ARGENTINE REPUBLIC

(Updated 2012)

1. GENERAL INFORMATION

The Argentine Republic is a federal state constituted by 23 provinces: Jujuy, Salta, Tucumán, Formosa, Chaco, Catamarca, La Rioja, Santiago del Estero, Misiones, Corrientes, Entre Ríos, San Juan, Mendoza, San Luis, Córdoba, Santa Fe, La Pampa, Buenos Aires, Neuquén, Río Negro, Chubut, Santa Cruz and Tierra del Fuego, Antarctica and South Atlantic Islands. It is also constituted by Buenos Aires, the capital city of the country. The provincial political division of the country is presented as follows, in Figure 1.1:

Figure 1.1: Political Division of Argentina.

Each of the 23 Argentine provinces is also divided into administrative areas or departments.

SOURCE: UNDERSECRETARIAT OF TERRITORIAL PLANNING OF PUBLIC INVESTMENT: http://www.planif-territorial.gov.ar/

1.1. Country Overview

1.1.1. Governmental System

Argentina has a **Representative, Republican and Federal** system of government.

Representative: the representatives are elected by the people and govern the country.

Republican: the representatives are elected by the people through the ballot system. The government is divided into three powers: Executive, Legislative and Judicial, following a written Constitution. The country is based on a system of decentralization of power.

Federal: the Provincial States preserve their autonomy in spite of being reunited by a common government (National Government).

Argentina is based on a Democratic and Presidential system of government. The National Constitution was enacted in 1853, and amended in 1860, 1898, 1957 and 1994. Suffrage is universal and obligatory for every citizen, from the age of 18.

Each province, as well as the city of Buenos Aires, elect their legislators and governors by direct ballot. Moreover, provincial states organise and have their own justice administration.

The city of Buenos Aires is the first financial, political and economic centre of Argentina.

SOURCE: PRESIDENCY OF THE ARGENTINE REPUBLIC.

http://www.casarosada.gov.ar/index.php?option=com_content&task=view&id=13&Itemid=42
http://www.casarosada.gov.ar

1.1.2. Geography and Climate

The Argentine Republic is located in the southern and western hemispheres, with reference to the Equator and the Greenwich meridian respectively.

Argentina borders with Paraguay and Bolivia to the north, Brazil and Uruguay to the northeast, the Southern Atlantic Ocean to the east, and Chile to the west and south.

The province of Tierra del Fuego, Antarctica and the South Sandwich Islands engulf a continental area in the American continent, another in Antarctica and the Falkland Islands and South Georgias. These isles have been occupied by Great Britain since 1882. Argentina also claims the overseas territory of Antarctica.

The total area is 3,761,274 km^2.

By only taking into account the continental territory in South America, which entails the Bolivian frontier (at a latitude of 21º South) and the southern extreme of Tierra del Fuego (at a latitude of 55ºS), the North-South longitude of Argentina is 3,799 km, its highest width 1,423 km, and its surface area is 2,791,810 km^2. Argentina is the second largest country in

South America. Its borders with other countries are 9,376 km long, and its coastal line in the South Atlantic Ocean (including the islands) is 4,725 km long.

The continental area is 969,464 km^2, including the Austral Islands (South Orkney, South Georgia and South Sandwich).

The vast Argentine territory has a diversity of landscapes, including high peaks, mountains, mountain ranges and prairies. To the west, Argentina has the rugged mountain region known as the Andes. Towards the east, Argentina is completely plain or slightly undulated. The Argentinean pampas, originally treeless plains and including the most productive agricultural sectors, stretches 1,600 km to the south of Chaco province (northern forests) and to the north of Patagonia. Patagonia, the southern region of Argentina, is almost 1 million km^2 and is mostly arid with desolate steppes.

SOURCE: NATIONAL INSTITUTE OF STATISTICS AND CENSUS: http://www.indec.gov.ar;

GEOGRAPHIC INSTITUTE OF THE ARGENTINE REPUBLIC: http://www.ign.gob.ar/;

NAVY HYDROGRAPHICAL SERVICE: http://www.hidro.gov.ar

In Argentina, the climate is divided into four well defined seasons: autumn, winter, spring and summer. In the southern hemisphere, the winter begins on June 21st, and the summer on December 21st.

There are four major kinds of climate in Argentina: warm, mild, arid and cold. The extension of the territory and the features of its landscape determine the existence of varieties in each of the mentioned types. In Figure 1.2, the distribution of the types of climate in Argentina is shown.

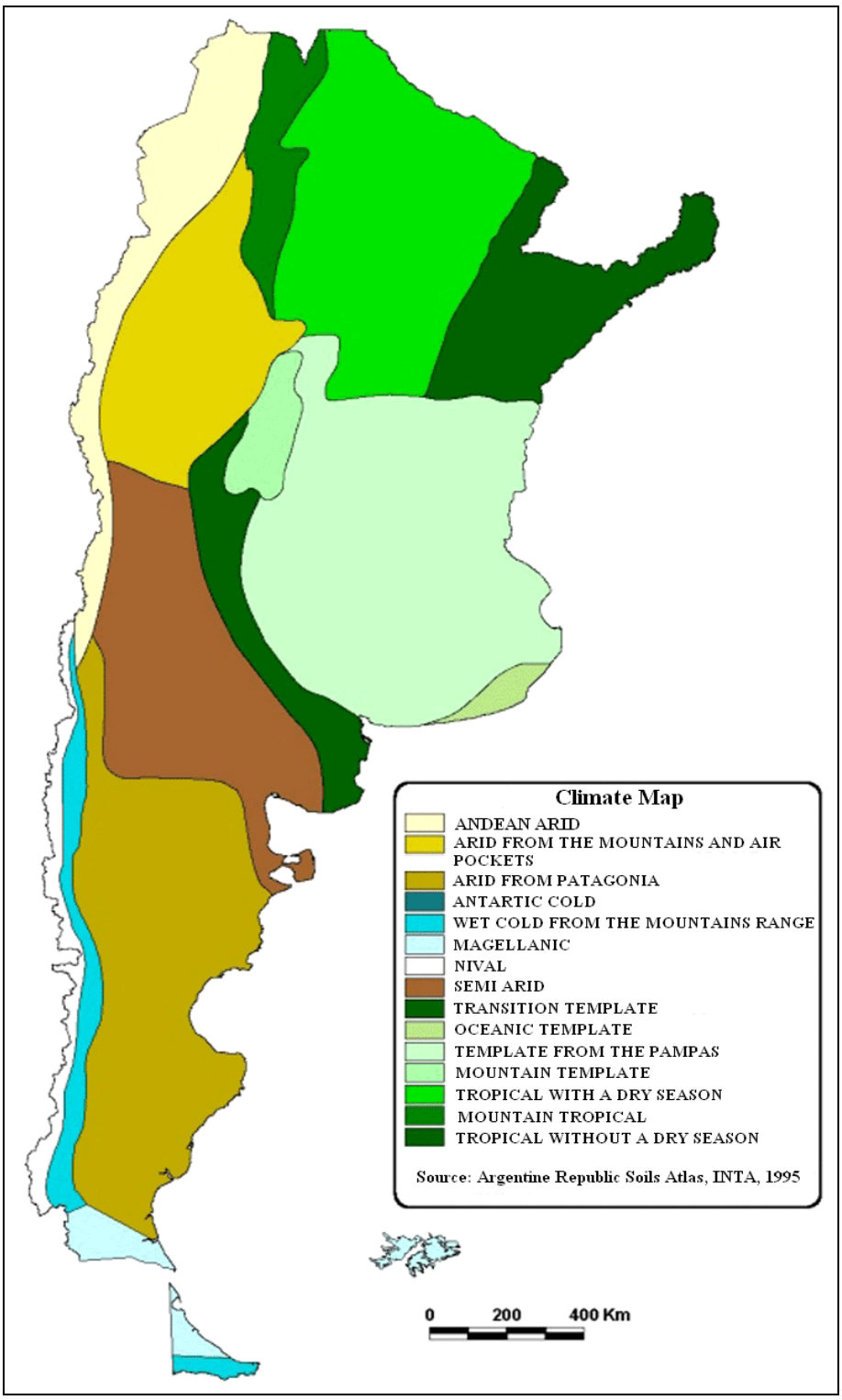


Figure 1.2: Types of climate in Argentina.

Temperatures generally decrease from the north to the south, as a consequence of the difference in latitude. To the north, the weather is tropical, while to the south, it is cold and has similar characteristics to the north of Europe.

Temperatures also decrease from the east to the west, due to the high altitudes of the Andes, which are in the western part of the country, and because of the moderating influence of the Atlantic Ocean to the east.

Moderate temperature conditions prevail in most parts of Argentina, with the exception of a small tropical area in the northeast and the subtropical Chaco region in the north, as well as the coldest areas in the south of Patagonia, Tierra del Fuego and the South Atlantic Islands.

In the surroundings areas of the Autonomous City of Buenos Aires, the annual average temperature is 17.7 °C.

In the north, near the Tropic of Capricorn, the highest temperatures prevail, compared to the rest of the country. In this region, the annual mean temperature is 23.3 °C, reaching maximum values of 46 °C.

In the Patagonia region and Tierra del Fuego province, the climate is generally cold. In the western region of Patagonia, which belongs to the Patagonian Andes, the winter average temperature is close to 0 °C. In most coastal areas, however, the ocean has a moderating influence on temperatures. Figure 1.3 shows the annual average maximum and minimum temperatures.

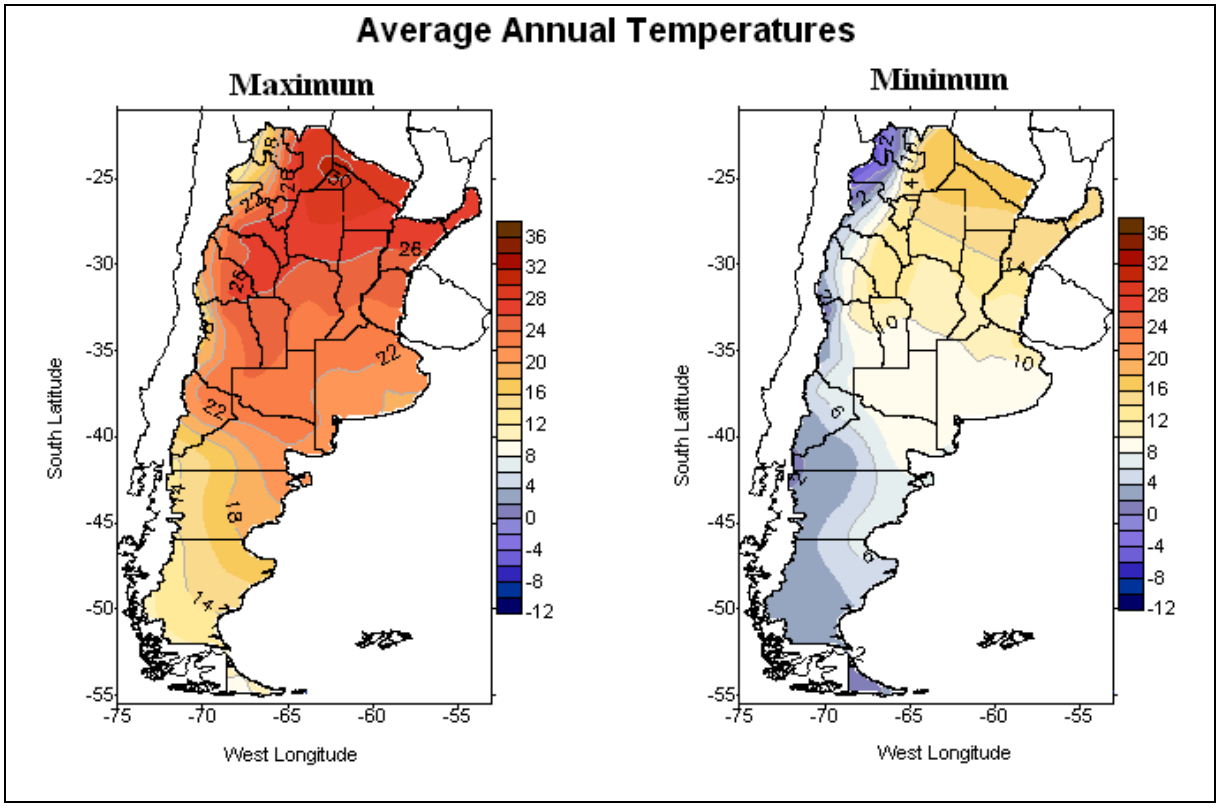


Figure 1.3: Average maximum and minimum annual temperatures.

In Argentina, the precipitation has large variations. The north of the country gets an average of 700 mm of rainwater per year, while around the city of Buenos Aires the annual rainfall is approximately 1,000 mm. The south and west regions are semiarid. Figure 1.4 shows the distribution for the four seasons.

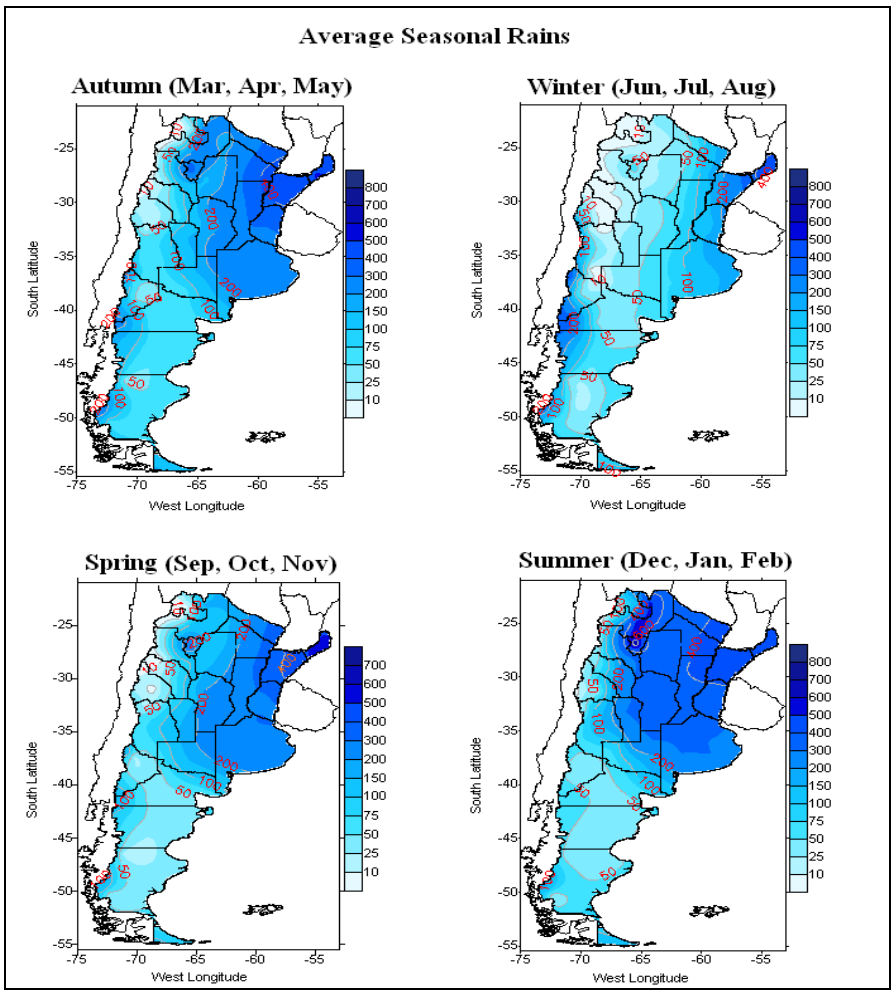


Figure 1.4: Seasonal average rainfall.

