

# Hydroelectric power and development in Argentina

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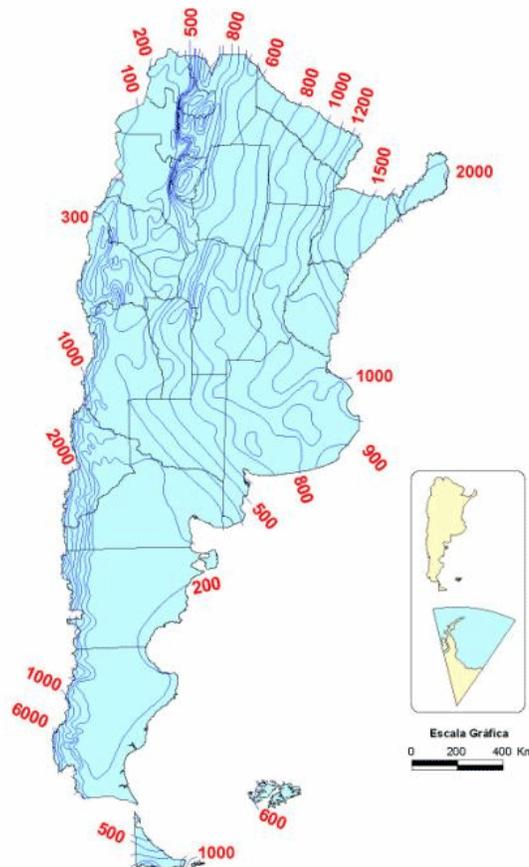
**Abstract:** A description of the hydropower system of Argentina. Needs and future projects.

**Keywords:** Argentina, hydropower system, hydropower projects

## 1. The country

The Argentine Republic has an area of nearly 2,780,000 square kilometres, a population of about 38 million of people, a quite well balance energetic matrix dominated by the gas, plentiful international rivers on the east side of the country but an uneven spatial distribution of water and population.

The following average annual isohyetal map shows that  $\frac{2}{3}$  of the territory is under 500 mm of precipitation, which reveals that we truly are a semi-arid country. In others words, Argentina needs flow regulation and flood control, particularly in the Andes and in the Patagonia regions where water is scarce, issue that must be solved with more dams and more reservoirs, infrastructure that is closely related with hydroelectricity.



Fuente: Balance Hídrico de la República Argentina, INCyTH, 1994  
Elaborado por: S.N.I.H., 2001

Argentina shares watercourses with Chile, Bolivia, Paraguay, Brazil and Uruguay and its position is generally downstream, except for some basins shared with Chile.

## 2. Argentine hydropower development

The gross theoretical hydro potential of Argentina has been estimated in 169,000 GWh/year while the technically feasible potential is 130,000 GWh/year. Only the 25% of this technically feasible potential had been developed at present.

Our total installed hydro capacity is almost 10,000 MW. There are 35 hydro plants with at least 10 MW of capacity and 16 hydro plants are part of multipurpose developments.

The average annual generation of all hydro plants in operation is 32,000 GWh/year (counting only half of the output of the bi-national plants), and it represents the 45% of national electricity production in an average year, including pumped-storage generation.

Hydropower is closely related with large dams and in practice all the other uses of the surface water resources are feasible only if the hydroelectric scheme is feasible. In fact hydropower support in our country all the other utilizations of water as irrigation, flood control and fresh water supply.

Today, in Argentina, the truly problem is not the political acceptance of dams, but how to finance these large structures because of our current economic difficulties.

Sustainable development (as it has defined in the Report of the World Commission on Environment and Development, 1987) "is that which meets the needs of the present without compromising the ability of future generations to meet their own needs". It requires the integration of three components - economic development, environmental caution and social justice.

Argentina regards sustainable development as a fundamental component of social responsibility, sound business practice and natural resource management, but without forgetting that the main objective is to foster economic and social development by:

- eradicating poverty;
- changing unsustainable patterns of production and consumption; and,
- protecting and managing the natural resource base.

## 3. A glance to the hydroelectric power system

During the early 1990s, Argentina began a thorough reform of its public sector, which included the restructuring and privatization of the electricity industry. This reform was a substantial turnaround of the Government's economic policy intended to encourage the flow of investment capital and private management criteria.

The Electricity Regulatory Framework Law (N°24,065/92) created the National Electricity Regulatory Commission (ENRE) as an independent entity that works within the scope of the Secretariat of State for Energy, responsible for drawing up the regulations governing the electricity industry and for ensuring compliance. ENRE was subsequently commissioned by the Secretariat of State for Energy (Decree 570/96) to administer hydroelectric concession contracts.

