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Energy policy and energy market performance: The Argentinean case

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ABSTRACT

In the early 1990s Argentina liberalized and privatized the energy system, trending to a total market oriented system and abandoning the use of energy policy. Since 2004, as a result of a boom in energy demand and constrains in energy supply, Argentina has gone through an energy problem mainly related to natural gas and electricity, which derived in energy shutdowns. In this frame, this study explores the role of energy policy and institutions in Argentina, with the aim of discussing whether it has been properly used to contrast the observed lack of coordination between fossil energy reserves management and the demand of fuels in power generation. The results of the analysis enhance the relevance of regulatory and control authorities, as well as the active use of long run energy policy for the energy system performance in order to avoid coordination failures between subsectors of the system. The relevance of energy consumption for the development process, and the particular characteristics of energy systems require a wide planning perspective.

1. Introduction

The role of energy consumption in socio-economic development has been widely discussed from theoretical and empirical standpoints. According to some authors, energy constitutes a biophysical constraint to economic growth because every economic activity requires a minimum quantity of energy to be performed (Beaudreau, 2005; Georgescu-Roegen, 1971; Stern and Cleveland, 2004). Furthermore, different studies found empirical evidence for the link between GDP and energy consumption, for both developed and developing countries (Soytas and Sari, 2003; Sari and Soytas, 2007; Lee, 2005).

These days, in a context of instability of energy markets, the discussion about future evolution of energy systems has been highlighted (IEA, 2009). Debates focus on the contribution of energy to the development process. Different perspectives on this topic can be linked to the role that energy plays in a national or local economy: while in producer states, energy may be an economic driver, in other states it may be a constraint to growth, depending on the balance between local and foreign energy supply and demand. In most of the cases, this situation may require the use of energy policy, in order to enhance energy markets coordination and performance. The Argentinean case constitutes a hybrid one, in the sense that up to very recently it was a producer country, to which energy might have been a driver, but it seems to be turning into a consumer country, to which energy may hinder economic growth.

Indeed, since 2004 the Argentinean energy sector has gone through an important supply problem, highly related to economic growth and de-growth periods, which derived on shutdowns in energy supply. These supply interruptions, mainly of natural gas (NG) and electricity, have had a negative impact on the key productive sectors, particularly the industry sector. According to estimations of the Centro de Investigaciones de la Unión Industrial Argentina, in July 2010 the GDP inter annual rate of growth decreased 2.3%, as a result of shortages in NG and consequent use of more expensive substitute fuels.

To some extent the goals of the Argentinean energy problem are both NG and electricity. For NG the weak points are productivity of the most important fields, most of which seem to be in their peak, diminishing trend of reserves and reductions in the reserve margin of capacity of transport of the system, which decreased between the 2005 and 2009 period (Recalde, 2010a). For the latter the problems have been also power capacity and production. According to information of Compañia Administradora del Mercado Mayorista Eléctrico (CAMMESA), one of the main problems of the power system is the diminishing reserve margin, as the gap between total installed generation capacity and peak demand levels has decreased significantly since 2002. This situation worsens by restrictions in NG supply, since it constitutes 76% of the fuel consumption in power generation.

There have been different explanations to the Argentinean energy problem. On the one hand, some authors explain the situation through the analysis of current conditions in either NG

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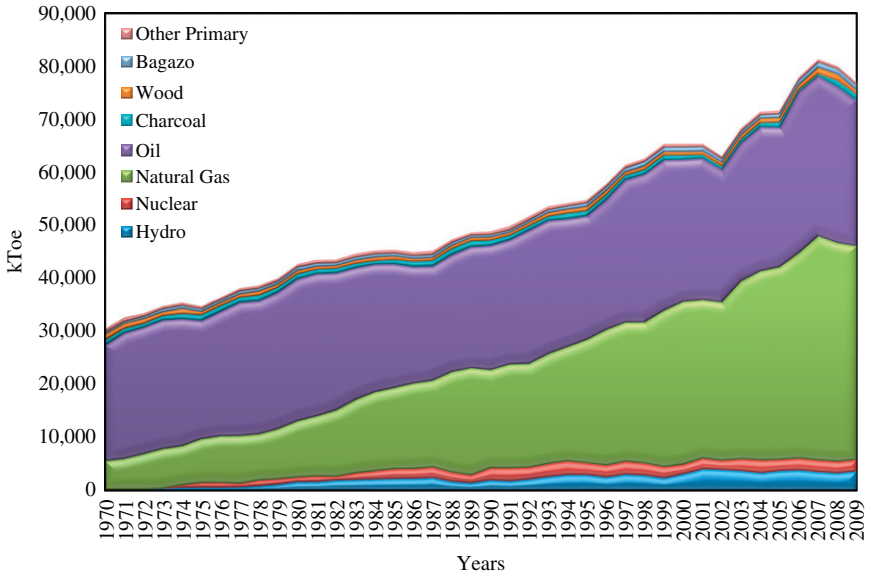