The Argentine wind regime is characterised by two anticyclone centres situated around parallel 30° S, one in the Pacific Ocean and the other in the Atlantic. In the winter season, both centres move away towards the north and are joined on the continental area. In summer, they move away towards the south, separating and creating a cyclonic centre above Argentina.

From the Atlantic Ocean, constant winds blow from the northeast, loaded with humidity, which affects the centre and northern parts of the country. Its humidity decreases in the interior part of the country. Thus, the rainfall pattern decreases from the east to the west in the northern region, except in the mountain areas. These winds are predominant in summer.

The cold winds of the west, coming from the Pacific Ocean, affect the southern part of the country. The Andes do not hamper their circulation as the Andean peaks are shorter, in this region. When these winds meet those of the Atlantic Ocean, an occluded front is created which is normally directed towards the southern part of the province of Buenos Aires, advancing or retreating in accordance with the prevailing mass of air (cold in the south, warm in the north). Rainfall prevails in winter, and decreases in the south from the west to the east.

Different meteorological factors affect Argentina, some of which are local and others which come from other countries. Warm and humid/wet winds come from the Atlantic anticyclone, which affect the regions above the north of Patagonia, and winds from the west come from the Pacific Ocean anticyclone and the Antarctica anticyclone cold winds. These three winds affect the Argentine climate in a permanent way contrary to the local winds,

which are as follows: Zonda, Pampero and Southeast. In Figure 1.5, the predominant direction of local winds is shown.

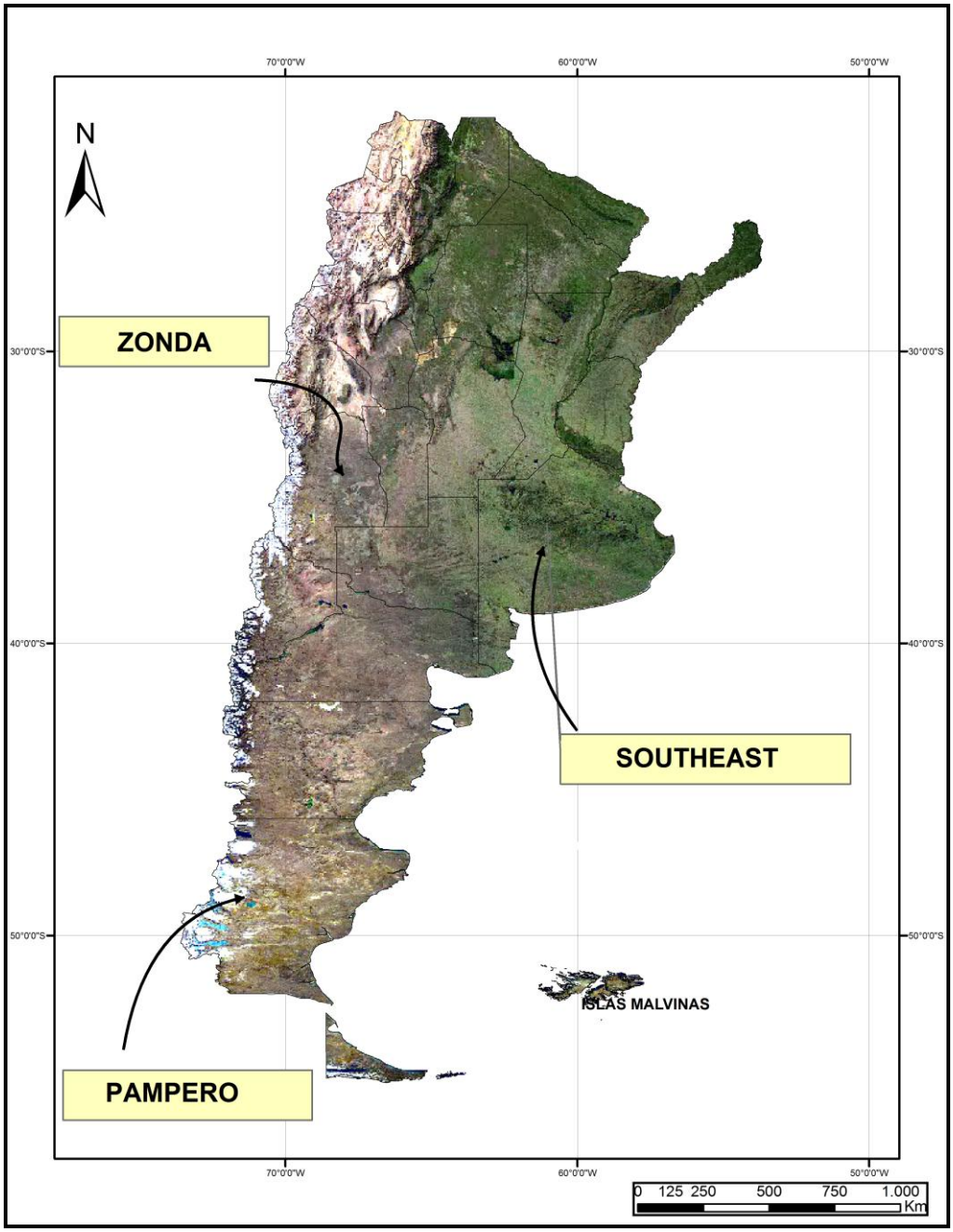


Figure 1.5: Local winds in Argentina.

Local winds are characterised by:

- Zonda: it is warm and dry. It generally blows between May and October and originates in the east of the foothills of the Andes of La Rioja, San Juan and Mendoza.
- Southeast ("Sudestada"): it originates in the coastal region of the Pampas and is characterised by its high humidity.
- Pampero: it comes from the southwest and is cold and dry. It mostly appears in summer, after several days of a constant rise in humidity and temperature.

Tornados consist of a mass of air with the shape of a condensation funnel which moves in circles and has a rotary movement of about 150 km/h. They occur between October and March in the basin of El Plata.

There are frequent snowfalls in the Andes and also frost (although these simply coincide with the advance of cold winds from the South Pacific or in high mountain areas and the Patagonic Plateau) and hail, which fall mostly between September and December, throughout the territory.

SOURCE: NATIONAL METEOROLOGICAL CENTRE: STATISTICAL DATA 1981 - 1990 PERIOD. http://www.smn.gov.ar

1.1.3. Population

The last census conducted in the country corresponds to the year 2010. According to data resulting from this census, Argentina has a total population of 40,117,096 inhabitants and an average density of 14.4 inhabitants per km^2. The average annual total population growth rate is 10.6%, the aging index is 40.2% (considering the population of 65 or more years, compared to the population which lies between 0 and 14 years), the crude birth rate is 17.5% and the crude infant mortality rate is 7.8%. The masculinity ratio, of number of males per 100 females, is 94.8%. Figure 1.6 shows the population distribution in Argentina, by age group, literacy level and urban and rural proportion, based on 2010 Census data.

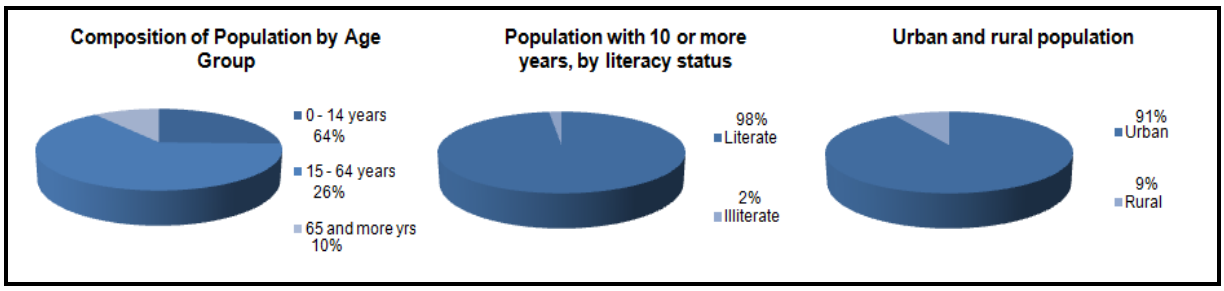


Figure 1.6: Population Distribution.

The city of Buenos Aires, along with the 24 administrative areas comprising what is known as Gran Buenos Aires, is one of the biggest cities worldwide. The 2010 Census shows that about one third of the national population lives in this area: out of a population of 12,806,866 inhabitants, about 2,890,151 live in the capital city.

Other major cities are as follows: Córdoba (1,329,604 inhabitants), Rosario (1,193,605 inhabitants), Mendoza (1,086,066 inhabitants), San Miguel de Tucumán (548,866 inhabitants) and Mar del Plata (614,350).

Around 91% of the total population lives in urban areas.

Table 1 presents the historical population data.

TABLE 1. INFORMATION ON POPULATION

								Annual average rate of growth (%)
Year	1970	1980	1990	2000	2005	2008	2010	From 2000 to 2010
Population (millions)	24.0	28.1	32.6	36.8	38.6	39.1	40.1	0.9

Population density (inhabitants/km²)	8.6	10.1	11.7	13.2	13.8	14.0	14.4	0.9
Urban population as part of the total %	78.9	82.9	87.2	89.2	90.1	90.3	91.4	0.2
Continental surface (1000 km²)							**2791.8***	

*Total land area excluding Antarctica and South Atlantic Islands departments.

Figure 1.7 presents a map of Argentina with the population distribution by density, as based on 2010 Census.

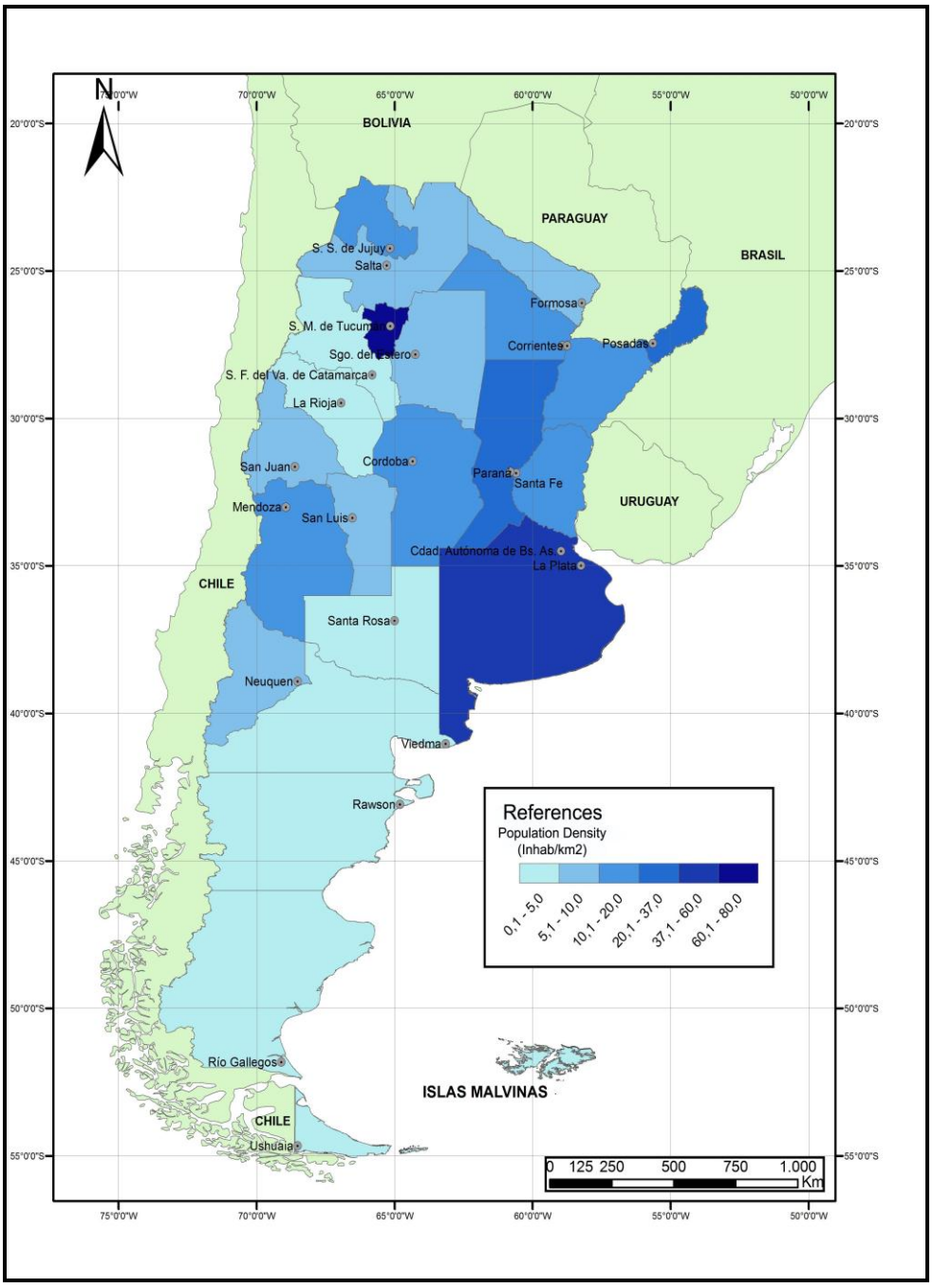


Figure 1.7: Population Density – 2010 Census.

SOURCE: NATIONAL INSTITUTE OF STATISTICS AND CENSUS http://www.indec.gov.ar;

UNDERSECRETARIAT OF TERRITORIAL PLANNING OF PUBLIC INVESTMENT. http://www.planif-territorial.gov.ar

1.1.4. Economic data

At present, the most important sectors regarding the contribution to the GDP (Gross Domestic Product), according to the 2010 registry, are: services, industry, agriculture and livestock (including hunting and forestry) construction, mining, electricity, gas and water services and lastly fisheries (almost insignificant in the country).

The energy sector has decreased its participation with the passing of time. The fundamental reason for this is the decrease in energy exports, mainly hydrocarbons, which are expected to decrease in the future, being able to be replaced with imports, especially with oil and natural gas.

The agricultural sector consists of soy crops and its derivatives: soybean oil, flour and soybeans. All these products are demanded worldwide.

The services sector is the biggest sector in the Argentine economy and is expected to continue as the dominant sector in the future.

In the year 2008, the construction sector increased its GDP, and is expected to continue growing, with the same tendency as the mining subsector.

In spite of the worldwide economic deceleration, it is expected that the country will keep on supplying the agro industrial goods. The domestic economy may implement protectionist measures.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

								Annual Average Rate of Growth (%)
	1970	1980	1990	2000	2005	2010	2011	2000 to 2011
GDP (millions of current US$)	28,178	190,661	123,274	284,204	181,967	368,399	445,620	4,2
GDP (millions of constant US$ 2000)	51,564	136,915	193,284	284,463	290,822	442,078	569,367	6,5
GDP per capita (PPP* U$S /capita)	n/d	4,861	5,609	9,210	10,871	15,603	**	-
GDP per capita (U$S/current capita)	1,176	6,787	3,828	7,929	4,629	9,189	11,108	3,1

* PPP: Purchasing Power Parity.

** Value currently not available.

SOURCE: NATIONAL INSTITUTE OF STATISTICS AND CENSUS http://www.indec.gov.ar;

1.2. Energy Information

1.2.1. Estimated Available Energy

Argentina has traditionally been one of the more self-sufficient countries of the region, with regards to energy. Even though it has natural resources such as oil, natural gas, carbon and uranium, it cannot be considered a major oil and gas exporter, as it was during the ‘90s, but it does have the potential to be self-sufficient, even with an exportable surplus. During the last years, all the aforementioned have suffered some severe changes. Argentina has brought

its hydroelectric development and especially its nuclear development to a standstill, in spite of counting with a bigger hydroelectric potential than the installed potential, and to a wide nuclear development capacity in every stage of the fuel cycle.

Reserves of fossil resources have also decreased considerably due to a lack of investment in registered prospecting and unplanned prospecting, mainly intended to meet the high growth in domestic demand and the regional market.

