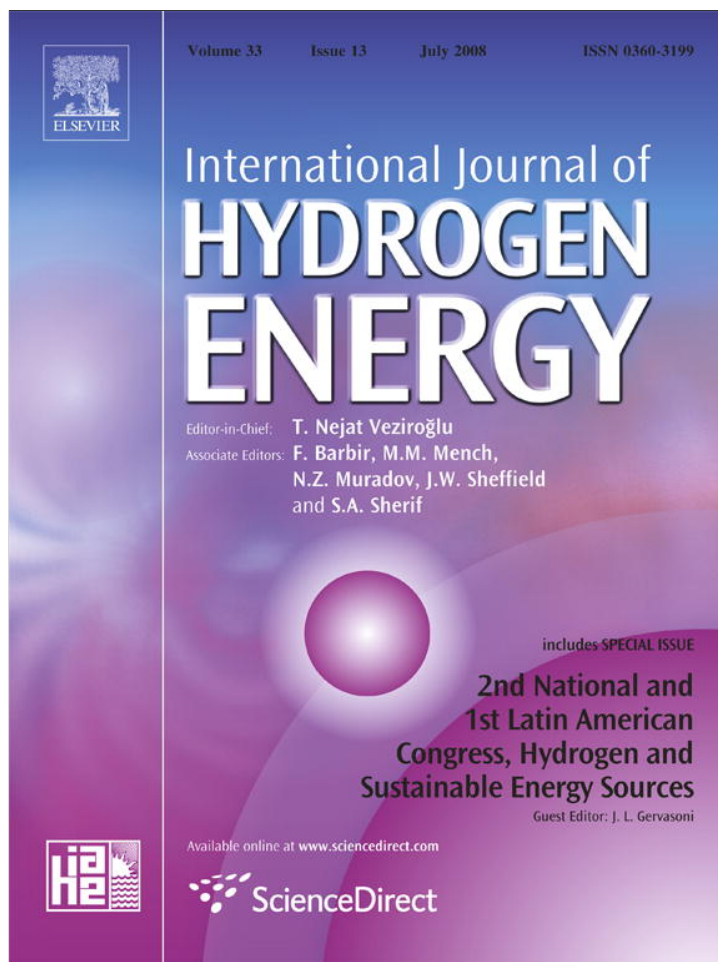


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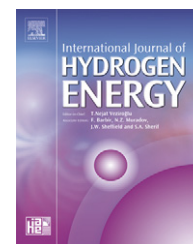


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Renewable energy in Argentina: Energy policy analysis and perspectives

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ABSTRACT

This paper presents a brief analysis of the key points for the development of renewable energy. The aim was try to respond about two important questions: Can deployment of renewable energy put downward pressure on Argentinean supply system? If so, How could it be done? We found that majority of countries with high contribution of renewable energy in their supply have promoted them through energy policies. Nonetheless, Argentina has recently started to develop new promoting legislation, and the results have not been good enough. We conclude that, in order to get better results, the Government should increase and improve policies related to renewable energy.

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1. Introduction

Currently, renewable energy (RE) is being supported in many countries because of its environmental, social, and national-security benefits. This has not been the case of Argentina. Even with high potential of some specific renewable sources, this country has not encouraged the use of them. Relative high endowment of natural gas (NG) and the restructuring of energy chains carried out at the beginning of the nineties, which led to a market coordination mechanism; seem to be the main drivers of this situation.

In the mentioned context, the goal of this study was to identify and discuss current situation and possibilities of RE in Argentina, as well as to present a schedule of energy policies. For this purpose, we have performed a comparative analysis between the evolution of RE and conventional sources. To some extent we use the analytical framework to identify which are the key issues in developing RE and the most important instruments of energy policy to promote them. We extend and complement earlier analysis by focusing on RE policies and the problems on implementing them in Argentina.

2. Current situation

At present, gas and petroleum are the most important energy sources in Argentinean energy system. In 2006 this resources together represented the 88.7% of primary energy matrix: 49% NG and 39% petroleum. Fig. 1 displays the evolution of primary energy matrix; it clearly reveals the increase in the participation of NG particularly towards the end of the eighties. This is indicative of a tendency towards the concentration of the energy system on this source, thus making gas have key role within national development.

The structure of an energy matrix can be explained by the analysis of the different agents across the energetic chains. Due to the institutional organization (open market) of Argentinean energy system, current dependence on hydrocarbons seems to be a result of the *strategies of private agents*. In this sense, the increase in NG in the primary energy matrix coincides with the increasing capacity of thermal generation power, particularly combined-cycle gas turbines (CCGTs). During the period 1992–2004 the increase in NG consumption is 44% due to electricity plants, 20% to exports and 36% to other domestic consumptions.