Fig. 1. Evolution of TPES in Argentina 1970–2009.
Source: Own elaboration according to National Balances from Secretaría de la Energía de la Nación.

or electricity markets. They argue that the key factor to understand this situation is recent energy policy, or industry re-reforms as mentioned by Haselip and Potter (2010), which did not succeed on promoting investment. These authors also insist that economic growth experienced in Argentina from 2004 implied a boom in energy demand that could not be rapidly addressed by private producers (Cont and Navajas, 2004). On the other hand, others insist that the roots of the problem are the changes in the control of energy resources in the early 1990s, the erratic energy policy and private investment from then on. According to these authors, the interrelation between electricity, NG and oil chains, the unpredictable evolution of the institutions and regulation through all the periods, the behavior of private operators and their reintegration and concentration strategies have been crucial to this problem (Campodonico, 2004; Kozulj 2002, 2004; Pistonesi, 2001).

This paper analyzes the Argentinean energy system, and throughout some points of previous arguments can be found. However, a systemic approach is mainly adopted, using the energy chains framework, from a historical standpoint, to study the performance of the energy system. Along this paper, energy system is defined as "a group of activities which, from an endowment of natural resources, satisfy energy services, both for final consumption and productive activities" (Bouille, 2004; Girord, 1998; Hasson and Pistonesi, 1988; Kaplinsky and Morris, 2002). Therefore, it can be characterized as a group of energy chains, each one corresponding to a particular source. From a wide point of view, a productive chain describes the "full range of technical, economical and financial activities required to bring a product or service from its origin, through the different phases of production and delivery, to final consumers". In this sense, in order to analyze the evolution of a productive chain, studying technical relations constitutes a necessary but not a sufficient condition. The historical evolution of the socio-economic conditions will be equally important to learn about the system. In accordance to Haselip and Potter (2010), country-specific contexts are very relevant to its performance and thus the success or failure or an economic model is rooted in the country's own history.

As follows, this paper examines some aspects of the performance of Argentinean energy system and energy policy. The aim of the paper is to explore the role of energy policy and institutions in a developing country, such as Argentina, and to discuss if it has been properly used to contrast the observed lack of coordination between fossil energy reserves management and electricity demand which, consequently, may hinder economic development.

2. Argentinean energy system

In order to understand and discuss the current situation of the Argentinean energy system, some of its key characteristics, such as the composition of the energy mix and relevance of hydrocarbons; the performance of the key segments of the chains and their inter-coordination, the energy reforms, the recent reintegration of the energy chains and market concentration, should be studied. Most of the following discussions focus on NG and electricity markets as they are considered to be the issue of the current Argentinean energy problem.

2.1. Energy mix and chaining

One of the main characteristics of the Argentinean energy system is its high dependence on hydrocarbons, primary NG and Crude Oil. In 2009 hydrocarbons represented 86% of Total Primary Energy Supply (TPES), where NG accounted for 52%. As shown in Fig. 1 the share of NG in TPES increased since the discovery of the field of Loma La Lata in 1977. Power and industry are the main destinations of NG, each one accounting for 30% out of total in 2008. In the case of oil, refineries are the most important TPES destination; fuel oil products are primarily used in transport (40%), power generation (12.7%) and agro.

The relevance of NG in the Argentinean energy system is highly related to the evolution of power generation. In 2010, the generation mix was composed by 57% of thermal generation plants, 38% hydro technologies and 3% nuclear plants. Fig. 2 shows the evolution of the Wholesale Electricity Market (MEM)[1] from 1992 onwards. During this period, power demand was supplied mainly by thermal plants, most of which are powered by the combustion of NG, that in 2010 represented 70.2% out of total fuel consumption in power generation, followed by fuel oil (16%), gas oil (10.4%) and charcoal (3.4%). Power shortages in

[1] Argentinean most important Wholesale Electricity Market.