Since 2004, the National State has implemented a policy of rational use of resources in a planned way, so that the activity is sustainable in the future.

According to the last available National Energy Balance, corresponding to 2010, approximately 87.2% of the total primary energy comes from fossil fuels, corresponding to 51.3% of natural gas, 34.7% of oil and 1.3% of mineral coal. The rest comes from hydraulic energy (4.6%), nuclear energy (3.0%), wood (0.8%), bagasse (1.2%) and other primary resources (0.5%). In the Figure 1.8, the evolution of the composition of primary energy is shown.

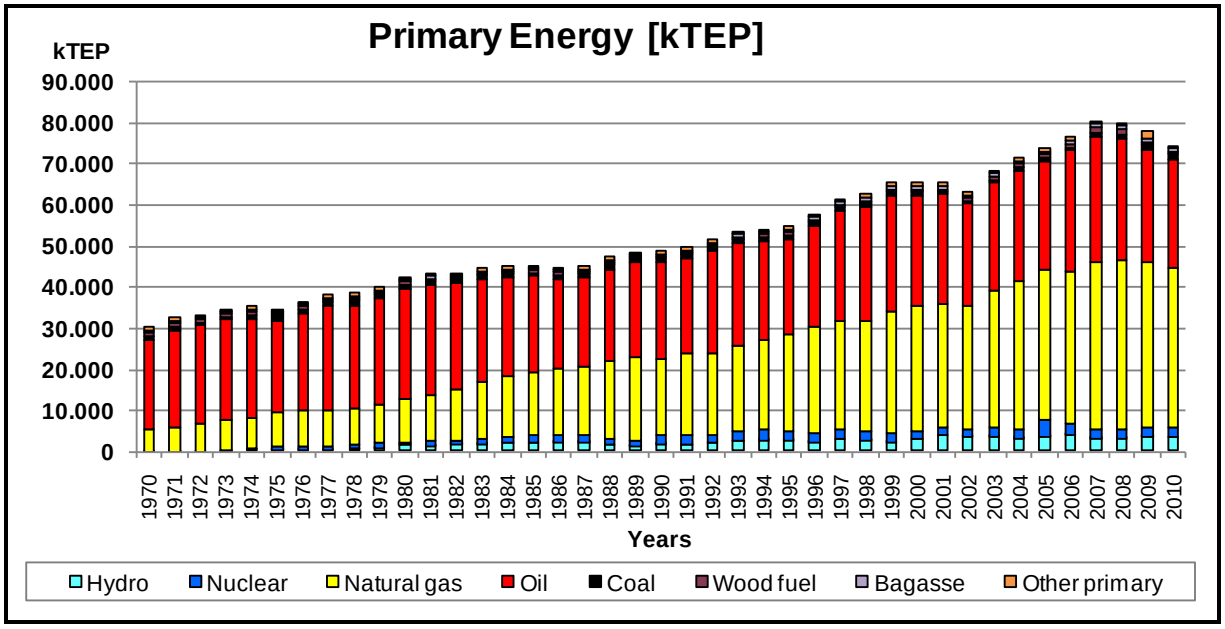


Figure 1.8: Composition of primary energy sources 1970-2010.

Concerning the analysis of the National Energy Balances for the period 1970-2010, significant changes can be observed relating to the continuous replacement of oil with natural gas. In 1970, 71.5% of energy came from oil and 17.6% from natural gas, while, in 1980, proportions were respectively 62.7% and 25%. In 1990, values reached 48% and 37.9%, to reach the above mentioned value in 2010.

Other remarkable changes are related to the evolution of water/hydroelectric power and nuclear energy. In 1970, hydro power accounted for only 0.6% of the energy sources and no nuclear energy records were registered. In 1980, energy records were of 3.8% and 2%, respectively, while by 1980, values were of 4% and 4.6%. In 2010, the rates were those mentioned above. In Table 3, the total of energy resources in Argentina is shown.

TABLE 3. ESTIMATE AVAILABLE ENERGY SOURCES

Estimated Available Energy Sources

	Fossil Fuels			Nuclear	Renewable	
	Solid	Liquid	Gas	Uranium	Hydro	Other renewable
Total amount in specific units*	444	401,308	358,726	17,271	40,400	2,055
Total amount in Exajoule (EJ)	10.04	14.87	12.62	10.94	0.61	0.03

*Solid, liquid: millions of tons; gas: millions of m^3; uranium; tons of U; hydro water and other renewable: MW.

For the coal reservoirs, the measured reserves of the Adaro Exploitation Plan were taken into account.

In the case of oil and gas, reserves of the country were taken into account.

In the case of uranium, reasonably ensured sources are taken into account, along with metallic uranium, located in the regions of Sierra Pintada, Cerro Solo and small deposits.

In the case of hydroelectrical power, the gross theoretical potential technically exploitable is 169,000 GWh/year, considering a load factor of 0.477.

Regarding renewable energy, the potential of geothermic sources as well as wind and solar are estimated considering a load factor of 0.3.Data is from December 2010.

SOURCE: RESERVES REPORT. UNDERSECRETARIAT OF FUELS. SECRETARIAT OF ENERGY.

ELEMENTS FOR THE DIAGNOSIS AND DEVELOPMENT OF THE NATIONAL ENERGY PLAN (Partial review, April 2008). STRATEGIC PLANNING GROUP, SECRETARIAT OF ENERGY.

RESERVOIR AND EVALUATION DEPARTMENT. RAW MATERIALS EXPLORATION AREA - CNEA.

1.2.2. Energy Statistics

TABLE 4. ENERGY STATISTICS (Exajoule (EJ))

	1970	1980	1990	2000	2005	2007	2009	2010*	Average rate of annual growth (%) 2000 to 2010
Energy consumption**									
- Total	1.28	1.79	2.04	2.74	3.00	3.37	3.22	3.11	1.28
- Solids***	0.04	0.04	0.04	0.03	0.04	0.05	0.05	0.04	2.28
- Liquids	0.91	1.12	0.98	1.12	1.10	1.26	1.15	1.11	-0.12
- Gas	0.22	0.45	0.78	1.29	1.52	1.71	1.69	1.64	2.42
- Nuclear	0.00	0.04	0.09	0.07	0.09	0.09	0.09	0.10	2.58
- Hydro	0.01	0.07	0.08	0.13	0.15	0.14	0.15	0.15	1.33
- Other renewable	0.09	0.08	0.07	0.09	0.09	0.12	0.09	0.08	-1.23
Energy production									
- Total	1.24	1.75	2.07	3.43	3.48	3.38	3.27	3.15	-0.83
- Solids***	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	-12.99
- Liquids	0.84	1.06	1.04	1.66	1.42	1.38	1.34	1.31	-2.32
- Gas	0.28	0.50	0.78	1.47	1.72	1.74	1.68	1.61	0.92
- Nuclear	0.00	0.04	0.09	**** 0.00	**** 0.00	**** 0.00	**** 0.00	**** 0.00	N/A
- Hydro	0.01	0.07	0.08	0.13	0.15	0.14	0.15	0.15	1.44
- Other renewable	0.09	0.08	0.07	0.09	0.09	0.12	0.09	0.08	-1.32

Net Import (Import – Export)	0.03	0.04	-0.02	-0.69	-0.48	-0.01	-0.05	-0.04	-23.94
- Total	**1.28**	**1.79**	**2.04**	**2.74**	**3.00**	**3.37**	**3.27**	**3.19**	**1.54**

*Latest data available from the National Energy Balance 2010 from Secretariat of Energy.
***Solid fuels including coal and lignite.
****Since 1997, Argentina imports the totality of uranium consumed by its NPPs, completely interrupting the local production.

As indicated above, Argentina bases its primary energy mix mainly in hydrocarbons. From the total energy supplied, almost 88% comes from hydrocarbon resources. However, these markets are characterized by a high concentration and a steady decline in reserves and adjacent production, with a low presence of exploratory activity by the producers.

The oil operators market recorded, in 2010, that 79% of production is in the hands of seven operators. First is YPF, with a market share of 28.7%, followed by Pan American Energy, Chevron, Petrobras, Petroandina, Ecopetrol, Total Austral, and others with a less than 10% share.

A similar phenomenon exists in the refining market, where leading companies Repsol-YPF, Petrobras, ESSO and Shell dominate the oil processing market.

With regard to gas production, it was recorded in 2010 that 85% of the market is held by eight operators. Total Austral is in first place, with an increase of 7%, displacing YPF, who lost the same percentage of market share, and were relegated to second place. Pan American Energy is in third place, followed by Petrobras.

In 1995, there was a severe fall in uranium prices in the international market. Consequently, mining activities in the deposit of Sierra Pintada, province of Mendoza, were suspended (the only producing deposit in Argentina at that time). The substitution of the local production with imports of concentrated uranium took place, which was then processed in the country.

1.2.3. Energy Policy

During the last years, several laws have been issued with the aim of decreasing the use of fossil fuels and encouraging rational use of energy by suggesting a series of objectives and mechanisms of promotion, and by recognising the importance of the participation of every energy source in the integration of the national energy mix.

The main goal is to diversify the matrix of power generation, with bigger participation from the nuclear, hydro and renewable energies.

In August 2006, in accordance with this aim, the reactivation of nuclear activity was declared in the country.

Enacted laws relevant to the achievement of the proposed aims are as follows:

Law No. 25019: promotes solar and wind energy;

Law No. 26093: promotes biofuels and its sustainable use;

Law No. 26190: National Development scheme for the use of renewable energy sources for electricity production;

Law No. 26123: promotes hydrogen as a fuel and energy vector;

Law No. 26566: expresses interest in extending the life cycle of Embalse NPP and authorizes the creation of trust funds intended for that purpose, and for the construction of a

fourth nuclear reactor in Argentina. Moreover, the law declares the construction of the CAREM 25 NPP as a matter of national interest, and puts CNEA in charge of it.

With regard to the greenhouse gases, even though Argentina is not included among the countries of Annex I of the Kyoto Protocol (that is, it does not have the obligation to reduce greenhouse gas levels), it has begun a series of actions with the aim of diminishing emissions. These are oriented in two directions: on the one hand, Argentina acts according to demand, through energy efficiency policies. On the other, it operates by means of the Plan on the Expansion of the Power Generation System 2008-2025, through which the electricity matrix has to be diversified in the medium and long term, based on water, nuclear and renewable energy (wind, solar, mini hydro, geothermic, among others).

Moreover, new ways to promote and encourage the search and exploitation of new gas and oil deposits have been created by companies from the private sector. Additionally, agreements between state and private companies have been settled, intending for the search and exploitation of deposits in areas that belong to the National State.

Uranium mining activity in Argentina has been paralysed since 1995, along with the rest of the nuclear plan. As a consequence of the reactivation of the nuclear plan in Argentina, exploration activities have been reintroduced, as well as the quantification of uranium resources.

SOURCE: Legal Information, CENTRE OF DOCUMENTATION AND INFORMATION OF THE MINISTRY OF ECONOMY AND PUBLIC FINANCE. http://www.infoleg.gov.ar/

1.3. The Electricity System

1.3.1. Electricity policy and decision making process

As a result of the governmental policies applied between 1960 and 1990, the electrical sector has been characterised by the following:

- Technologic diversification of energy sources: use of hydroelectric resources and nuclear technology development, which has reduced fossil fuel rates from 93% in 1972, to 42% in 1994.
- Reduction of the consumption of oil derivatives in thermal: oil consumption in 1990 (1,440,000 toe) can be compared to the beginning of the fifties, in spite of the fact that energy produced by thermal power plants has been increased five times, as a result of the intensive use of natural gas.
- Electric Transmission and Distribution System: the rate of electrification is 95% in urban areas and above 86% at a national level.
- Low participation in self-generation of power supply: at present, its contribution is just 12%, in comparison to the existing 20% at the end of the sixties.
- A highly interconnected system which is also integrated.
- Beginning of electrical power interchange with Brazil, in spite of the difference in frequency systems (50 Hz in Argentina and 60 Hz in Brazil).

It is important to highlight that during the mentioned decades, global energy policy was almost exclusively defined by the National Government, with planning both in the short and long term.

On the contrary, during the nineties, the electrical market was completely deregulated through Law No. 24065 and its decrees. Through this law, two entities have been created:

- The Regulatory National Entity of Electricity (ENRE): created as an independent organism within the Secretariat of Energy, with the aim of controlling the achievement of regulations on behalf of the agents of the market by defending the interests of users.

- The Administrator Company of the Wholesale Electricity (CAMMESA, by its Spanish acronym): created to administer the operation of the Wholesale Electrical Market. This company is constituted by the Association of Electrical Energy Generators of the Argentine Republic (AGEERA), the Association of Distributors of Electrical Power of the Argentine Republic (ADEERA), the Association of Haulage Contractors/Transporters of Electrical Energy of the Argentine Republic (ATEERA), the Association of Great Users of Electrical Energy of the Argentine Republic (AGUEERA) and the National State represented by the Secretary of Energy, each owning 20% of the total assets .

Supply and demand are related through the markets: "Term Market" and "Spot Market". In the former, agreements between generators and big users or distributors are established by setting the price and quantity of electricity to be commercialised for a determined period. Spot Market, on the other hand, is determined by the price/hour of energy, calculated to marginal cost that the next MW incorporated into the system may have,

Law No. 24065 also allows:

• Privatization of the assets of the entire State-owned thermal generation network.

• The concession of the operation of hydropower plants owned by the Federal Government to private companies, with the exception of the bi-national hydro power plants (Salto Grande and Yacyretá).

• The granting of the operation of networks in high voltage transmission, which are State-owned.

• The privatization of the State-owned distribution networks.

• The granting of permission for the expansion of the three systems (generation, transmission and distribution) to private actors, guaranteeing free access for any new generator to the idle capacity of transport (both high voltage and medium and low voltage distribution).

• Establishing of a minimum clearance system by marginal cost of generation, and remuneration to generators for maximum marginal cost of the system.

This policy initially generated an additional investment in thermal equipment involving the burning natural gas. This caused a high dependence on gas, and nuclear and hydraulic projects were subsequently abandoned.

This situation, along with the low prices of natural gas and the starting up of major hydraulic projects to which the state was committed, caused a strong reduction in the prices of electric power allowance in the wholesale market. This made private investment in new facilities quite unattractive.

During the Nineties, there was a gradual reduction in the industrial sector. In December 2001, Argentina suffered a financial economic crisis that continued up to 2002, with a reduction in demand for electric power.

From 2003 to 2008, Argentina experienced quick recovery of the industrial sector along with rapid growth in electric power demand. The market did not respond in a dynamic way and therefore a policy change took place.

Since 2004, the State has resumed its planning tasks with the aim of guiding investments by only performing those investments deemed necessary, which are of no interest to private investors.

The Secretariat of Energy is focused on the solution of short term issues and on formulating and implementing a medium and long-termed energy plan, as a reference for private investors, fundamentally based on the expansion of the system with bigger participation of hydraulic, nuclear and renewable energies.

Regarding long-term energy planning, the Secretariat of Energy, with the assistance of the CNEA's Strategic Planning Management and other institutions and agencies, developed the Strategic Energy Plan, for which the basic guidelines of two alternative demand scenarios were established, depending on how these sectors are expected to demand energy. The two scenarios are as follows:

• The tendency scenario is developed with a consistent and plausible description of how the energy system will evolve in the future, in the absence of new and explicit policies of structural change, other than those which are on-going or planned. This scenario maintains the historical trend in the share of different energy sources.

• The structural scenario incorporates the expected impact of a policy to promote sustainability and efficiency in the allocation and use of energy resources available in the period. It proposes goals of exploitation of energy sources and policies for efficient use of energy (UEE). This scenario modifies the historical trend for the relative shares of different energy sources, and favours the penetration of certain existing sources, such as distributed gas, electricity and solar energy.