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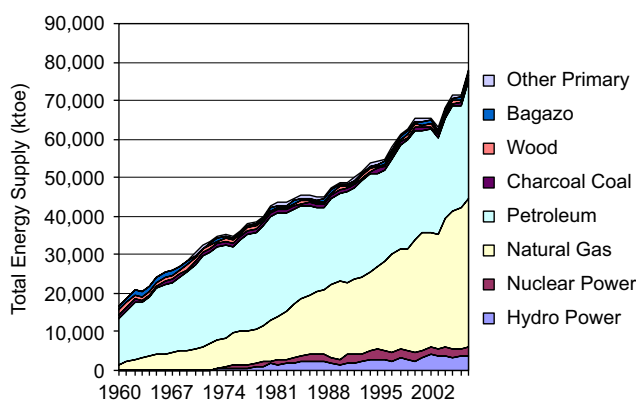


Fig. 1 – Total energy supply in Argentina 1960–2005.

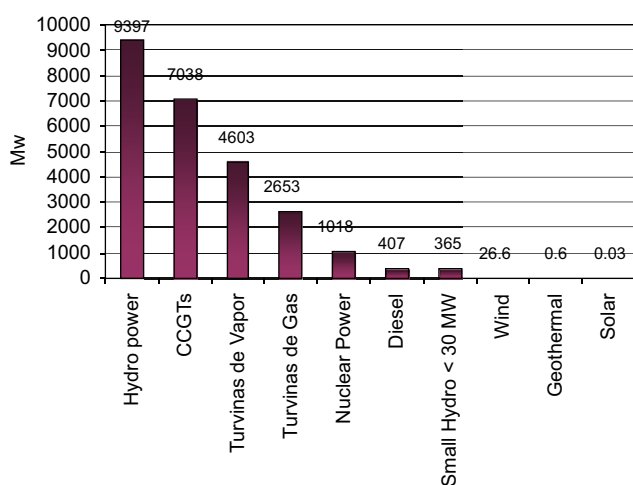


Fig. 2 – Current composition of power generation system.

The major preference for this resource in Argentina during the 1990 decades was due to the high cost of the projects of hydroelectric generation, to the change of political of the multilateral organisms of credit that determined the virtual ceasing of the financing of hydroelectric projects, to the improvements in the systems of transport and distribution of the NG, to the lower contamination on the environment due to this resource compared with the fuel oil and particularly to the technological innovations in the power stations of combined cycle, of quicker construction and of lower cost than the hydraulic centrals. In general the convenience of this last type of investments has been, on one hand strongly associated to the availability of NG at low price in the 1990 decades which has induced up to a strong geographical concentration of the offer in areas with abundant gas resource and, on the other hand to the appearance of technologies of high efficiency of electric production with turbines of combined cycle gas rather than the conventional thermal stations.

As regard of the strategies of private agents, as well, electricity sector is predominantly dependent on distributed gas (55%) and hydropower (19%), with a small share of RE. According to the Secretary of Energy, RE contribution to the total generated electricity (1.700 GW per year) is 1.87% whereas 1.57% of installed capacity (400 Mw) corresponds to REs (Fig. 2).

The case of wind energy is especially relevant in this country. In spite of the physical potential of Argentina, the installed capacity is 27.8 Mw (while the overall power capacity of the electric system is 23 026 Mw). Furthermore, most of the wind energy projects are small and currently facing financial problems. Besides, as a result of current regulation, system problems, and distort price incentives, most of them are currently not working.

3. Barriers to entry

Altomonte [7], Lutz [1] and Laponche [8] agrees that these barrier can be classified into four different groups: economics (investment and O&M costs), financial, institutional (externalities measurement error) and legal (regulation). Usually in deprived regions of the world there is also a social barrier (because of the low affordability capacity) [1].

3.1. Investment and operative costs

The investment and O&M costs for REs are higher than for conventional fuels. These costs are the most important economic barriers for these sources to be included into energy systems.

Table 1 presents the costs of the main power technologies for a survey of previous studies. Except for the investment costs of small hydroelectric stations, the rest of the technologies require investing more than twice of CCGTs. Moreover, it is evident that nuclear and thermoelectric plants O&M costs are approximately half of renewable costs, probably because of a more competitive market [2].

While the previous analysis discourage the development of RE, there are other aspects that endorse it.

In the first place, the mean life of RE plants is larger than for conventional plants. As the plans can be pay off in a longer period, there is a positive impact on net present value (NPV) analysis. In addition these new technologies do not need important investments on additional infrastructure in regard of thermal generation, which requires additional investment for fuels transport and storage [3].