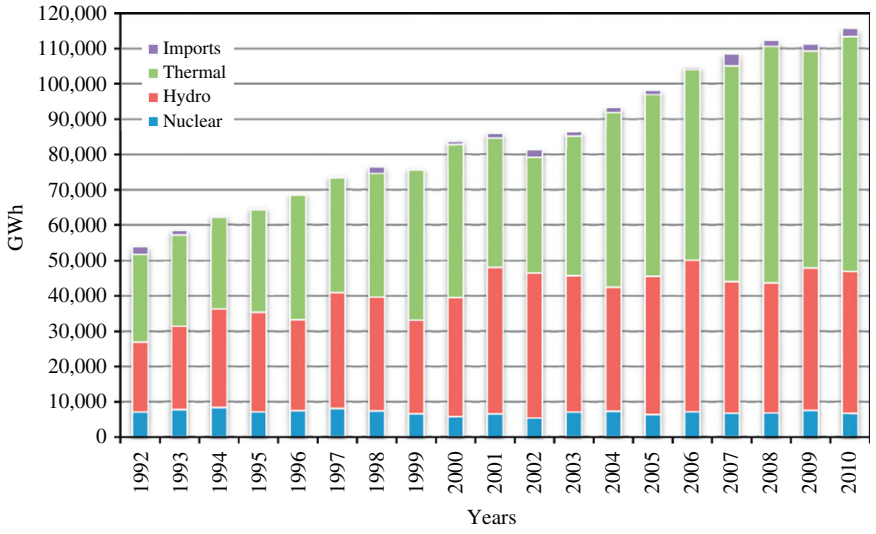

Fig. 2. Annual power generation by technologies 1992–2010.
Source: Compañía Administradora del Mercado Eléctrico Mayorista (CAMMESA).

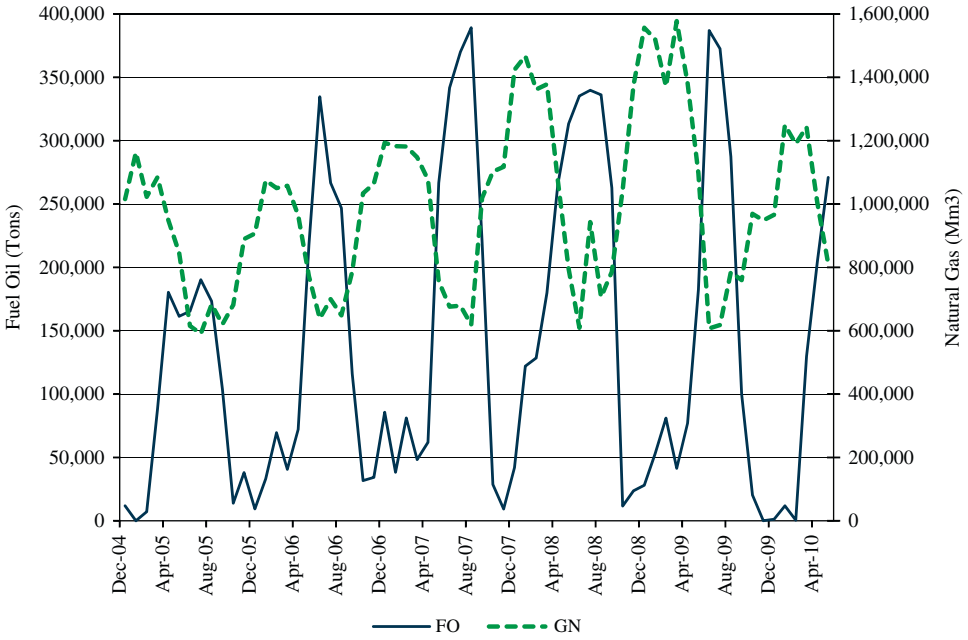

Fig. 3. Natural gas and fuel oil use in power plants December 2004–May 2010.
Source: Own elaboration according to Compañía Administradora del Mercado Eléctrico Mayorista.

1998, 2001/2002 and 2007–2009 where addressed by imports (CAMMESA, 2009; Recalde, 2010a).

According to information from CAMMESA, the use of FO increases with problems in the supply of NG, particularly in winter since the availability of NG is not enough to supply both electricity plants and heat. Fig. 3 shows the negative relation in the use of these two fuels which, to some extent, reinforces the argument. However, the use of FO does not completely replace the requirements of NG, as not every thermal plant can use alternatively both fuels and the equivalent energy content of FO is lower than that of NG[2] . Therefore, the use of FO is only one of the alternatives used to solve the fuel problem in power generation.

For instance, according to Annual Reports of CAMMESA, the use of NG in power generation during 2009 increased as a result of higher resource availability (due to imports from Bolivia) and reductions in NG demand in industry (since world economic recession), while reduction in the use of FO is related to hydroplants availability in rainy seasons.

The relevance of NG in power generation increased during the nineties for different reasons. Perhaps, the main reasons have been lower cost of thermal power generation in relation to the hydroelectric one; changes in the policies of multilateral organisms of credit; improvements in NG transport and distribution; lower environmental impact of NG in comparison to FO; and technological innovations in combined cycle NG plants (Guzowski and Recalde, 2008). Moreover, some authors argue that these investments have been strongly associated to the local availability of NG at low prices during the nineties and the strategies of private producers (Pistonesi, 2001).

[2] According to the World Energy Council, burning 1000 m^3 of NG is equivalent to 36 GJ, while burning 1 ton of FO is equivalent to 42.7 GJ. Thus, the energy content of FO is lower than the NG content, and therefore in order to replace NG in power generation huge amounts of the fuel would be needed.