Scenarios: Tendency-growth: 3.2%

Structural-growth: 2.7%

With regard to the evolution of the generated energy, for both the structural and trend demand scenario, a baseline and an alternative offer scenario were modelled. In the alternative scenarios there will be an increased availability of gas in general, thus improving the availability of fuel for thermal power plants.

Figures 1.9 and 1.10 show the estimates of the electrical power requirements by technology type until 2025 for two scenarios: the minimum and maximum, and the baseline trend scenario and the alternative structural scenario, respectively.

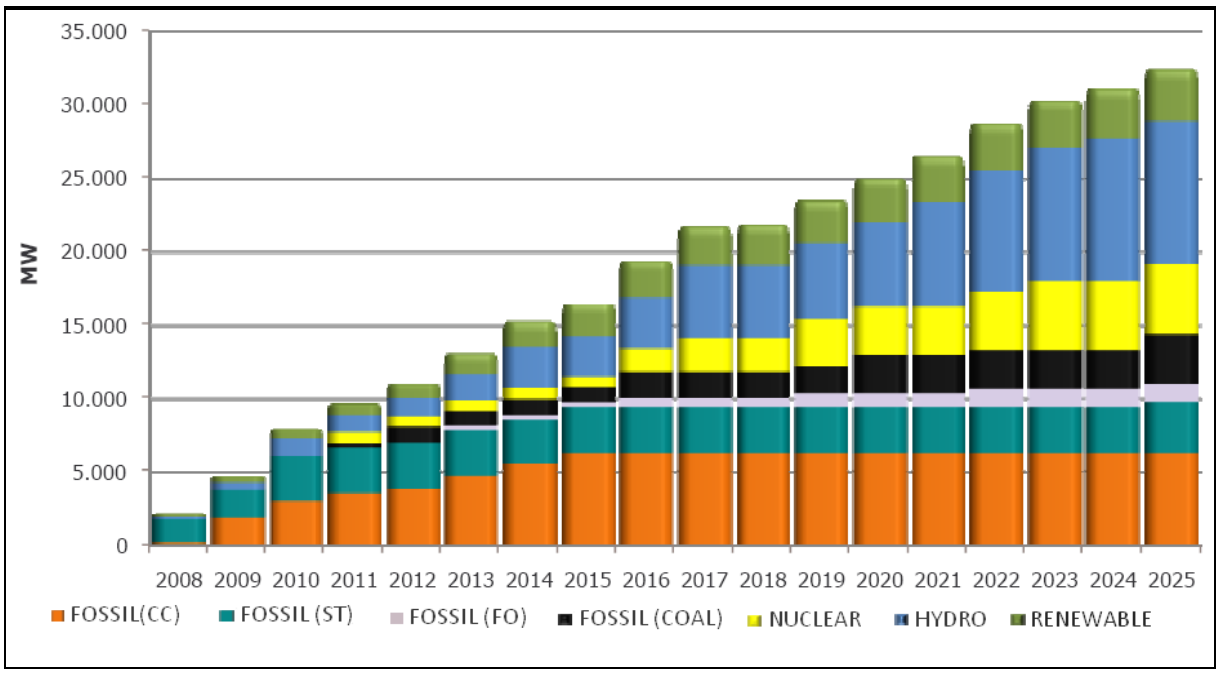


Figure 1.9: Capacity Requirements until the year 2025 - Baseline Trend Scenario.

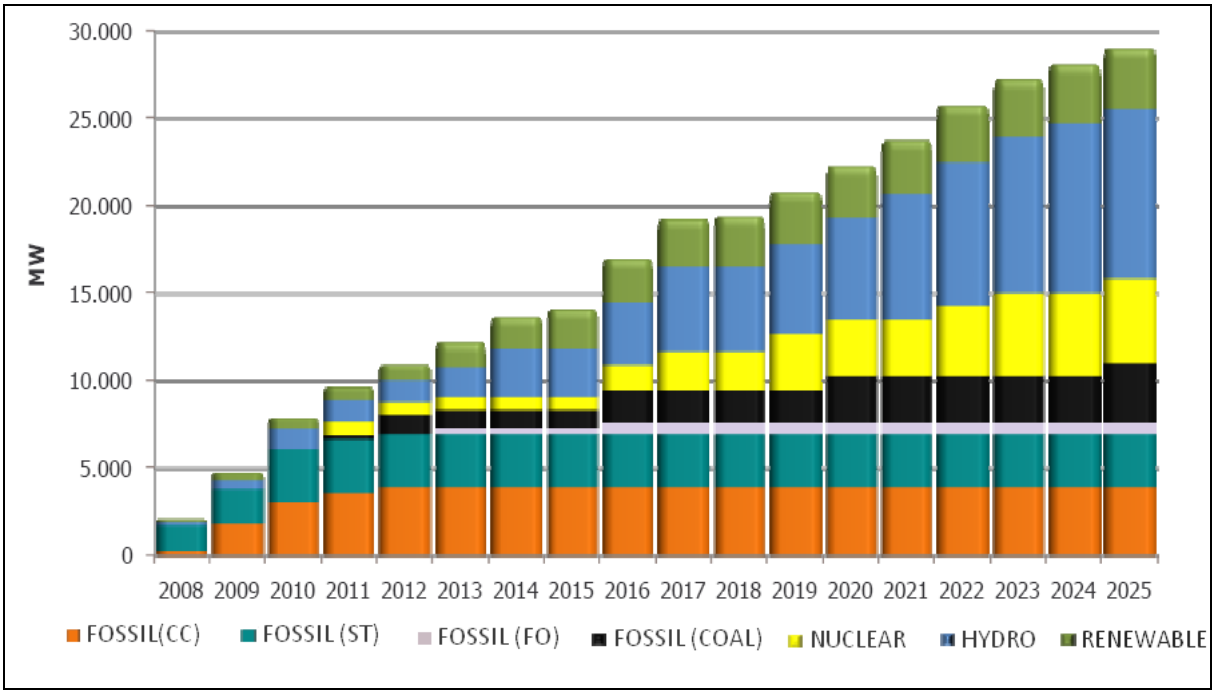


Figure 1.10: Capacity Requirements until the year 2025 - Alternative Structural Scenario.

Figures 1.11 and 1.12 show the contribution of electric power of technologies considered in the tendency scenario.

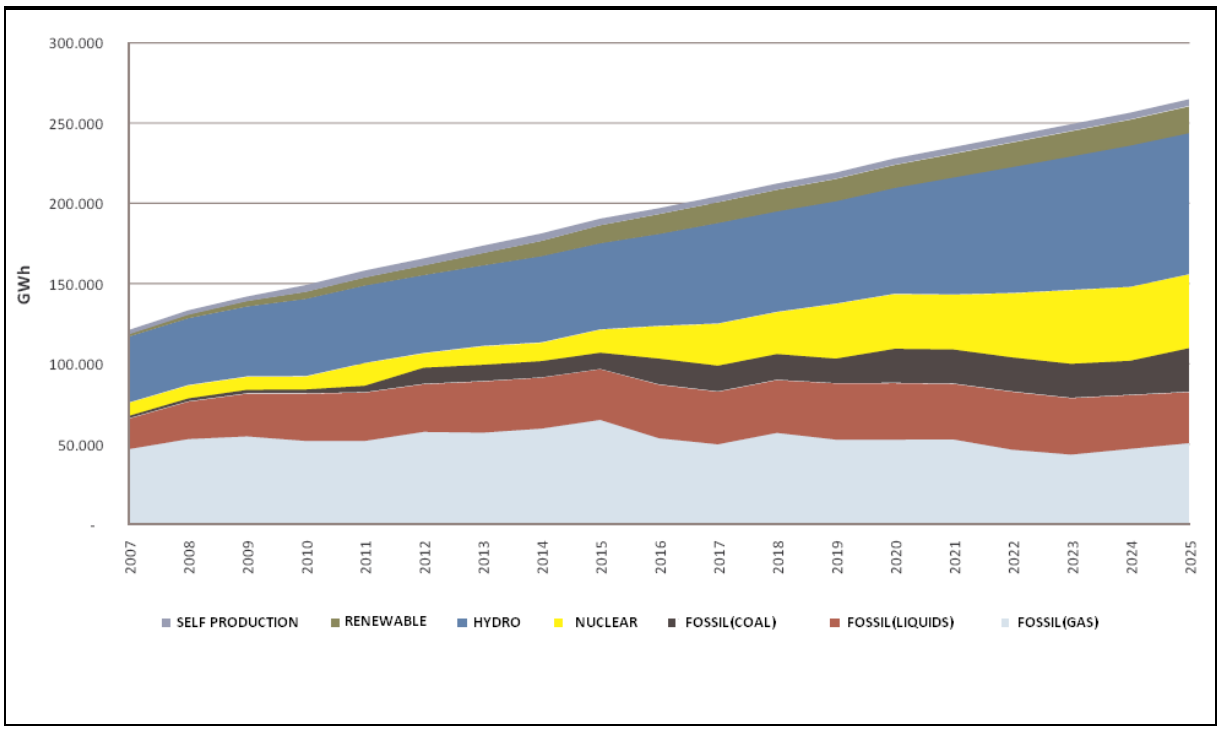


Figure 1.11: Energy Contribution of each source - Baseline Trend Scenario.

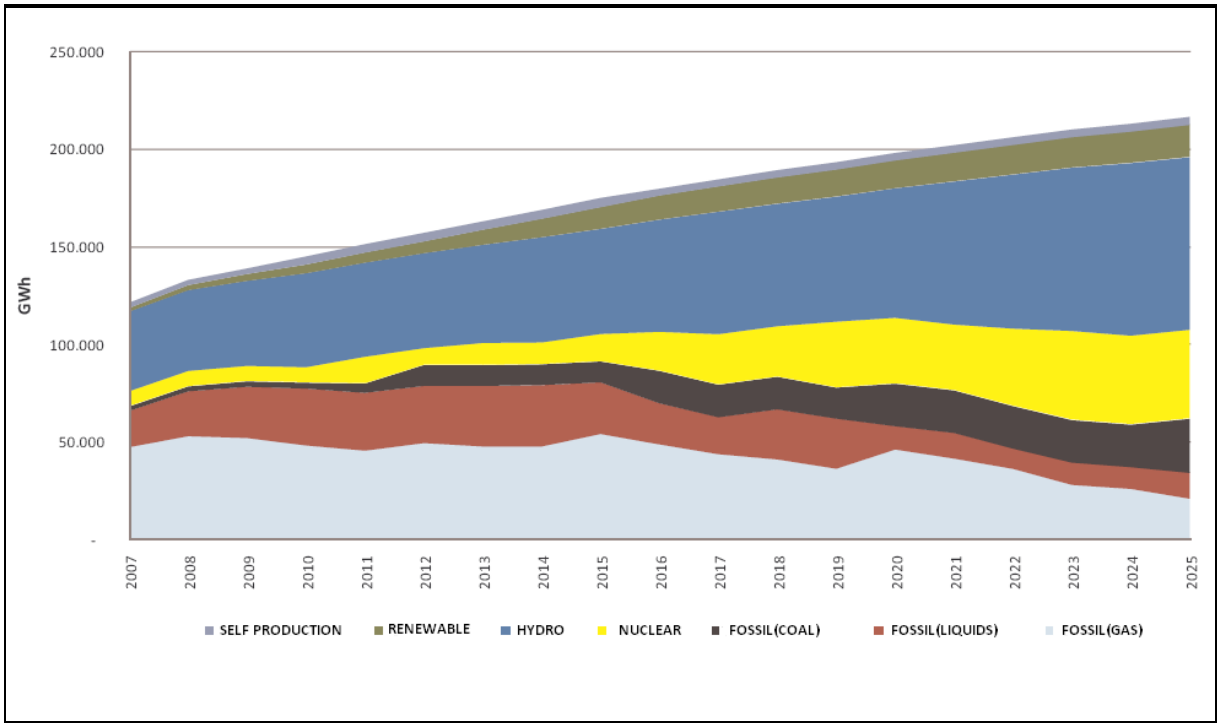


Figure 1.12: Energy Contribution of each source - Alternative Structural Scenario.

In 2010, electric power was 115.7 TWh. Of this, 57% was produced with fossil fuels (40% natural gas, 15% liquid fuels and 2% coal), 6% nuclear, 35% hydraulic and 2% imported electricity.

As a result of the implementation of the Governmental Plan, a reduction in electric power generation with hydrocarbons would occur, to 42% for the alternative trend scenario and to 29% for the alternative structural scenario. Nuclear power generation would increase to

17% in the first case and to 21% in the second. In the case of renewable energies, values would rise to 6% and 8%. Finally, the participation of hydraulic energy would rise to 34% and to 40%, respectively.

Among the established plans for the hydrocarbon sector of the Secretariat of Energy, a comprehensive program called Gas, Oil and Refining Plus was implemented, designed to boost exploration, development and production of new deposits, and the construction of new refineries and expansion of existing Plus programs. These programs are intended to implement incentive mechanisms that encourage new investments.

These programs allow better prices to be obtained for new production, and try to be an incentive for the development of unconventional reservoirs. For now, work is being done in exploration of such resources.

SOURCE: ELEMENTS FOR THE DEVELOPMENT AND DIAGNOSIS OF THE NATIONAL ENERGY PLANNING 2008-2025. Report on Advances. Version IV. STRATEGIC PLANNING GROUP. SECRETARIAT OF ENERGY. December, 2008.

1.3.2. Structure of Electric Power Sector

The Electric Sector

In 1992, by means of Law No. 24065 and its reglamentary decrees, a horizontal division of integrated state companies occurred (SEGBA [Electrical Services of the outskirts of Buenos Aires], Agua y Energía [Water and Energy Services] and Hidronor). Generation, transport and distribution were separated, and thermal generators privatised. Hydraulic generators, transport and electric power distribution were franchised.

Electric Power Generation

Argentina has a generation facility with three main generation sources: thermal of fossil origin, hydraulic and nuclear, with a small part wind generation.

Within the facility, the main technology used is the combined cycle by burning natural gas.

Since 1994, NPPs are operated by a state company known as Nucleoeléctrica Argentina Sociedad Anónima (NA-SA), which came from the National Commission of Atomic Energy.

The entity responsible for dispatching (CAMMESA) prepares a merit order with the available generators, originally considering exclusively the marginal cost of fuel incidence, but now also taking operation and maintenance costs into consideration. The despatching is carried out with these criteria, in order to meet the demand and necessary margins so as to maintain the quality of supply.

According to the merit order, the technologies dispatched first and foremost are base hydro and nuclear power generation. Conventional thermal generation follows, to meet the demand of valleys, while hydro technologies of reservoir and gas turbines (working with liquid fuels) satisfy the peak demands. In Figure 1.13 a diagram of the schedule can be seen along with the applied technologies at each moment.