Table 1 – Investments and O&M average costs of generation

Technology	Average generation cost (dollar cents/ kWh)	Average investment (dollars/W)
CCGTs	3.5 (3.0–4.0)	0.6 (0.4–0.8)
Charcoal	4.8 (4.0–5.5)	1.2 (1.0–1.3)
Nuclear	4.8 (2.4–7.2)	1.8 (1.6–2.2)
Wind	5.5 (3.0–8.0)	1.4 (0.8–2.0)
Biomass (25 MW combustion)	6.5 (4.0–9.0)	2.0 (1.5–2.5)
Geochemical	6.5 (4.5–8.5)	1.5 (1.2–1.8)
Small hydro	7.5 (5.0–10.0)	1.0 (0.8–1.2)
Photovoltaic	55.0 (30.0–80.0)	7.0 (6.0–0.8)

In the second place, as a result of the advancement through the *learning curve*, there is a progress in the technological knowledge (“*learning by doing*”) and a reduction of costs. According to National Renewable Energy Laboratory there is a decreasing tendency in RE costs. The reduction of costs has a direct positive impact over the NPV economic analysis, which generates incentives to invest in these sources [4] (Fig. 3).

In the third place, the previous analysis neither takes into account the negative social and environmental externalities of conventional fuels, nor the benefits of RE. Both externalities measurement error and absence of a systemic analysis put RE in disadvantage. This situation is due to the institu-

tions, which are too weak to assure a good mechanism for promoting these sources. The weaker the institutions are, the lower the opportunities of REs to be developed.

Unfortunately, *investments funding* constitute the most important barrier to entry. The literature search shows that this problem is more important in developing and under-developed countries than in developed. The formers usually have immature and weak credit markets, which makes it difficult to find financial arrangements for these projects.

In summary, high investing costs, lack of finances and minimum demand share, are the main aspects of disincentive investing.