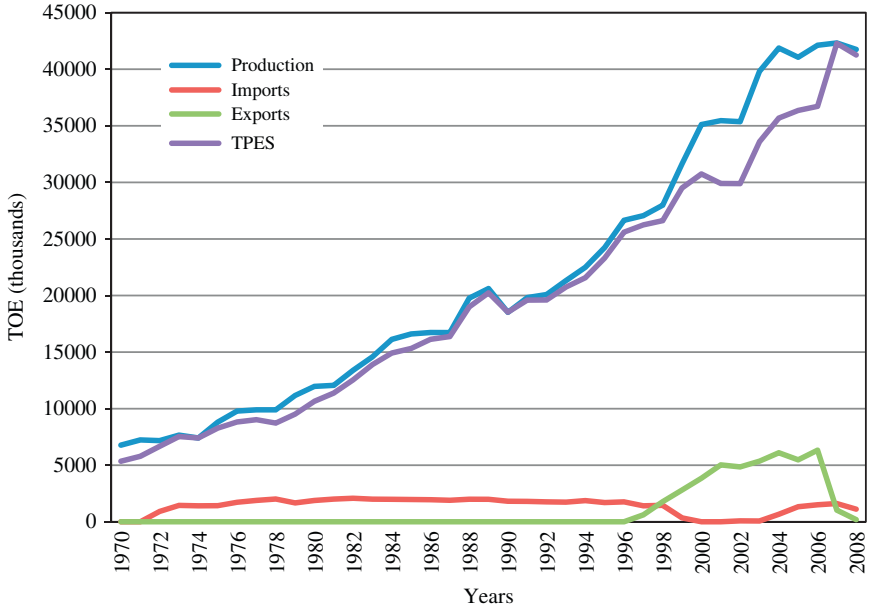

Fig. 4. Evolution of natural gas production, imports and exports 1970–2009.
Source: Own estimation according to information of Secretaría de Energía.

From Fig. 2 it is clear that Renewable Energy Technologies (RETs)[3] have not yet succeeded to enter in the Argentinean Wholesale Market. According to the Secretaría de la Energia, in 2008 RETs contribution to total generated electricity (1.700 GW in 2008) was 1.87%, whereas 1.57% of installed capacity (400 MW) corresponded to RETs (Guzowski and Recalde, 2008). In spite of this, Argentina seems to be a naturally well-endowed country. According to a study performed by National Secretary of Energy, Fundación Bariloche (FB) and the Renewable Energy and Energy Efficiency Partnership in 2009 (REEEP, 2009), 11 of the 23 Argentinean provinces are fit to photovoltaic projects, with an average solar radiation superior to 5 kWh/m^2, while wind and biomass power potential is around 5000 MW and 422 MW, respectively[4]. Painuly (2001), Altomonte et al. (2003) and Noord et al. (2004) argue that in the majority of the countries RETs do not succeed to enter to electricity mix because they face different barriers to entry, whose intensity is different according to the countries' characteristics. In accordance with these authors, particularly in developing countries, economic and institutional barriers make RETs less competitive in relation to fossil fuel conventional technologies; thus they may not succeed under market conditions (Guzowsky and Recalde, 2008). For this reason, in order to promote their use, energy policy is required. Empirical evidence shows that RETs world leader countries have used policy instruments for this purpose (Pandey, 2002; Haas et al., 2004). Nevertheless, up till very recently the use of such policy has not been regular in Argentina, leading to the low contribution of RETs in power generation (Guzowski and Recalde, 2008; Recalde, 2010a).

Conversely, while power generation in the electricity chain trended to thermal (gas intensive) technologies during the nineties, the strategies in the NG and crude oil chains were opposite oriented and did not support this strategy.

As shown in Fig. 4, increases in NG production form 1997 were followed by increases in resource exports. According to information from Energy Balances of the National Secretary of Energy, exports increased 190% among 1997 and 1998, and then grew at an average annual rate of 40% up to 2003, while local consumption did not significantly increase neither in power plants nor in final consumption up to 2000. In this regard, different authors argue that the main strategy of private corporations in the upstream of hydrocarbons in Argentina has been to maximize the present value of reserves as much as possible, through increases in production and exports (Azpiazu and Schorr, 2001; Azpiazu, 2002; De Dicco 2005, 2006; Kozulj, 2002, 2004; Pistonesi, 2001). This behavior was indirectly promoted by regulatory institutions which, since the deregulation of the energy system in 1989, allowed producers to extract and freely allocate the production. As stated by these authors, producers followed highly extractive policies, since the early 1990s, increasing mean production, which grew 51% and 64% from eighties to nineties, and from nineties to twenties, respectively. However, as shown in the graph, the boost in exports stopped in 2005/2006 and decreased from then on. This reduction in exports (nearly 83% between 2006 and 2007) are mainly due to a governmental decision. In 2004, at the beginnings of the energy supply crises, the National Government, via Resolution N°265/2004 of the Secretary of Energy, decided to interrupt NG exports, mainly to Chile, in order to prevent the lack of provision of local demand. Indeed, according to information of the Chilenan Comisión Nacional de Energía, these restrictions implied nearly 60% of Chilean shutdowns in energy provision, because this system is highly dependent on the Argentinean NG.