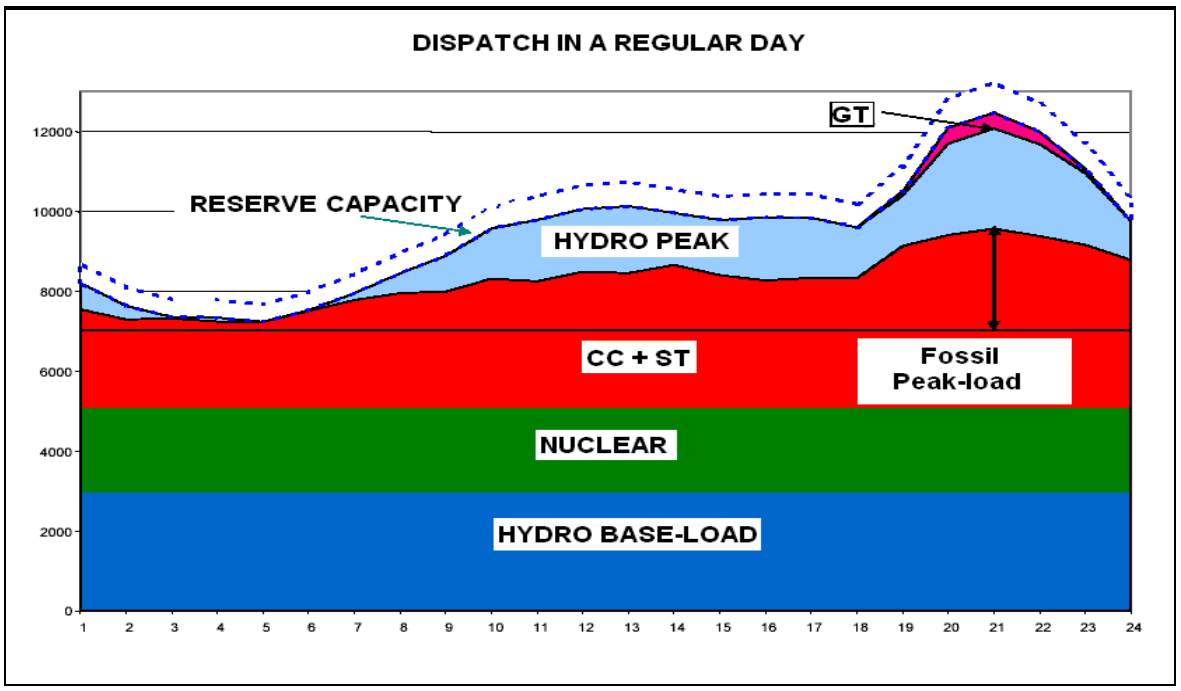


Figure 1.13: Diagram of the schedule of power generation technologies dispatch.

As regards retribution, generators receive it by means of the following concepts:

- Energy delivered to the grid net: remunerated/paid by the spot market price or the term agreement.

- Available power: fixed retribution for kW available in hours outside the valley.

- Other concepts related to the use of liquid hydrocarbons just perceived by generators using these fuels so as to afford the additional expenses of fuels produced by the above mentioned generators (in replacement of natural gas in times of shortage). The system was originally designed to completely supply it with natural gas under the supposition of abundant reservoirs. Since 2004, new restrictions have begun to be verified in both production and transport of this fuel. It was replaced by major imported liquid fuels or natural gas, thus becoming five times more expensive.

Transport

Transport in high and extra high tension is performed through TRANSENER: Transport Company of energy, which operates the grid of national interconnection whose tension is 500 kV. It is linked to 6 regional operators:

- TRANSNOA: it includes the entire north-western Argentine region, including the provinces of Tucumán, Catamarca, La Rioja, Salta, Jujuy and Santiago del Estero.

- DISTROCUYO: it engulfs the provinces of San Juan and Mendoza.

- TRANSBA: it engulfs the province of Buenos Aires.

- TRANSNEA: it includes the North-eastern Argentine region, which has the provinces of Formosa, Chaco, Corrientes and part of Entre Ríos.

- TRANSCOMAHUE: it engulfs the region of El Comahue and covers the provinces of Río Negro, Neuquén and part of La Pampa.

- TRANSPA: it covers Patagonia, which entails the provinces of Santa Cruz and Chubut.

In recent years, significant extensions were made to the network that forms the Argentine Interconnected System (SADI) at 500 kV, electrically linking the country's various regions.

During 2011, two main additions have been made: NOA-NEA line, which links the northwest and northeast regions, and COMAHUE-CUYO line, linking the Cuyo and the Comahue regions. This closes the two rings, strengthening the safety and quality of electricity supply in several regions of the country. These developments are part of a plan to convert the radial structure of the SADI in a meshed distribution network, which will respond more efficiently to failures in the system through the closure of its circuits.

In Figure 1.14 the network of lines of extra high tension is shown.

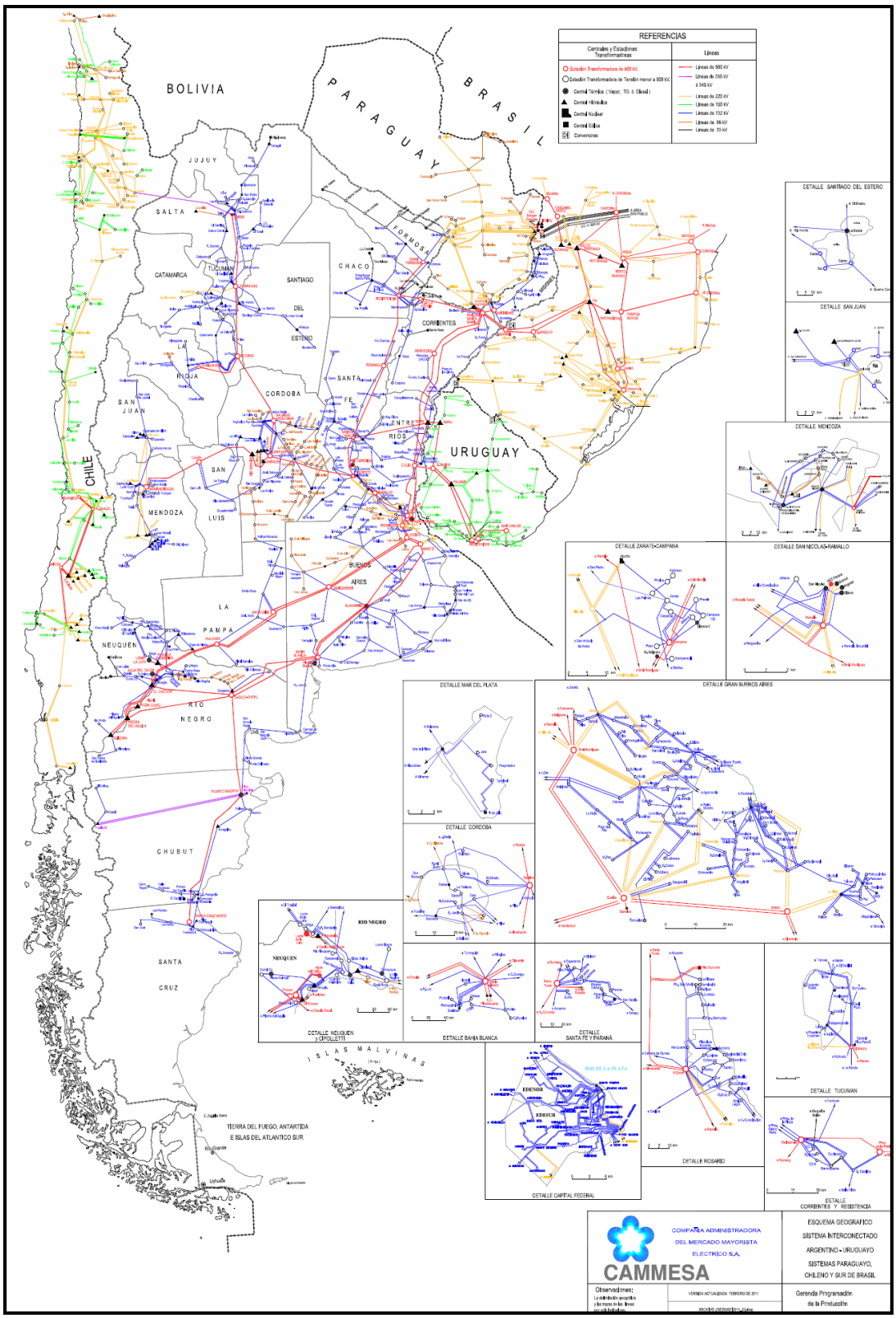


Figure 1.14: Lines of 500 kV, 300 kV and 132 kV.

Figure 1.15 presents lines of longitude and voltage run by each of the electricity transport system, by 2011.

TRANSPORTATION SYSTEM	500 kV	330 kV	220 kV	132kV	66 kV	33 kV	Total
TRANSENER	13,194		562	6			**13,762**
Troncal Distribution		1,116	848	14,825	422	24	**17,235**
TRANSNOA				4,184			**4,184**
DISTROCUYO			641	611			**1,252**
TRANSBA			177	5,535	398		**6,110**
TRANSNEA			30	1,407		24	**1,461**
DISTROCOMAHUE				1,215			**1,215**
TRANSPA		1,116		1,873			**2,989**

Figure 1.15: Energy Transport Companies, line type and Length of the Electricity Transport Lines.

Distribution

65% of distribution corresponds to provincial public services and cooperatives.

The remaining 35% is distributed between private companies such as EDENOR, EDESUR and EDELAP.

- EDENOR: supplies the northern part of Gran Buenos Aires and the city of Buenos Aires.
- EDESUR: supplies the southern part of Gran Buenos Aires and the city of Buenos Aires.
- EDELAP: supplies the area of the city of La Plata and its outskirts.

Consumers

Users are divided within the Electric Market in accordance with their consumption level:

- Large users (GUMA)
- Small users (GUME)
- Particular users (GUPA)

1.3.3. Main Indicators

As already mentioned in 1.3.2, Argentina relies on three main sources of energy: fossil, water and nuclear power; and an additional small one: wind energy.

Power from the electrical generators, as of December 2011, is divided like so: 59.1% comes from thermal generators of fossil origin, 37.5% comes from hydro generators, 3.4% is of nuclear origin and 0.03% comes from renewable energy.

Thermal generators represent 25.5% of the total generation system with steam turbines, 19.7% comes from gas turbines, 50.2% is produced through combined cycles and 4.6% with diesel engines.

Hydro power stations represent 12.5% of the total generation installed capacity, 22.5% of which are reservoir plants and 2.5% are pumping plants.

Current nuclear power plants are: Atucha I PHWR NPP, which has 1.2% of the installed power of the total capacity, and Embalse CANDU type NPP, which produces 2.2% of the total energy.

Tables 5 and 6 present the main characteristics of the electricity sector.

TABLE 5. ELECTRICITY PRODUCTION, CONSUMPTION AND CAPACITY

									Average rate of annual growth (%)
	1970	1980	1990	2000	2005	2007	2009	2010*	2000 to 2010
Capacity of electric power station (GWe)									
- Thermal	6.08	8.01	9.48	15.75	17.34	18.13	21.03	21.78	3.32
- Hydro	0.61	3.63	6.61	9.60	9.94	9.97	10.04	10.05	0.45
- Nuclear	0.00	0.37	1.02	1.02	1.02	1.02	1.02	1.02	0.00
- Wind	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.03	7.82
- Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
- Other renewable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
- Total	6.69	12.00	17.11	26.35	28.33	29.14	32.13	32.88	2.24
Electricity production (TW.h)									
- Thermal	20.17	22.22	25.58	53.93	63.87	75.84	78.94	84.90	4.64
- Hydro	1.55	15.14	18.14	28.84	34.25	31.65	35.18	33.90	1.63
- Nuclear	0.00	2.34	7.28	6.18	6.87	7.22	8.16	7.17**	1.50
- Wind	0.00	0.00	0.00	0.03	0.08	0.06	0.04	0.03	-3.11
- Geothermal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
- Other renewable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
- Total (1)	**21.73**	**39.71**	**51.00**	**88.98**	**105.0**	**114.7**	**122.33**	**125.99**	**3.54**
Total electricity consumption (TW.h)	18.72	33.49	40.53	75.28	90.20	101.83	106.36	111.87	4.04

(1) Losses in the electrical transmission are not deduced.

* Last available data.

** Embalse NPP generation decreased because it is limited to 80% (520 MW) of output power for its life extension.

SOURCE: STATISTICAL REPORT OF ELECTRICITY SECTOR. SECRETARIAT OF ENERGY.

TABLE 6. ENERGY RELATED RATIOS

	1970	1980	1990	2000	2005	2007	2009	2010*
Energy Consumption per capita (GJ/capita)	53.25	63.62	62.76	74.40	75.47	86.49	81.54	79.49
Electricity Consumption per capita (kW.h/capita)	745.73	1170.73	1238.24	2026.10	2337.62	2587.00	2653.66	2810.55
Electricity production/Energy Production (%)	6.29	8.16	8.59	9.34	10.95	12.22	13.25	13.98
Nuclear/Total Electricity (%)	0.00	5.89	14.28	6.94	6.54	6.29	6.67	5.71
Ratio of External Dependence (%)	8.60	12.50	2.14	-27.80	-21.78	-3.86	0.12	1.27

(1)								

(1) Net Import / Total Energy Consumption.

* Last available data.

SOURCE: NATIONAL ENERGY BALANCE OF THE SECRETARIAT OF ENERGY.

STATISTICAL REPORT OF ELECTRICITY SECTOR - 2010. SECRETARIAT OF ENERGY.

WHOLESALE ELECTRICITY MARKET MANAGEMENT COMPANY S.A (CAMMESA) www.cammesa.com

2. NUCLEAR POWER SITUATION

2.1. Historical Development and Current Organizational Structure

2.1.1. Overview

A few years after 1943, Enrico Fermi achieved a controlled chain reaction, thus introducing nuclear power into the worldwide scientific community. In Argentina, the first moves were made to establish the National Commission of Atomic Energy (CNEA), the entity responsible for all nuclear activity with peaceful purposes performed at a national level.

The creation of CNEA in 1950 was framed within an industrialization process promoted by the government, with the firm intention of not only possessing nuclear technology but of becoming its producer.

- During its first decade (1950-1959), CNEA activities were characterised by:
  - Organization of the first research and development equipment.
  - Training of employees abroad, conducted in the most advanced countries.
  - Creation of Bariloche Atomic Centre (CAB) in 1955, located in Río Negro Province.
  - Training of professionals specialized in physical sciences by means of the establishment of the Institute of Physics, currently Balseiro Institute.
  - Beginning of uranium prospecting and exploration activities.
  - Creation in 1958 of Constituyentes Atomic Centre (CAC), located in the northern area of Gran Buenos Aires.
  - Construction of the first 40 kW_t experimental reactor, RA-1 Argonaut type, and its fuel elements, which began in 1957.
  - The sale of "know how" of the manufacturing of fuel elements for "ARGONAUT" reactors to Degussa-Leybold AG German company, in November 1958.
  - In 1959, the Radioisotope Lab for Haematological Studies was inaugurated in the "Hospital de Clínicas de la Universidad de Buenos Aires" ("University of Buenos Aires' Hospital"), before the "Centro de Medicina Nuclear del Hospital de Clínicas Jose de San Martin" ("Jose de San Martin Hospital's Nuclear Medicine Center") which began operating in 1969.
- During its second decade (1960-1969), the following activities were conducted:

- Design and construction of experimental reactors 1 W_t RA-0, 0.1 W_t RA-2 and 3 MW_t RA-3 in 1965, 1966 and 1967, respectively.
- Research in metallurgy and fabrication of fuel elements for experimental reactors.
- Exploitation of a leaching plant in Don Otto (Province of Salta).
- In early 1964, a new stage in the history of nuclear energy in Argentina began, since the possibility of building the first nuclear power plant, Atucha I (CNA-I), was under analysis. During a 14-month period, the feasibility study in CNEA was completed, with the recommendation of building a 300 to 500 MW_e NPP in Lima, Buenos Aires Province. This study arrived at the conclusion that the project was technically feasible, economically convenient and financially sound. In addition to this, with a 40% to 50% investment from the national industry in NPP construction and operation, a development of scientific-technological activities in Argentina could be included. Likewise, it was necessary to decide whether to buy a light water reactor or a heavy water reactor.
- Construction of the first uranium concentrate plant in Malargüe (Mendoza Province), which started operating in 1965.
- Creation of the Ezeiza Atomic Centre (CAE) in 1967, located in the Western area of Gran Buenos Aires.
- In the period between 1970 and 1979, techniques of radioisotope production and applications of radiation to medicine, biology, industry and agriculture were developed. In order to obtain this, the followings tasks were achieved in CAE:
    - A multipurpose semi industrial irradiation plant was built (1970), with a 1,000,000 Ci (curies) capacity.
    - A radioisotope production plant in RA-3 reactor, which has met national demand since its creation in 1972, and currently contributes to alleviate the international shortage by supplying molybdenum-99 to Brazil.
    - A cobalt-60 sealed source production plant for medical and industrial uses (1978).
- The construction of CNA-I was concluded, operation of which started in 1974.
- In 1976, the pilot plant was built to manufacture fuel elements for CNA-I in CAC.
- In 1978, the construction of the experimental heavy water plant with a 3 t/year production capacity began in Lima, Buenos Aires Province.
- In 1979, the construction of the reprocessing pilot plant began in CAE.
- The allocation of the uranium deposit “Los Gigantes” took place in Cordoba province in August 1979.
- Also in 1979, the uranium concentrate plant was inaugurated in San Rafael, Mendoza Province.
- At the end of 1979, the construction of the heavy ion accelerator, which constitutes the “Argentine Tandem Laboratory” (TANDAR), began in CAC.

