote forward market liquidity. In practice, the Proposed Rules are more likely to drive liquidity out of the market, by injecting new and unnecessary regulatory risks.

5. Conclusions

Our conclusions, which are signaled in the text above, are as follows.

Having reviewed the design and stated purpose of the Proposed Rules, we conclude that they appear to be an opportunistic move by the CREG.

- The CREG’s reasoning overlooks the importance of capital, and capital market confidence, in the outcome it wishes to advance in Colombia’s power market.
- It displays a character of peremptory and unsupported rule-making that damages the value of existing generating property—a type of highly-visible “regulatory taking” of the value of private property that is either outlawed or specifically avoided in other countries.

²³ Some combination of forward and option contracts will match the risk structure of hydro generation or thermal generation, but such complex contract portfolios are not conducive to secondary trading and liquidity in a small market.

- Given the threat that this idiosyncratic and unsupported rule change constitutes to the value of investor property, it damages the credibility of Colombian regulatory institutions and will increase the cost of both private and public capital devoted to the power business.

Overall, it does not appear that the CREG sufficiently considered the damage to the credibility of the power market rules in Colombia, given that the new rule is aimed at the forced, unjustified, and uncompensated, retirement of a class of power generators.

The opportunistic aspect of CREG's Proposed Rules is illustrated by its choice of an in-house, idiosyncratic, and unprecedented rule change that has no objective support of any kind. The Proposed Rules violate basic and widely-accepted principles of power markets and ignore the role of high-variable-cost peaking plants in an efficient generation portfolio.

Finally, the Proposed Rules will not achieve their stated purpose, and will conflict with general economic objectives for the electricity market. They will increase total costs and promote inefficiency in energy supply. They will reduce reliability and adequacy of energy supply. They do not address the cause of the high prices seen most recently in the electricity spot market. They will not promote forward market liquidity and will more likely drive liquidity out of the market.

On the basis of these considerations, we conclude that adopting the Proposed Rules is distinctly unwise. We would propose that the CREG either decline to issue them or to send the rules back for further re-consideration, demanding a re-examination of its purported economic motivation and a reasonable explanation of its expected consequences.