To some extent, the high rate of resource production, the low rate of exploration investments and the maturity of the productive fields (Zilli et al., 2005), have resulted in a decrease in hydrocarbons reserves. This situation can be observed in the Reserves to Production Ratio (RPR or R/P). This ratio is usually used as an indicator of the remaining availability of a resource, under current conditions of production and reserves. It is usually defined as:

$$H_i = \frac{R_i}{P_i}$$

[3] Solar heating and cooling, wind energy, solar photovoltaics, and modern forms of bioenergy (which includes biomass-based power and heat generation, co-. ring, biofuels for transport and short rotation crops for energy feedstocks), concentrating solar power, ocean energy, enhanced geothermal systems, and integrated bioenergy systems.

[4] In 2010 total power capacity was 28,664 MW.

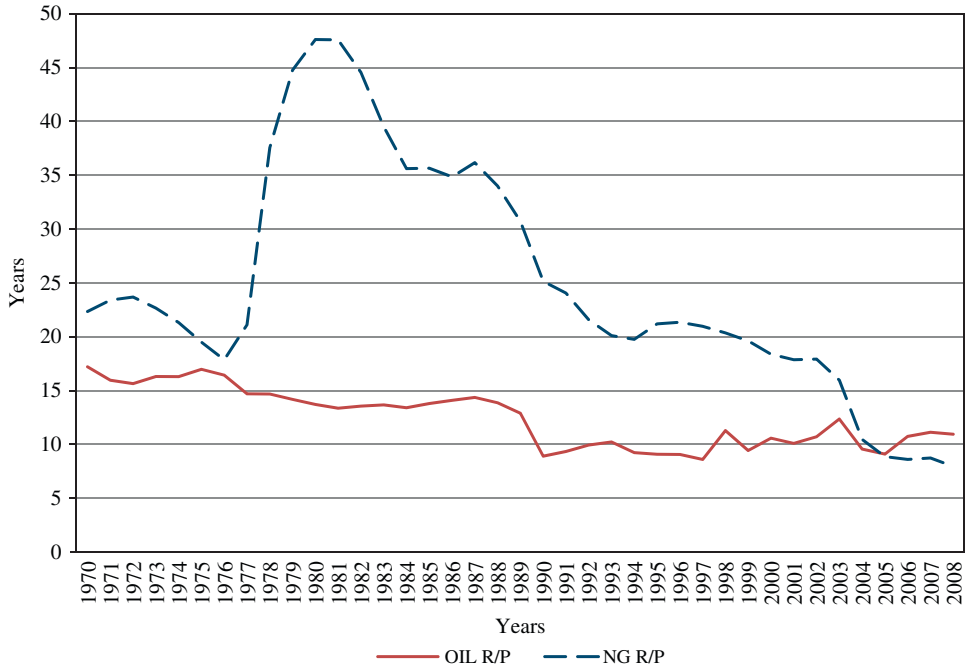

Fig. 5. Evolution of the reserves to production ratio 1970–2007.
Source: Own estimation according to information of SIEE/OLADE.

where H_i is the Horizon of life of the reserves in period i measure in years. R_i is the Proved reserves plus 50% of probable reserves in period i and P_i is the Production in period i.

As shown in Fig. 5 the ratio displays a negative trend, particularly for the case of NG. The RPR increases at the mid seventies as a result of the discovery of the field "Loma la Lata", in 1977, which represented an increase of 290 MMm^3, and became a country in one of the most NG endowed countries of the Latin American region.

In a context of a highly gas dependent country, this decreasing trend RPR of NG fields is worrying. This may be even worse in the Argentinean case, where the electricity chain depends nearly 70% on NG. Hence, security of supply of electricity depends on the result of allocation decisions made in the chain of NG. Therefore, even when market allocation rules can lead to a good performance in one segment, as they did in the case of the electricity market in Argentina after privatizations (Chisari et al., 1999; Delfino and Casarin, 2001) it cannot result for the whole system.

2.2. Reintegration and concentration of energy chains

Currently, reintegration and concentration of the energy chains are the others characteristic of the Argentinean energy system. In order to understand the relevance of this situation, a brief historical revision of the Argentinean energy regulation is required.

The Argentinean energy system is constituted by three main chains: electricity, NG and oil. The three of these chains were institutionally changed in the late 1980s and early 1990s. This period was characterized by market based reforms in accordance to the "Washington Consensus" not only in Argentina, but also in the majority of Latin American countries (Haselip and Potter, 2010). Up to this period, most of these economies had big Governmental contribution to the economy, which played a strategic role in production and regulation (OLADE/CEPAL/GTZ, 2003).