- The nuclear development of the following decade (1980-1989) was characterized by:
    - The completion of the nuclear fuel cycle stages prior to the entry of the fuel element to the reactor (“front end”), which triggered the following events:

  - Prospection of new uranium deposits in the Industrial Mining Complex San Rafael (CMFSR), Sierra Pintada (Mendoza), Los Gigantes (Cordoba), La Estela (San Luis) and Los Adobes (Chubut) Industrial Mining Complex.
  - Operation, since 1982, of a concentrated uranium and uranium dioxide production purifying plant, with a capacity of 150 t per year, in the Cordoba Industrial Nuclear Complex.
  - A fuel element plant started operating in CAE (CONUAR S.A.), in 1982, to supply the NPP in operation. A year later, it delivered the first fuel element for CNA-I.
  - In 1983, the uranium enrichment technology was mastered by means of the gaseous diffusion method, developed by CNEA with the collaboration of INVAP company in Pilcaniyeu, Province of Río Negro.
  - Start up, in 1984, of a special alloy plant mainly dedicated to producing Zircaloy clads and components for fuel elements in CAE. In 1986, the corporation FAE S.A. was created.
  - In relation to the stages of the nuclear fuel cycle, following the passage of the fuel element to the reactor ("back end"), a pilot plant for spent fuel reprocessing was built. This was deactivated in the mid-Eighties.

- Construction of the experimental reactor RA-6 at CAB, Rio Negro Province, in 1982.
- Completion of the second NPP, CNE, by the Atomic Energy of Canada Ltd. and the Italian Construction Company (Italimpianti). This NPP was located in Embalse Rio Tercero, Cordoba Province. CNE's start-up was conducted in January 1984, with a net power of 600 MW_e. The main attraction of the Canadian offer consisted of the agreement of technological transfer, which would be used to gain the knowledge to guarantee future independent production of nuclear energy.
- The following NPP to be built was Atucha II (CNA-II). This project began in mid-1980, by means of an agreement signed between CNEA and Siemens AG. The election of the German company as a supplier was based on the supply of an industrial heavy water plant, inaugurated in 1993. The agreement entailed the transfer of the know-how of the design, fabrication and assembly, for Atucha II and another 3 power plants, which were included in an expansion plan of the generation to a 20-year period. In order to complete that project, the "Empresa Nuclear Argentina de Centrales Electricas Sociedad Anonima" (ENACE S.A.) corporation was created, integrated by Siemens Kraftwerk Union (KWU) with a 25% property share and by CNEA with a 75% share. Starting in 1982, the funds provided for national supplies began facing difficulties, which were aggravated by the permanent modification of the exchange rate. This caused delays and the project was brought to a standstill, along with the growing difficulties of the Argentine economy. This situation endured for many years, and caused the dissolution of ENACE S.A.
- In 1985, MOX fuel, which is a fuel element of mixed oxides, was finally manufactured in CAC for irradiation proofs and post-irradiation analysis in Petten reactor, Holland.
- In 1985, the molydenum-99 fissile production in the radioisotope production in CAE began.
- In November 1985, a Joint Presidential Brazilian-Argentine Declaration on nuclear policy was signed

- In 1986, the Argentine Government executed the Convention on physical protection of nuclear materials.
- From 1985-1987, U_3O_8-Al fuels were manufactured to 20% of U-235 for the Critical Facility RP-0 of Peru.
- In December 1988, the formal inauguration was conducted in the Peruvian Nuclear Research Centre and reactor RP-10 in Huarangal, Peru, built by CNEA.
- From 1988-1989, the fuels U_3O_8-Al were manufactured to 20% of U-235 of NUR Reactor in Argelia. This reactor, built by the government corporation INVAP S.E., was inaugurated in 1989.
- At the end of 1989, the government corporation Empresa Neuquina de Servicios de Ingeniería S.E. (ENSI S.E.) was created to operate the Industrial Heavy Water Plant of Arroyito, Neuquén.
- From 1989-1992, U_3O_8-Al fuels were manufactured to 20% of U-235 for Teheran Research Reactor in Iran.

- In the following decade (1990-2000), and despite the unfavourable energy political paradigm in Argentina, the following events took place:
  - In March 1990, RA-3 research and production reactor reopened with a low-enrichment fuel elements core (20% of U-235), designed and built by CNEA.
  - In March, the inauguration of the Hot Cell Laboratory (CELCA) was conducted in CAE.
  - Start-up of the heavy water production industrial plant in Arroyito, Neuquen Province, with a 220 t heavy water design capacity of nuclear purity per year, to supply to nuclear power plants in operation as well as for the provision of the initial inventory of future NPPs.
  - In November 1990, a Joint Argentine-Brazilian Presidential Declaration was conducted on a common nuclear policy in Foz de Iguazu, Brazil.
  - Not-for-Profit Organization School of Nuclear Medicine (FUESMEN, by its Spanish acronym), based in Mendoza city, was inaugurated in May 1991.
  - In 1991, an Agreement was executed between the Argentine-Brazilian Agency of Accounting and Nuclear Material Control of Nuclear Materials (ABACC), the Argentine and Brazilian governments and the International Atomic Energy Agency (IAEA), which was inaugurated in September 1992 in Rio de Janeiro, Brazil. It is acknowledged worldwide as a regional cooperation model in terms of peaceful uses of nuclear energy.
  - In November 1993, CAC was created, along with the National University of San Martín, and the Technological Institute which is currently "Sabato Institute".
  - In 1994, a radioisotope production cyclotron was inaugurated in CAE.
  - In February 1995, Argentina adhered to the Non Proliferation Treaty (NPT).
  - In 1995, the production of molybdenum by fission for medical purposes at an industrial level began, in a plant in CAE. This facility became the first plant to operate with low-enriched uranium targets worldwide (20% of U-235), developed by CNEA. This was the result of the international requirement to reduce the use of U-235 to 90% for the proliferation risks implied by their uses.

- Since 1996, CNA-I has begun using low-enriched uranium fuels (LEU, U-235 to 0.85%), and since 2001, it has been the first and only heavy water plant which completely operates with LEU worldwide, an achievement obtained by scientists from CNEA. This change from natural uranium to LEU caused a decrease of 40% in fuel consumption, with a reduction of 30% in fuel costs.
- In 1997, the RA-8 critical facility of 10 Wt was built in Pilcaniyeu Technological Complex (CTP), in Río Negro Province.
- In Egypt, during the period 1994-1998, the design, start up and training of employees of the Fuel Manufacturing Pilot Plant (FMPP) was conducted, for the manufacturing of fuel elements corresponding to research reactors and of U_3O_8-Al (to 20% of U-235) for the Multipurpose Reactor ETRR-2 of 20 MW_t. In February 1998, the research and production reactor in Inshas, Egypt, was constructed by the government corporation INVAP S.E.
- In 1998, National Law No. 25018, Radioactive Waste Management Regime, was sanctioned. This law sets the basic instruments for the accurate management of radioactive waste, to guarantee in this regard environmental protection, public health and the rights of future generations.
- Since 1999, an integral revision has been conducted of the engineering of CAREM-25 Project.

- In the last decade the following achievements were obtained:
  - In January 2000, an agreement was executed between INVAP S.E. and the Australian Nuclear Scientific Technological Organization (ANSTO) to construct the research and production reactor OPAL of 20 MW. The fuel for this reactor, of U_3Si_2-Al, to 20% of U-235, was manufactured by CNEA in CAC during the period 2003-2007.
  - In December 2001, the Radiochemistry Facility Laboratory (RFL) was inaugurated in CAE.
  - In July 2002, the separation and purification of strontium-90 fission radioisotope was achieved, with important applications in medicine and industry.
  - In August 2002, Argentina became the first country to use low-enriched uranium targets (below 20%) for the regular production of the molybdenum-99 fission radioisotope.
  - In March 2003, the radiodrug FDG for diagnosis through (PET-CT) was supplied, based on fluorine-18 produced in the cyclotron of Ezeiza Atomic Centre.
  - In March 2003, CNEA submitted the Annual Report on Radiowaste and Spent Waste Management to the National Congress within the framework of a Radioactive Waste Management Act (Law No. 25018).
  - In March 2003, as part of CNEA's environmental policy framework, environmental restitution activities began to take place in the Industrial Mining Complex Malargüe (PRAMU Project).
  - In October 2003, the first application in Latin America of Boron Neutronic Capture Therapy (BNCT) was conducted in RA-6 research reactor at CAB.
  - In 2004, the Nuclear Diagnostic Centre Foundation (FCDN) was created with a PET-TC system and a Baby-Cyclotron.
  - At the end of 2005, the Joint Argentine-Brazilian Presidential Declaration on Nuclear Policy was executed in Puerto Iguazu, along with the Additional Protocol to the

Cooperation Agreement with Brazil for the development and application of peaceful uses of nuclear energy in terms of reactors, nuclear fuels, radioisotope and radiodrugs supply and radioactive waste management, and in the areas of legislation and implementation of nuclear regulation.

- In May 2006, CNEA and NA-SA executed the Agreement on Cooperation in Nuclear Energy with the Atomic Energy of Canada Limited (AECL).
- On August 23, 2006, the Reactivation of the Nuclear Activity in Argentina was officially announced, which included a nuclear program for the short and medium term based on two main topics: applying nuclear technology to public health and the industry and strengthening nuclear energy as an electrical power source by increasing its participation in the national electrical market through:
    - Concluding the building work of CNA II.
    - Extending the life cycle of CNE.
    - Beginning preliminary feasibility studies to construct a fourth NPP.
    - Concluding feasibility studies to construct the prototype modular facility of lower power (25 MWe) and national design, which began before nuclear activities were brought to a halt, under the name of "Central Argentina de Elementos Modulares" (CAREM, Argentine Modular Elements Facility) in accordance with Law No. 25064, Law No. 25160 and Law No. 26566.
    - Producing heavy water to be used in CNA II.
    - Reactivating both uranium prospecting throughout the country and the construction of the uranium enrichment pilot plant/facility. Both activities had been completely paralysed for political reasons since the second half of the Nineties.
- In November 2006, the official inauguration of the Cosmic Rays Observatory Pierre Auger took place in Malargüe, Mendoza Province.
- In December 2006, by means of the National University of San Martin, the Nuclear Technology Institute Beninson was created, in CAE.
- In April 2007, OPAL reactor, which was built by INVAP S.E. for ANSTO, was officially inaugurated.
- In July 2008, the World Bank granted a loan to finance activities corresponding to PRAMU.
- In 2009, the RA-6 research reactor went critical with a new configuration of the core, applying fuels of low-enriched uranium silicon (below 20%), becoming the first research reactor in Argentina to work with this type of fuel. Every research reactor in Argentina uses low-enriched uranium fuel elements by fulfilling non proliferation international agreements and the commitment of peaceful uses of nuclear energy in Argentina.
- In July 2009, the first national container was manufactured. Its design was achieved by CNEA to transport radioisotopes.
- In September 2009, IAEA designed Balseiro Institute as a Collaboration Centre for the Development of Human Resources for Nuclear Technologies and their Applications.

- In November 2009, Law No. 26566 was enacted by ample majority in both chambers, declaring CNE's life extension a matter of national interest. This law was sanctioned in December 2009, and authorises the creation of both trust-funds to conduct the above mentioned extension and to construct the fourth Argentine nuclear power plant. Likewise, CAREM 25 NPP is also a matter of national interest, and the law states that it shall be constructed by CNEA.
- At the end of 2009, the Institute of Technologies in Detection of Astroparticles was established jointly by CNEA, CONICET (National Council of Scientific and Technical Research) and UNSAM (National University of San Martín).
- In May 2010, an agreement was signed with Formosa Province to boost the construction of a CAREM NPP. At present, siting studies are taking place.
- On October 25, 2010, uranium enrichment plant in CNEA installations in Pilcaniyeu Technological Complex was reactivated.
- In November 2010, the 2010-2019 CNEA's Strategic Plan was presented at the XXXVII Annual Meeting of the Argentine Association of Nuclear Technology (AATN), in conjunction with the 60th anniversary of the Institution, in order to strengthen the reactivation of nuclear activity in Argentina.
- In December 2010, CNEA received the qualification of the National Management of Food, Drugs and Medical Technology (ANMAT) to produce, register and commercialize medical radioisotopes produced in the main facilities that the Institution has in the CAE: Radioisotope Production Plant and Production Cyclotron.

- Finally, in 2011, the nuclear activity was strengthened by the following milestones, which allow for the resumption of the Argentine Nuclear Plan development:
  - In January 2011, Argentina finished the design of a new fuel element model for a PWR reactor. This is an innovation achieved by CNEA, and is a further step towards finalizing the project to create the first reactor of domestic making, wholly designed and built in the country, and known as CAREM.
  - During 2011, the conceptual design was concluded for the new multipurpose research reactor RA-10 for production of radioisotopes.
  - In 2011, new equipment for the Oncological Centre of Nuclear Medicine of the Oncological Institute Roffo was purchased. This included a *multislice* tomography, with a next-generation ultrasound, a computer scan of plain radiography and the first direct digital mammography of the generation to arrive in the country.
  - On June 9, the Argentine satellite SAC-D/Aquarius was launched from California, equipped with solar panels which have been developed and manufactured by the Solar Energy Department of CNEA.
  - At the science, technology and art fair named *TECNOPOLIS*, CNEA introduced two interactive domes wherein people could move through and explore the nuclear fuel cycle, and experience the 3D video display that explains the workings of the CAREM.
  - In August 2011, the FUESMEN launched the first linear accelerator in the South of Mendoza with the help of the Ministry of Health and CNEA.
  - Under the bilateral agreement between the presidents of Argentina and Brazil, the supply of 1/3 of Brazil's needs for the molybdenum-99 radioisotope was continued during 2011.
  - In 2011, the first cycle of the Nuclear Reactors Senior Technician training in the Dr. Oscar Melillo Center in the town of Lima took place. The creation of this career aims

to have new top-level educational opportunities linked to electronuclear expansion projects in the country.

- On September 28, 2011, the President of Argentina, Cristina Fernandez de Kirchner, inaugurated the first phase of implementation of Atucha II NPP, located in Lima, Buenos Aires Province.
- At the end of 2011, the trust agreement between the President of CNEA and the head of the *Banco de la Nación* of Argentina, for the realization of CAREM NPP, was signed.
- During 2011, the tasks at the site where the CAREM NPP will be located were advanced. These were mainly the construction of the simulator scale reactor, the enhancement of existing structures, and excavation of the pit required for the building of CAREM 25, which has advanced to a first level of 6 meters, and will reach 12 meters when the second stage concludes.
- The radioisotope production plant in INSHAS Atomic Center, located 60 km from El Cairo, in Egypt, successfully produced the first batch of radioisotopes for medical applications using technology developed in Argentina.
- CNEA, in conjunction with DIOXITEK, CONUAR and FAE, completed the delivery of the 451 fuel elements constituting the first nucleus of Atucha II NPP.
- In December 2011, the interconnection of the Atucha II NPP 500 kV line, with the TRANSENER high-voltage conveyor extending between Ramallo and General Rodriguez towns, in Buenos Aires Province, was concluded.