The main hydro plants are grouped into 13 "Business units" that are national concessions containing between one and three power plants operated by the following Power Producers :

<u>Business Unit</u>	<u>Power Producers</u>
○ Hidroeléctrica AES JURAMENTO S.A.,	AES Andes (USA)
○ Hidroeléctrica RIO HONDO S.A.,	NECON (Argentina)
○ Hidroeléctrica TUCUMAN S.A.,	NECON (Argentina)
○ Hidrotérmica SAN JUAN S.A.,	AES Andes (USA)
○ Hidroeléctrica NIHUIL S.A.,	EDF (France)
○ Hidroeléctrica DIAMANTE,	EDF (France)
○ Hidroeléctrica EL CHOCÓN S.A.,	ENDESA (Chile)
○ Hidroeléctrica CERROS COLORADOS S.A.,	DUKE ENERGY (USA)
○ Hidroeléctrica PICHI PICÚN LEUFÚ S.A.,	PETROBRAS ENERGÍA (Brasil)
○ Hidroeléctrica PIEDRA DEL AGUILA S.A.,	TOTALFINA EDF (France)
○ Hidroeléctrica ALICURA S.A.,	AES Alicurá (USA)
○ Hidroeléctrica FUTALEUFÚ S.A.,	ALUAR (Argentina)
○ Hidroeléctrica FLORENTINO AMEGHINO S.A.	CIESA (UK)

Yacyretá and Salto Grande, which are very large bi-national schemes (with Paraguay and Uruguay respectively), are not concessioned. At present 66% of power generating capacity is privately owned.



The figure shows the main hydro plants in operation as blue circles. The installed power in each power plant is proportional to the area of the circle.

#### 4. Future Outlook

Ten years ago, the scenarios considered by the Secretariat of State for Energy as electrical energy offer, were mainly based on new thermal plants, particularly large combined cycle units.

At present, after the recent gas shortage of february'04, and even though gas reserves do not seem to be at risk, the vision of the Secretariat has change in favor of hydropower investment as interesting economic alternatives.

The identification of and technical pre-feasibility studies for studies for new hydro projects is responsibility of the Government, while feasibility studies and the implementation of new water projects depends on private sector investment.

Of the hydro projects planned, Corpus (2,880 MW - installed power - and 19,000 GWh/year - annual mean generation -) is considered the best option. The bi-national site with Paraguay is on the Paraná River, downstream Itaipú and upstream Yacyretá and its cost estimate is 2,668 million US\$ for the civil works and 915 million US\$ for the transmission. Other hydro projects currently planned are:

Name	Type	H (m)	Basin	Purpose	Volume ( Hm <sup>3</sup> )	(MW)	(GWh/year)
<sup>1</sup> Garabí	TE	81	Uruguay River	Generation	15,000	1,500	6,500
El Chihuido II	RCC	78	Neuquén River	Gen./Irrig.	1,500	228	1,050
Añacuá	ER	15	Paraná River	Generation	----	255	1,250
Las Pavas	RCC	103	Bermejo River	Gen./Irrig.	589	88	372
Arrasayal	RCC	100	Bermejo River	Gen./Irrig.	594	93	430
Cambarí	RCC	116	Tarija River	Gen./Irrig.	1,670	102	543

Hydropower project require a Government license and their implementation is subject to regulations relating to alternative water use and to their integration with other central grid supplies, according to economic criteria. The aim is to achieve the best possible rational use of generation resources. Those holding licenses for hydroelectric generation are also responsible for monitoring dam safety and environmental control in the reservoir area.

#### 5. The key role of hydropower

Although hydroelectricity offers definite advantages over fossil fuels in terms of climate impacts and is perceived as a clean, low cost renewable energy source with a proven technology, hydropower has become the topic of intense controversy in recent years.

The debate is centered on large hydropower's negative environmental and social impacts, as well as other problems ranging from cost overruns to performance shortfalls.

The negative impacts on the environment of hydroelectric plants has been sometimes over-emphasized. It is curious to note that these attacks usually come from NGOs which are campaigning for conservation (preservation of the ecosystem) without considering that the first strategic priority for a country as Argentina is poverty alleviation, to give work and to get cheap energy and safe water.

They act to influence public opinion and especially the finance agencies, by highlighting negative aspects of water storage projects, while ignoring their positive impacts. They are also offer no realistic alternatives and try to impose unreasonable rules and criteria for the governance of dams projects.

Inevitably, as with all large scale infrastructure, hydropower has an impact on the environment, and the impact is essentially as a result of the presence of the dam, but it has to point out that is possible to harmonize the implementation of a hydro plant with conservation of the environment, and with regard for people affected by the project.

The Sustainable Guidelines of the International Hydropower Association, are an excellent contribution to promote greater consideration of environmental, social and economic aspects in the sustainability assessment of new hydro projects and the management and operation of existing power schemes.

Without any doubt, hydropower projects developed and operated in accordance with good practice can make a great contribution in the five key areas identified by Dr. Kofi Annan during the World

<sup>1</sup> A Government Commission is nowadays adapting the Garabí design parameters project to the latest environmental criteria.

Summit on Sustainable Development held in Johannesburg in September 2002, that are: water, energy, health, agriculture and biodiversity.

Hydropower is a major renewable energy resource that can play an increasingly important role in enabling countries as Argentina to meet sustainability objectives.

As a high quality, reliable and flexible energy source it has a pivotal role in integrated energy systems. This flexibility, through energy storage in reservoirs, is increasingly being seen as a way of expanding the effective contribution of other less reliable and more dilute renewable energy sources, such as wind and solar energy.

The multiple-use benefits of hydropower, particularly in relation to the availability, reliability and quality of fresh water supplies, can also contribute to a fundamental sustainability goal, the alleviation of poverty, and this is essential for undeveloped countries.

Nowadays, the need for charting a sustainable energy path and the no access to water and electricity of one part of our population are enough reasons to push engineers and researchers to resolve the issues associated with large hydropower, that will be a main component of our energy mix in the next future.