For the energy system, these changes in political context implied changes in the property of the utilities in most of the energy chains of Latin American countries, which liberalized energy markets and sold state-owned energy companies (OLADE/CEPAL/GTZ, 2003). Nevertheless, according to Campodonico (2004) only Argentina, Bolivia and Peru totally privatized the sector, whereas Colombia and Brazil, for instance, aimed at promoting private participation to the sector avoiding full-scale privatization and keeping key resources, such as oil and NG, under the governmental control. The author emphasizes that one of the main differences between the Argentinean case and the Brazilian and Colombian ones, is the existence of an energy plan: to increase State share in energy system throughout every chain, increasing the investment of National Oil Companies (NOCs). Conversely, in Argentina, the reforms were deployed in a short period of four years, and the intensity of changes, as well as its speed, has been emphasized by many authors (Campodonico, 2004; Kozulj 2002, 2004; Pistonesi, 2001).

The legal frame for energy reforms in Argentina was established by a group of National Laws and Decrees. Two of the most important general laws were the N°23.696 (*Ley de emergencia del Estado*) and N°23.697 (*Ley de Emergencia Económica*). These laws aimed to dismiss the share of the State in public services as well as in different economic activities. Reforms reached all segments of the three energy chains trough horizontal and vertical disintegration. The reforms in the upstream of NG and oil implied the deregulation and liberalization, the bidding of the productive areas and the sale of the vertically integrated state-owned and operated energy companies Yacimientos Petrolíferos Fiscales (YPF) and Gas del Estado. For transport and distribution of NG the country was divided in regionally regulated monopolies. The oil refining and distribution segments were liberalized. In the case of the electricity chain, reforms implied vertical disintegration of the chain and incompatibility of functions within the segments, as in the case of NG; the promotion of competence in the power generation segment, and regional regulated monopolies for transport and distribution (IDEE/FB, 1992; Kozulj and Bravo, 1993; Kozulj, 2002, 2004; Pistonesi, 2001; Recalde, 2010b).

As mentioned, one of the main characteristic of the reform was vertical disintegration of the chains and incompatibility of

functions, particularly in the case of NG and electricity because they are net industries (OLADE/CEPAL/GTZ, 2003). Considering the quasi-monopolistic nature of part of the gas and power sectors, the same actor should not operate (nor directly nor indirectly) more than one segment of the same or different chains in order to avoid a bargaining leverage and thus the possibility of capturing energy rents through the chain.

However, this condition has not been addressed in Argentina, and the energy system shows a reintegration. As stated by Basualdo and Azpiazu (2002), the economic Argentinean history has been characterized by concentration, integration and conglomeration strategies of a group of private agents. According to this argument, institutional frame left private agents in a more favorable situation than control and regulation governmental institutions, fostering this behavior. In the particular case of the energy system, these strategies promoted the concentration and centralization of capital. While capital concentration means boosting the share of the most important firms or conglomerates in one sector, centralization means increasing their control over the means of production in different markets through acquisition and fusion of companies. In Argentina, as argued by Azpiazu (2001), the energy regulatory authorities created a favorable atmosphere for these strategies. Therefore, a few group of firms have increased they share in one particular segment, e.g. hydrocarbons production, and in different segments of more than one chain, for example hydrocarbons production and transportation or power generation, increasing their control along the system.

In 2009, three of the most important oil and gas producers also operated oil and gas pipelines, refineries and NG distribution in the hydrocarbons chains, and power generation in the electricity chain (Azpiazu 2002, 2008; De Dicco, 2004, 2005; Recalde, 2010b). In the same year, in the electricity chain, the second largest power generator also participated in transmission and distribution segments. This can be seen in Table 1, which has been included just with illustration purposes because changes in the company's ownership in Argentina are very dynamic processes. As mentioned, this reintegration process has been possible due to the absence of regulatory and institutional control, which is one of the characteristics of the post-reform performance in Argentina (Gabriele, 2004). One of the key problems of the reintegration of the energy chains is that it increases market leverage, dismissing competition and increasing the chance of capturing monopolistic rents along the system.

Finally, market concentration has been the other characteristic of the system after the reform. In this section, this problem is addressed by an analysis of the Hirschman–Herfindhal Index (HHI) and the Discrete Concentration Ratio (DCR).

HHI is a measure of market concentration easily computed by squaring and adding up the market share of each firm in a market. So it can be expressed as:

$$\mathrm{HHI} = \sum p_i^2$$

$$p_i = 100 \times \frac{p_i}{Q}$$

where p_i is the Market share of the firm i. This HHI ranges from zero to 10,000, the closer the market to the monopoly, the higher the market's concentration. If there is only one firm in an industry (monopoly), it has 100% market share, and then HHI is 10,000. Otherwise, if there are many firms competing (near perfect competition), their market share will be nearly 0%, and HHI is close to zero. According to a recent report of the US Department of Justice and the Federal Trade Commission, an industry is non-concentrated if HHI is below 1500, moderately concentrated if $1500 < \mathrm{HHI} < 2500$ and it is highly concentrated when $\mathrm{HHI} > 2500$ (FTC, 2010).