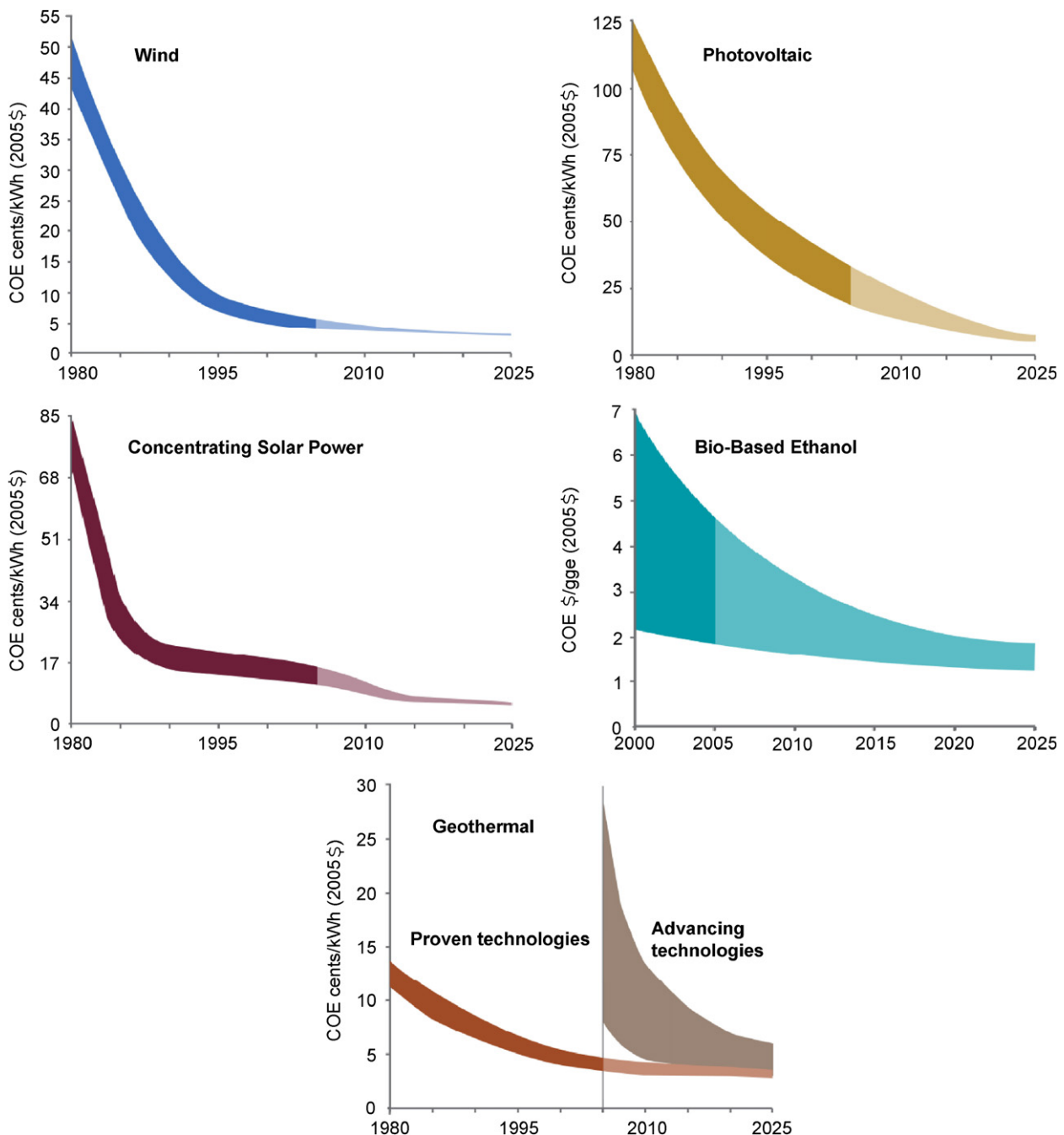


Fig. 3 – Renewable energy cost trends dollar cents/kWh (constant dollar 2005).

Majority of the problems of RE projects are due to the risk of the activity [5]. The higher the risk, the higher the required return of the investment; and the more difficult to find funding. Market risk is related to the main characteristics of the activity and its competitiveness in relation to conventional fuels.

In Argentina, the market concentration and the small participation of RE in the energy supply reinforce the problem. Besides, there is a lack of clear market signals (basically lack of stability and transparency in prices) which becomes more difficult for the funding process.

3.2. The RE in Argentinean legislation

Historically, in Argentina there was no specific legislation to promote RE. The efforts had been on substituting more pollutant fuels (carbon and petroleum) for “environmentally friendly” such as NG and hydropower.

More recently, and probably due to both environmental reasons and current supply problem, there have been developed a group of laws and program.

The origin of the legislation is the law 25.019 for wind and solar energy (*Ley de Energía Eólica y Solar*), which states wind and solar electricity generation as one of the main national interests. The recent law 26.190 (27-12-2006) proposes to take the participation of RE to 8% in 2015. The promoting instruments are mainly economic (15 \$/MW on subsidies during 15 y, as well as taxes devolution).

On the other hand EU countries such as Germany and Spain, which also have an open market coordination scheme in the electrical subsector, have promulgated laws and decrees that minimize obstacles and support their RE systems. In Latin America, Chile (and more recently Brazil) is one of the most important examples of countries that are promoting RE. Currently different instruments, such as lead-in tariff and preferential and obligatory dispatch of “green electricity”, are into discussion [6].

4. Energy policy

Nowadays there is a broad group of energy policies to promote RE. The simplest schemes consist on both direct subsidies to energy production, and indirect incentive mechanisms.

The choice of a specific instrument relies on, energy resources endowment as well as social and economic requirements and the institutional design of the sector. When designing a policy it is equally important to consider both supply and demand characteristics, and the relevance of each barrier to entry.

In the Argentinean case, for example, the financial is one of the most important barriers. In this particular case, it would require a political decision of devoting more funds to RE projects through promotion on the credit market.

Gomeslsky [9] proposes a group of public policy instruments, some of which are:

- Clear regulatory frameworks. This will dismiss the investment risk and so it will be easier to support projects, because of the required return rates will be smaller.
- To dismiss activity (market) risk. One possible way is to implement long term contracts.
- To establish a national—international nets and design different funding specific programs.
- To provide of guarantee to entrepreneurs and their project so that they can access to formal credit market.

5. Conclusions

International experience shows that EU countries have increased “green electricity” share in energy systems. Despite its higher costs in relation to conventional technologies, green electricity has become competitive in those countries.

In order to address the objective of augment the share of RE, EU countries used different incentive mechanisms. There are a lot of mechanisms: green certificates, R&D subsidies for renewable resources, internalization of external costs and environmental taxes.

Whatever the instrument of policy is, the role of Governments is fundamental. Furthermore, the role of energy policy in national development policies is particularly relevant in those countries.

Finally related to Argentine case, it could be said that this country is presently facing an important scarcity of NG, with crucial repercussions of electricity system, and to the economy as a whole. This situation highlights the role of energy policies to promote the expansion of RE resources. However, these policies are in a very initial stage.

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