It is worth mentioning that Argentina has experience in design, construction and assembly of experimental reactors, and up to the present day it has exported the following reactors:

- RP-0 Training Reactor of zero power operating since 1978. It was sold to the “Instituto Peruano de Energía Nuclear” (IPEN, Peruvian Institute of Nuclear Energy) by CNEA.

- Research reactor, radioisotope fabrication and training of personnel, RP-10 of 10 MW in operation since 1988. Sold to IPEN by CNEA.

- Multi-purpose facility 1MW, named as NUR (a word of Arabic origin which means "luminosity"), in operation since 1989. It was sold to the Algerian "Haut Comissariat pour la Recherche".

- Multi-purpose reactor ETRR-2 of 22 MW, in operation since 1997. It was sold to the Egyptian Atomic Energy Authority (AEA).

- Radioisotope production facility with medical and industrial application, located in Inshas, next to the ETRR-2 reactor. It was sold to the Egyptian Atomic Energy Authority.

- CENTIS radioisotope production and fractioning facility, inaugurated in 1995. It was sold to the company "Inversiones Gamma", dependent on the Ministry of Nuclear Topics of the Cuban Republic.

- Reactor, known as OPAL, of 20 MW, which supplies radioisotopes for microelectronic and material research. In operation since 2005. Located in

Lucas Heights, Sydney, Australia. Sold to the Australian Nuclear Science Technology Organisation (ANSTO).

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION http://www.cnea.gov.ar/;

INVAP SE. http://www.invap.com.ar/;

INFOLEG LEGISLATIVE INFORMATION. http://www.infoleg.gov.ar/.

2.1.2. Current Organizational Chart(s)

Since August 30, 1994, through a governmental decree (No. 1540/94), the nuclear sector has been reorganised, and thus nuclear activity has been divided into three entities. Nuclear Regulatory Authority (ARN, by its Spanish acronym), Nucleoeléctrica Argentina Sociedad Anónima (NA-SA) and the National Atomic Energy Commission (CNEA) are responsible for the regulation and operation of facilities, for research and for the development of the sector accordingly. Before this division, every activity was developed by CNEA.

Figure 2.1 introduces the dependence of the actors of the nuclear area on the national government.

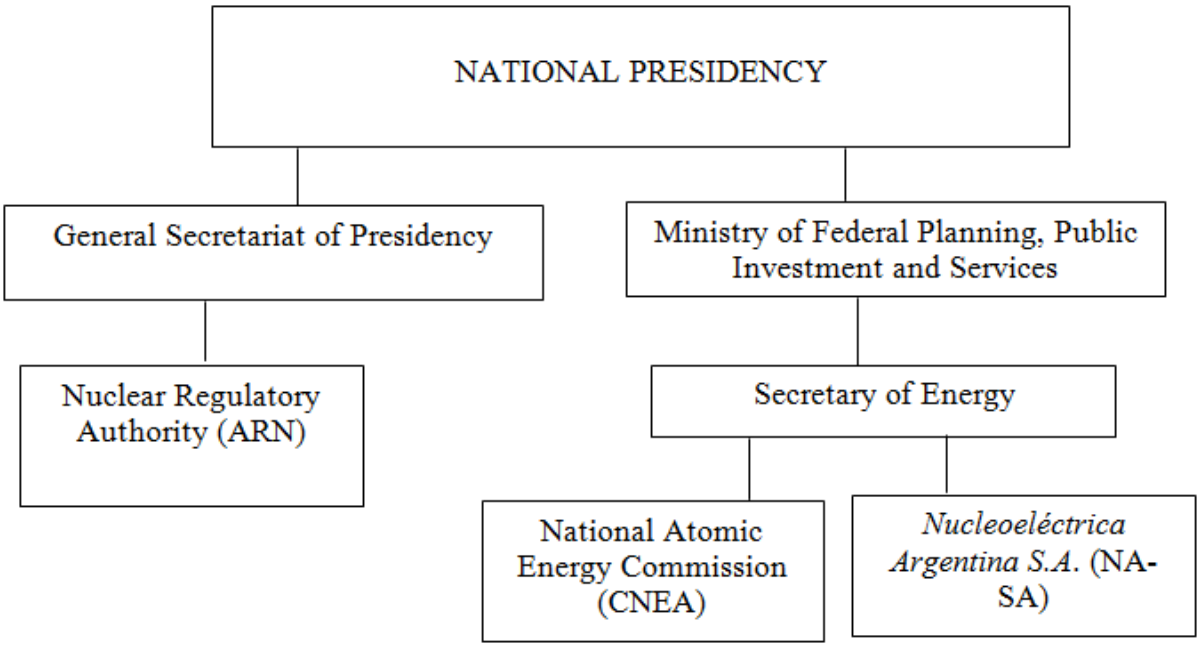


Figure 2.1: Organizational Chart of the National Nuclear Activity.

ARN assumed the responsibilities for regulating nuclear activities which were previously performed by CNEA. Its function is to establish regulations on nuclear and radiological safety and to make regulations related to the physical protection and control of the use of nuclear materials. It is responsible for granting licenses, regulation of nuclear facilities and meeting international safeguards.

The main task of NA-SA is to operate nuclear power plants. At present, it is responsible for financing the construction of CNA II. The decree also binds NA-SA to paying an annual tax to CNEA and ARN for licence fees.

The abovementioned decree was formally substituted by Law No. 24084, known as the "National Law of Nuclear Activity". Sanctioned by the Argentine National Congress in

1997, it came into force in 1998 (through the decree 1390/98). This federal law ratified the division of CNEA into the three entities, and legally allowed the gradual/eventual privatization of NA-SA through an international bid.

CNEA advises the Executive Power on the definition of the nuclear policy. As a Research and Development Institution in the nuclear area, it performs activities connected to the nuclear area and the relevant human resources. It regulates decommissioning of the relevant nuclear facilities, carries out programmes related to nuclear NPPs, nuclear fuel cycle, radioisotopes applications and radiation, is responsible for management of radioactive wastes and owns special fissionable radioactive materials.

Figure 2.2 presents the diagram of fund sources for the three nuclear entities.

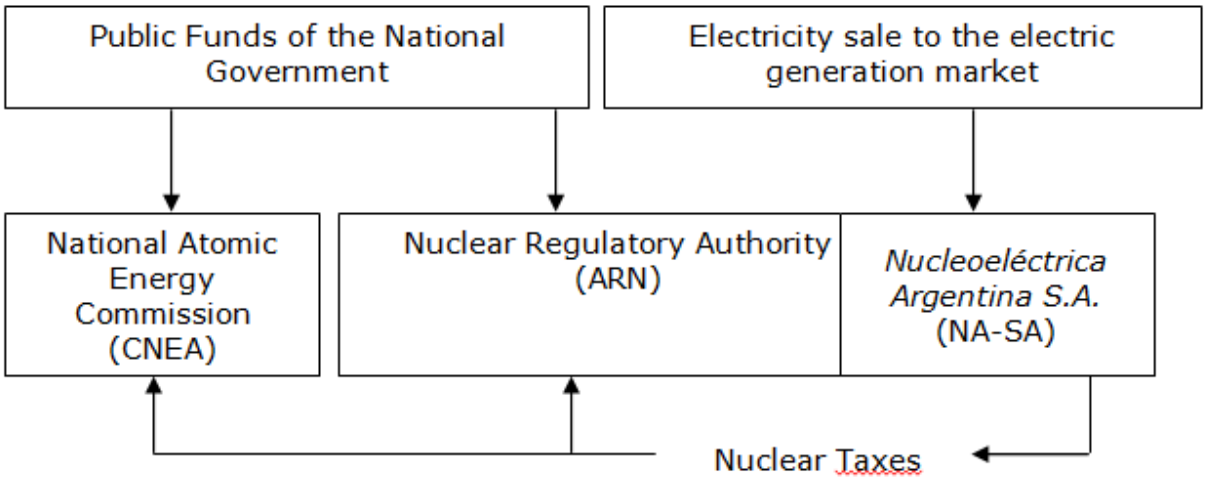


Figure 2.2: Cash Flow of Nuclear Activity.

Other nuclear entities are the associated companies with CNEA, created as commercial entities devoted to production activities at an industrial scale. These include:

- INVAP SE: It was created in 1976 by an agreement between CNEA and the Provincial government of Río Negro. Its headquarters are located in the city of San Carlos de Bariloche of Río Negro. This company is devoted to the development of advanced technology in different areas. It carries out multidisciplinary technological projects in nuclear, space and industrial areas, performing works entailing some (or all) of the following stages: feasibility studies, product development, design, engineering, supply, construction, assembly, start-up, operation and post-sale service. Among the engineering services relevant to NPPs, the following can be mentioned: repairing, modernization and dry storage engineering of spent fuel elements.

- CONUAR SA: Combustibles Nucleares Argentinos S.A. (Argentine Nuclear Fuels Company) was created in 1981. The industrial facility is located in CAE, where uranium pellets are manufactured along with the assembly of structural components to fabricate fuel elements for NPPs. CNEA owns 33.33% of the assets of this company, and SUDACIA SA, 66.67%, which belongs to the Perez Companc Group. The facility also manufactures fuel elements devoted to research reactors (enriched uranium up to 20%) and control reactivity rods (cobalt cores), and provides services in the nuclear area to research reactors, hot cells and nuclear facilities.

- FAE SA: Fábrica de Aleaciones Especiales SA (Special Alloys Industrial Company). It was created in 1986, and during its beginnings it devoted its activity to producing Zircaloy tubes for the Nuclear Industry. It is located in Ezeiza, Buenos Aires, next to CAE. CNEA owns 55% of the assets. The company has been created to provide zirconium tubes for nuclear fuel of the NPPs of the Argentine electronuclear CNA I and CNE facilities. At present, it is the only Latin American producer of tubes without special alloys seam, such as austenite stainless steel and duplex, nickel and titanium.

- ENSI SE: Empresa Neuquina de Servicios de Ingeniería SE. It was created on December 21, 1989, through Law No. 1827, sanctioned by the Provincial Legislature. It is a State Corporation owned and formed by CNEA (49%) and the province of Neuquén. It operates the Heavy Water Industrial facility (PIAP, by its Spanish acronym) belonging to CNEA, and commercialises heavy water at a reactor degree. Its main purpose is to operate chemical facilities and/or petrochemical facilities, the production and commercialization of chemical products and, as a secondary goal, intends to perform applied research activities, technological development, engineering design, construction, assembly and start-up of industrial facilities and any other services related to the Argentine industrial sector.

- DIOXITEK SA: It was created by the Executive Power in 1997 so as to guarantee uranium dioxide supply, used in the manufacturing of fuel elements for CNA I and CNE facilities. It is a state-owned company. CNEA owns 99% of its assets and the province of Mendoza owns the remaining 1%. The industrial facility is located in the city of Córdoba. It began operating in 1982, and Dioxitek SA has been responsible for it since May 1997.

In Figure 2.3, the technical relations and supply connections among CNEA, NA-SA, supplier companies and ARN are presented.

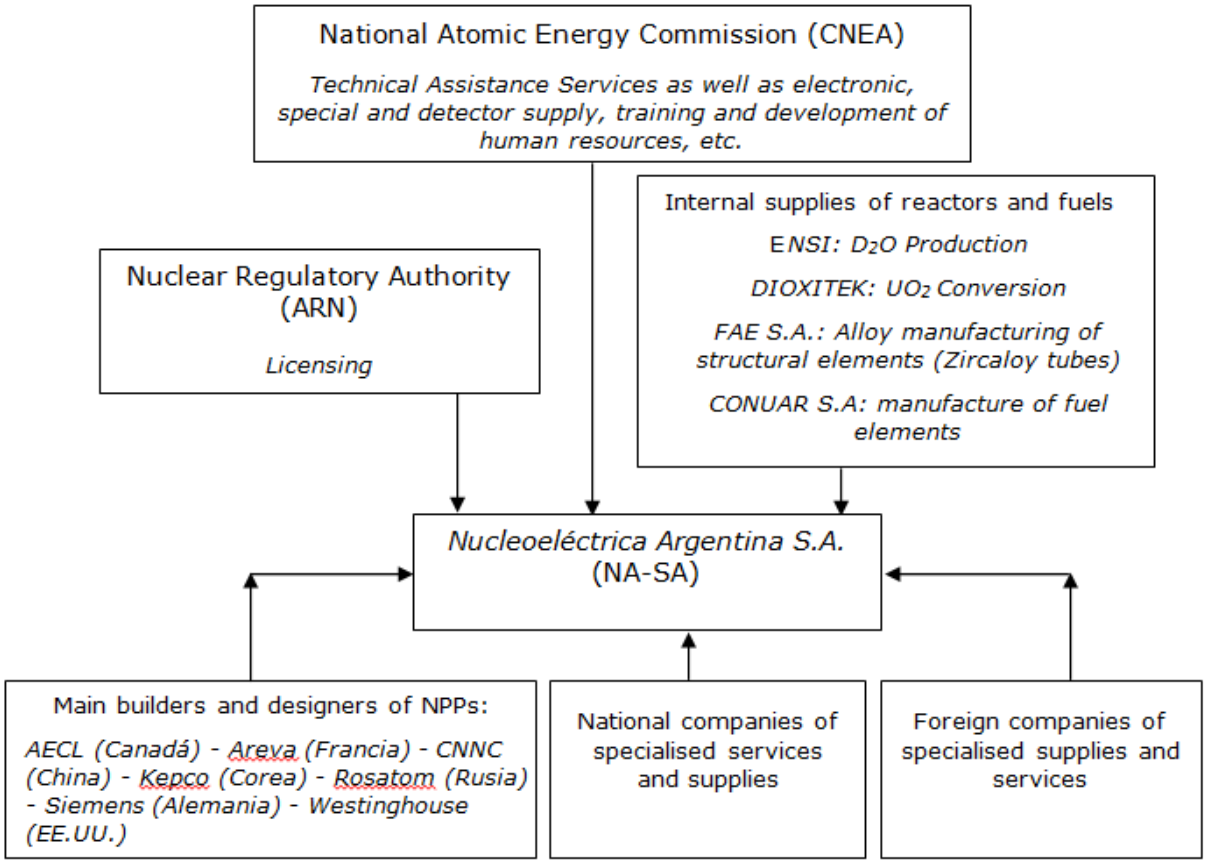


Figure 2.3: Technical and Supply links of the Nuclear Sector.

SOURCE: MINISTRY OF FEDERAL PLANNING, PUBLIC INVESTMENT AND SERVICES. http://www.minplan.gov.ar/,

NATIONAL ATOMIC ENERGY COMMISSION: http://www.cnea.gov.ar/,

NUCLEAR REGULATORY AUTHORITY: http://www.arn.gov.ar/,

NA-SA NUCLEOELÉCTRICA ARGENTINA SA: http://www.na-sa.com.ar/,

ENSI SE EMPRESA NEUQUINA DE SERVICIOS DE INGENIERÍA: http://www.ensi.com.ar/,

CONUAR SA: http://www.conuar.com.ar/,

DIOXITEK SA: http://www.dioxitek.com.ar/,

INVAP SE: http://www.invap.com.ar/,

FAE SA: http://www.fae.com.ar/.

2.2. Nuclear Power Plants: Overview

2.2.1. Status and Performance of Nuclear Power Plants

At present, around 5% of the electricity in Argentina is produced by the two nuclear facilities in operation, CNA I and CNE, which have a total installed facility capacity of 1,005 MWe, with a net contribution of 935 MWe.