The DCR or the Standard Index (SI) is used to study market power of the most important firms in an oligopoly industry. It considers market share (expressed as a percentage) of the "m" largest firms in the industry. It can be defined as:

$$C_a = \sum p_i; (i = 1,\ldots,m,m+1,\ldots m)$$

where p_i is the Market share of the firm i.

According to Khavisse and Azpiazu (1983) (in CEPA, 1985) for "m" equal to eight, the market is not concentrated for $0\% < \mathrm{DCR} < 25\%$ (ranging from perfect competition to oligopoly), for $25\% < \mathrm{DCR} < 50\%$ there is medium level of concentration (oligopoly) and in the case of $50\% < \mathrm{DCR} < 100\%$ there is high concentration (ranging from oligopoly to monopoly).

Table 2 illustrates both ratios for different years before and after deregulation of the sector; unfortunately a number of missing relations are due to lack of official information. As shown, there has been an increase in decentralization from the beginning of the nineties. For instance, HHI level for oil and gas production was close to 6000 before the reform of the sector, and it is less than 2000 twenty years later. However, a clear decentralization trend cannot be identified along the period. Concentration reduces and increases in different years, may be as a reaction to economic conditions and changes in oil companies' properties. Besides, despite the reductions in concentration, particularly after 2004, both industries remain moderately of high concentration, depending on the index. In 2008 eight companies where responsible for 85 and 92 out of total production of oil and NG respectively, and they controlled more than 80% of reserves.

Table 1
Main groups and companies in the Argentinean energy system (2009).
Source: Own elaboration based on information of the companies.

Group	Electric chain		Oil chain			NG chain		
	Generation (%)	Distribution	Production (%)	Transport	Refineries (%)	Production (%)	Transport	Distribution
AES	*(15.11)	*						
PAMPA HOLDING	*(11.59)	*						
PETROBRAS	*(3.95)	*	*(7.33)	*	*(17.80)	*(9.15)	*	
PLUSPETROL SA	*(4.52)		*		*	*(7.85)	*	*
ENDESA	*	*						
REPSOL YPF			*(34.91)	*	*(52.89)	*(27.12)		
PAN AMERICAN			*(16.96)	*		*(13.04%)		
CHEVRON SAN JORGE SA			*(9.97)	*		*		
TOTAL AUSTRAL			*(3.54)			*(25.11)	*	
ESSO					*(13.52)			
SHELL C.A.P.S.A.					*(12.50)			

* indicate the participation of the groups or companies in each segment of the energy chain.

Table 2
Production and reserves concentration ratios.
Source: Own elaboration based on information of Subsecretaría de Combustibles – Secretaría de Energía de la Nación; Instituto Argentino de la Energía and Instituto Argentino de Petróleo y Gas.

Year	Oil				Natural Gas			
	HHI		DCR[a]		HHI		DCR[a]	
	Production	Reserves	Production	Reserves	Production	Reserves	Production	Reserves
1983	5648[b]	–	–	–	–	–	–	–
1988	5737[b]	–	–	–	–	–	–	–
1993	972	–	75	–	2770	–	93	–
1995	1288	–	83	–	2067	–	89	–
1998	2000	1903	86	78	1657	1682	85	78
2001	1180	1872	86	86	1388	1640	89	92
2004	2304	2138	91	85	1966	1900	93	86
2008	1729	1962	85	86	1785	1398	92	80

[a] Eight largest firms.
[b] Kozulj and Bravo (1993).

In this sense, according to Khavisse and Azpiazu (1983) (in CEPA, 1985), this industry may be considered as highly concentrated. Although, as stated by Kozulj (2002) and Fischer (2004), concentration is a characteristic in worldwide hydrocarbons industries, the consequences of market concentration over the energy system performance in low institutionally developed countries may be more important than in countries in which institutions work correctly. Once again, institutional control is crucial to avoid companies to perform anticompetitive actions and rents capture along the chain.

3. Institutions and market performance

As well as reintegration and market concentration, institutional performance is important to explain the Argentinean energy performance. One of the main channels by which institutions impact on system performance is through the impact on investment.

In any market, supply and demand balance depend on investments in infrastructure. Either this investment is enough to support demand growth or does not depend on different factors. In the Argentinean energy case, different authors argue that periods of underinvestment have been the result of private agent's strategy (IDEE/FB, 1992; Kozulj, 2004). Nevertheless, political performance and economic uncertainty have also played a crucial role.

The impact of uncertainty on investment has been deeply studied in economic literature (Driver and Moreton, 1991; Dixit and Pindyck, 1994; Serven, 1998; Kosacoff and Ramos, 2006; Bontempi et al., 2010; Mohn and Misund, 2009). Some panel data papers support a negative relation between uncertainty and investment (Mohn and Misund, 2009). Furthermore, the impact of uncertainty on investment is negative and highly intensive in concentrated industries (Recalde, 2010a). As shown in previous sections, the Argentinean energy market is concentrated; therefore, uncertainty may play a key role in investment. Irreversibility of capital is also important. According to Dixit and Pindyck (1994) the joint conjunction of irreversibility and the chance to postpone investment decisions are crucial to the negative relation between investment and uncertainty.

In a similar way, there is a relation between the main characteristics of the countries and the impact of uncertainty. Underdeveloped and developing countries usually present institutional weakness and are given to economic and political crises. In Argentina, as argued by Kosacoff and Ramos (2006), political instability and uncertainly are crucial to understand the industrial performance. The volatility and low institutional quality of the country impacts on investment decisions (Recalde, 2011).

Moreover, it may be argued that both political volatility and the lack of strong institutional control have contributed to the past and recent evolution of the sector. In the former, institutions failed to avoid reintegration and concentration strategies, which were legally forbidden (Azpiazu, 2001). In the latter, market conditions have changed after the economic and political crises in 2001. After the 2001 crisis the economy of the country suffered a strong devaluation, after which economic profitability changed in different sectors of the economy. On the other hand, government intervention on markets has increased from 2003 through electricity and gas final tariff regulations, subsidies for energy companies and frozen upstream prices (Haselip and Potter, 2010). All these aspects negatively impact on private incentives to invest in the country, and might have contributed to the current energy crises.

4. Concluding remarks

Given the relevance of energy in economic and development processes, especially in a developing country, the previous sections have attempted to discuss the performance of the energy system in Argentina. The paper sought to contribute to the literature on the performance of energy markets and the role of energy policy. In this sense, as argued by Haselip and Potter (2010), the relative success and failure of market performance can be only appreciated in parallel with an understanding of country-specific contexts. Therefore, the discussion about the proper use of energy policy in Argentina has been carried in conjunction with a historical study of the energy system evolution, the energy mix, the reforms and the energy market performance. The main hypothesis has been that, in the Argentinean case, energy policy has not been properly used to contrast the lack of coordination between fossil energy reserves management and electricity demand, and this may hinder economic development.

One of the main issues to be addressed in the Argentinean case, which can be clearly seen from previous sections, is the lack of coordination between NG and electricity chains, which surely constitutes the key point of the current energy problem. As shown, the increase in NG production and exports, in conjunction with reductions in explorations investments, and lack of an intensive policy to this purpose, has led to a diminishing RPR of NG. At the same time, the electricity mix has trend to be highly

concentrated in thermal technologies, very dependent on NG. This disconnection led the energy system in a weak position, particularly in winter when NG is on its peak demand due to industrial and household requirements. From the standpoint of this paper, this disconnect should have been addressed by institutions of control and avoided through a long run energy planning. However, both country characteristics and economic and political context might have contributed to fail to this goal.

As remarked in this paper, and as stated by Pistonesi (2001) and Kozulj (2004) among others, one of the core characteristics of the performance of the system after the reforms in the early 1990s was the abandonment of the use of energy policy and long run energy planning. This has also implied a relative backwardness of the regulatory agencies in relation to the private agents which, to some extent, resulted in reintegration and concentration of the energy chains. Both strategies may lead to a bad performance of the system as the increase in market power and dismissing competition foster the possibility to capture monopolistic rents along the system.

Recently, as an attempt to "bridge the gap" between demand and supply, particularly in the electricity sector, the Argentinean government has implemented different policies such as the program for the rational use of electricity energy (PUREE), the fund for promoting investment in generation (FONIVEMEM) and the creation of ENARSA among others (Haselip and Potter, 2010). Probably, when looked at superficially, it could be said that Argentina is returning to the use of energy policy and planning. However, in a closer inspection, these policies constitute isolated efforts to try to solve or alleviate the current problem in a particular subsector of the system. Unfortunately, they do not imply an integrate long run energy planning.

To conclude, the main policy recommendation from this paper may be that in a developing, and low institutionally developed country, such as Argentina, energy policy and the long run energy planning are crucial and they must be performed by an authority such as the National Government. In this regard, a broad perspective for planning, considering the entire system, as well as inter- and intra-relations, are very important. This also begs for an improvement of the regulatory framework, and an active role of the regulatory authorities. In the particular case of Argentina this may imply, not only a better planning for electricity supply through expansions on the capacity of generation, transport and distribution, but also strengthening aspects related to the linking with other energy chains. Thus, as a long run planning may include promoting a more systematic exploitation of NG and oil reserves' and increase in the share of RETs in the energy mix. The energy sector is one of the most strategic ones in socio-economic development, therefore it should be seriously planned.

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