During the period 1984-1990, nuclear participation represented around 15% of the total generated electricity. This has been gradually reduced owing to the extension of the installed capacity based on other technologies and the discontinuity of the nuclear plan, which resulted in the halt of building activities concerning CNAII NPP. CNA II, located next to

CNA I, is still under construction but is over 90% complete. Its completion was forecast for 2011 and it will increase electronuclear power by 10%.

While nuclear generation has kept a normal dispatch since March 2011, Embalse NPP began operating within a limit of 80% (520 MW) of its maximum capacity, due to preparations for its life extension.

On September 28, 2011, the process of the implementation of Atucha II NPP began, which consists of testing and individual verification of each of the 566 subsystems. It is expected that the verification of each power plant's sector performance will continue during 2012. This process leads to the production of steam and energy generation, finally entering the plant into commercial operation.

The main characteristics of NPPs in operation are presented as follows:

CNA I:

This is sited on the right bank of the river Paraná de Las Palmas, Lima, Zárate, province of Buenos Aires, 100 km from the city of Buenos Aires. The thermal power of the NPP is 1,179 MWt thus contributing 220 kV to the Interconnection Argentine System (SADI).

CNA I is a pressurised heavy water reactor (PHWR), refrigerated and moderated with heavy water. At first, fuel elements were designed based on natural uranium (0.7% of U-235 isotope), but by a modification performed in 1995, it was possible to replace it with slightly enriched uranium (0.85% of U-235 isotope), in order to raise the degree of fuel element burned up by reducing the number of consumed elements. It became the first reactor in the world to operate with this degree of enrichment and heavy water.

This NPP engulfs the following facilities: reactor, primary, secondary and tertiary refrigeration circuits, the pressure maintenance system, the moderator system, auxiliary and secondary facilities, turbine building and the electric operations area. It also has two spent-fuel elements pools, located in an adjoining building.

A particular characteristic of this reactor is that it has a machine to replace fuel elements which avoids the interruption of service, something different from NPPs with PWR (Pressurised Water Reactor) or BWR (Boiling Water Reactor).

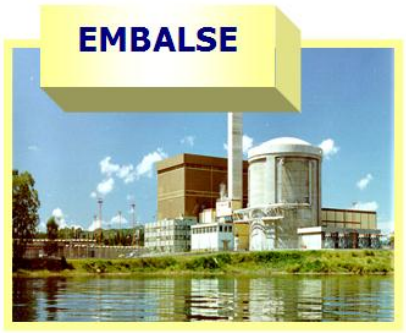
CNE:

Chronologically, this is the second Argentine NPP and the largest thermal unitary (machinery) Argentine reactor, with an electric nominal power of 648 MW.

CNE is located in the southern coast of Embalse de Río Tercero, province of Córdoba, 665m above the sea level. It is 100 km away from Córdoba city and 700 km from the city of Buenos Aires. It began its commercial service on January 20, 1984, and uses a CANDU (**Can**adian **D**euterium **U**ranium) reactor with PHWR technology. It uses natural uranium as fuel and heavy water as refrigerant and moderator. Just like CNA I, loading and unloading of the fuel is performed during the operation of the NPP.

As well as generating electrical power for SADI, this NPP produces cobalt-60 (Co^{60}), used in medical, industrial and research applications. It is the third largest worldwide producer of the mentioned radioisotope.

The geographical location of the operating NPPs and their relevant characteristics are presented in Figure 2.4.



EMBALSE NPP Operating Since 1984	
Type of reactor	CANDU
Thermal power	2109 MW_t
Electric power	648 MW_e
Moderator and cooling System	Heavy water (D_2O)
Nuclear Fuel	Natural uranium
Steam generator	4 vertical "U" tubes Incalloy 800
Turbine	1 high pressure step and 3 low pressure step. Speed: 1500 rpm
Generator	4 poles 22 kV Voltaje, 50Hz

ATUCHA NPP Operating since 1974	
Type of reactor	Pressure vessel
Thermal power	1179 MW_t
Electric power	357 MW_e
Moderator and cooling System	Heavy water (D_2O)
Nuclear Fuel	Slightly enriched uranium (0,85%)
Steam generator	2 vertical "U" tubes Incalloy 800
Turbine	1 high pressure step and 3 low pressure step. Speed: 3000 rpm
Generator	4 poles 21 kV Voltaje, 50Hz

Figure 2.4: Site and characteristics of the operating NPPs.

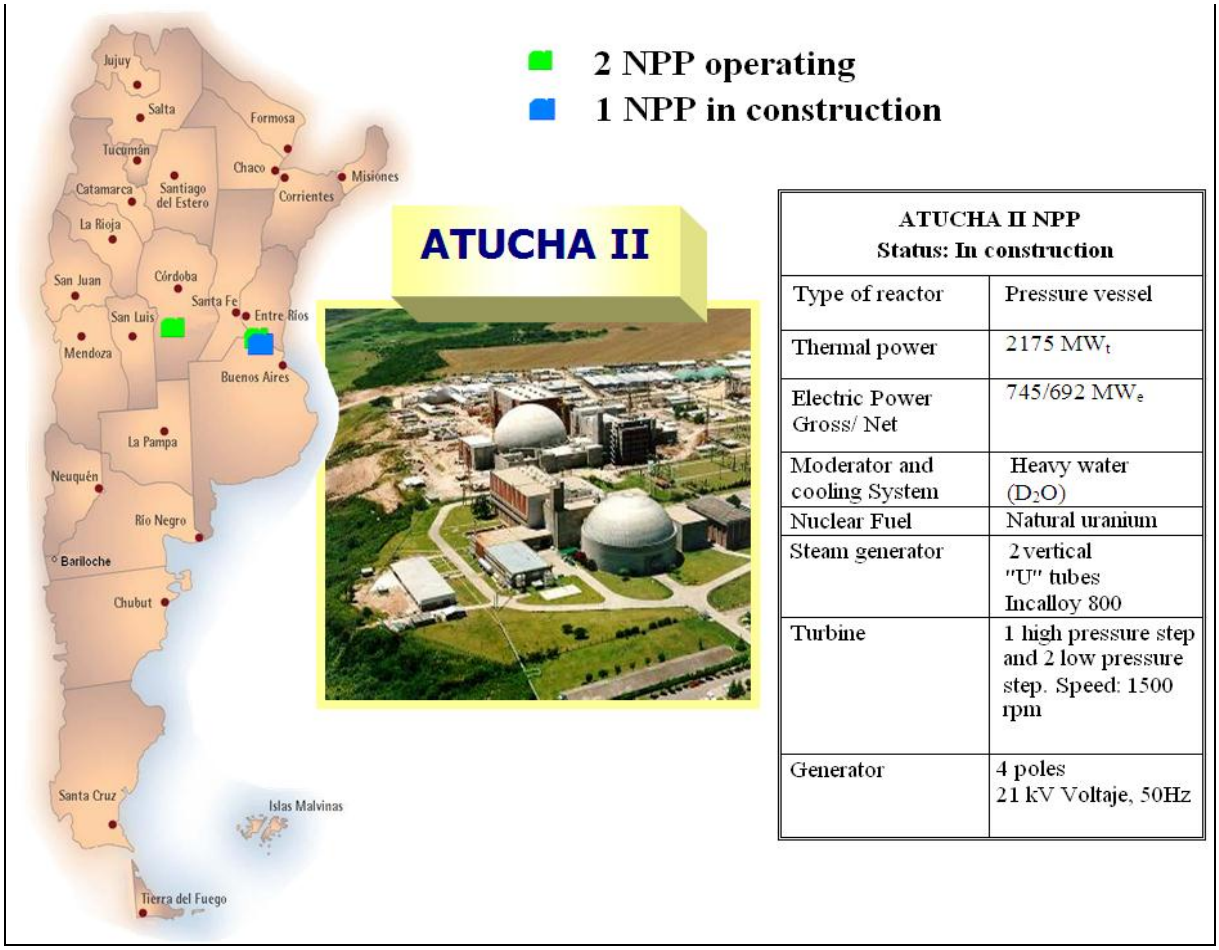
The main characteristics of the NPP under construction are described as follows:

CNA II:

CNA II is sited on the right bank of the river Paraná de Las Palmas, in Lima, Zárate, province of Buenos Aires, 100 km from the city of Buenos Aires and next to CNA I.

In the same way as its neighbouring NPP, CNA II is a Pressurised Heavy Water Reactor (PHWR), and its fuel will initially be natural uranium, in keeping with the original design.

The geographical location and characteristics of the NPP under construction are presented in Figure 2.5.



ATUCHA II NPP Status: In construction	
Type of reactor	Pressure vessel
Thermal power	2175 MW_t
Electric Power Gross/ Net	745/692 MW_e
Moderator and cooling System	Heavy water (D_2O)
Nuclear Fuel	Natural uranium
Steam generator	2 vertical "U" tubes Incalloy 800
Turbine	1 high pressure step and 2 low pressure step. Speed: 1500 rpm
Generator	4 poles 21 kV Voltaje, 50Hz

Figure 2.5: Site and characteristics of NPP under construction.

Thermal power of the NPP will be 2,175 MWt, thus obtaining an electric gross power of 745 MWe. This represents the largest power unitary machine to enter SADI since it has begun operating.

CNA II is under construction according to the construction license, regulations and inspection programme provided by ARN.

In Table 7, the characteristics of the NPPs in operation and under construction are presented.

TABLE 7. STATUS AND PERFORMANCE OF NUCLEAR POWER PLANTS

Station	Type	Net Capacity (MWe)	Operator	Status	Reactor Supplier	Construction Date +	Grid date ++	Commercial Date	Shutdown Date	UCF (2011)*
ATUCHA I	PHWR	357	NA-SA	In operation	Siemens	01/06/68	19/03/74	24/06/74	-	79.30%
EMBALSE	PHWR	648	NA-SA	In operation	AECL	01/04/74	25/04/83	20/01/84	-	68.55%**
ATUCHA II	PHWR	692	NA-SA	Under construction	Siemens	14/07/81			-	

+ Date, when performing the first major casting of concrete, generally for the base mat of the reactor building is done.

+ + Date of first connection to the grid.

* UCF (Unit Capability Factor) for the latest available year (only applicable to reactors in operation). Latest data available: December 2011.

** The decline of the UCF of Embalse NPP is because the full capacity is limited to 80% (520 MW) due to life extension tasks.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION http:www.cnea.gov.ar

NUCLEOELÉCTRICA ARGENTINA S.A.: http://www.na-sa.com.ar

INTERNATIONAL ATOMIC ENERGY AGENCY. NPPS INFORMATION SYSTEM: http://www.iaea.org/pris.

2.2.2. Plant Upgrading, Plant Life Management and License Renewals

CNA I:

Throughout its life time, different improvements in the facility design were implemented, such as: exchange of all fuel elements and fuel channels, construction of the second ultimate heat sink, construction of the second spent fuel temporary storage pool and modification of the steam dump channel of the tertiary circuit, owing to the construction of CNA II.

In 1996, the fuel design was changed from using natural uranium to using slightly enriched uranium, which resulted in a 40% reduction in fuel consumption and around a 30% reduction in costs. The date in which the storage pool would reach its highest capacity was therefore postponed.

At present, the feasibility of a spent fuel dry storage is being undertaken, for when the elements are extracted from their storage pools.

CNE:

The NPP is estimated to conclude its life time in 2012, and so Nucleoeléctrica Argentina is developing its Life Extension Project. Currently, the plant is operating at 80% of its maximum capacity, in preparation for the life extension.

The objective of the project is to extend the plant's life time for up to another 25 years of safe, trustworthy and competitive operation. Additionally, it is expected to increase the electric power of the NPP by approximately 35 MWe.

In this context, CNE is developing actions linked with the facility life time management and has completed the analysis of life and ageing assessment for different NPP systems.

The major working areas to be developed in the project are: revision of pressure and calandria tubes, feeder, change of steam generators and repowering.

CNA II:

From a design and construction perspective, CNA II has been planned with updated safety systems, including the concept of defence in depth with successive barriers, contention sphere, physical separation between safety systems and surveillance programme in service, among others.

The schedule of the project consists of three stages. Stage I involves relaunching the project (organisation, recovery of the infrastructure, engineering and contracts). Stage II consists of construction and assembly (at present under development), and Stage III involves NPP start-up/commissioning.

The remaining design tasks are to be performed by NA-SA, with contributions from the scientific and technological resources of CNEA and with the participation of other entities and national and international companies.

SOURCE: NUCLEOELÉCTRICA ARGENTINA S.A.: http://www.na-sa.com.ar

2.3. Future Development of Nuclear Power

2.3.1. Nuclear Power Development Strategy

The Argentine strategic nuclear plan includes the reactivation of the sector, from an energy point of view, through the insertion of major nuclear participation into the electric matrix by revitalising the applications in medical and industrial areas.

This reactivation is based on the knowledge and domain of disciplines of a high technical and technological level, which place the country in a competitive worldwide context. Even though there was paralysis of some nuclear activities during the nineties, Argentina currently has a sector which transcends its own barriers and is recognised by the rest of the industrial and service sectors.

It is forecast that it is likely Argentina will recover those capacities not wisely used during the last decade. Moreover, it is expected that Argentina will prepare and train the necessary human resources to bear the responsibility for continuing and improving the nuclear development in Argentina, in order to supply present and future energy needs.

Notwithstanding the political definition provided in 2006, Law No. 25160 was sanctioned on September 1st, 1999 (enacted on September 27th, 1999), thus enabling CNEA to create the CAREM Project, which was registered by CNEA and INVAP SE.

More details about the nuclear plan were announced on August 23rd, 2006, by means of the speech delivered by the Minister of Planning, Public Investment and Services, Julio De Vido. Key aspects are transcribed below:

> "(...) This reactivation is based on two technical, pragmatic main points which have a mere strategic content:
>
> -"In the first place, a massive production of nucleoelectric energy, (...)
>
> -"Second, nuclear technological applications to public health and industry (…).
>
> "(...) As part of the plan, building activities of Atucha II NPP will be concluded and this NPP will be commissioned."

As mentioned in section 1.2.3., National Law No. 26566 was sanctioned on November 25th, 2009 and enacted on December 17th, 2009. This law regulates nuclear activities and enables:

- Extension of the operating licence and necessary tasks for CNE's life extension.
- Beginning of studies for the definition of life extension of CNA I.
- Execution of pending building activities so as to conclude the construction, commissioning and operation of CNA II.

- Beginning of preliminary studies of the feasibility of constructing a fourth NPP.

- Design, execution and commissioning of a CAREM prototype reactor.

As regards prospecting and exploitation activities, a plan entails the reopening of certain mining areas already developed in former years, as well as the incorporation of new reserves through prospecting, with the aim of reactivating national prospecting of uranium.

By continuing with the activities required by the fuel cycle, the uranium enrichment project is being undertaken, through gaseous diffusion process in the Pilcaniyeu Technological Complex, in the province of Río Negro. At present, the preparatory stage of the enrichment pilot plant is under development.

Taking into account the greater worldwide participation of enriched uranium and light water reactors, studies have been undertaken to determine the feasibility of incorporating this line of reactors in Argentina. These have concluded that "Argentina has to incorporate an enriched uranium NPP which should resemble a 3rd generation NPP", given the internal and external implications from a technological, economic and human resource point of view, since the incorporation of NPPs with enriched uranium would enable the optimization of the fuel cycle in Argentina through the application of both technologies.

The strategy is based on promoting competition among suppliers with the aim of achieving technological transference, the best economic, financial conditions, ideal guarantees of components and critical supplies, as already done with CNA I, CNE and CNA II.

The incorporation of an enriched uranium reactor does not imply that natural uranium reactors have to be abandoned but rather that there must be complementation between both lines.

CNEA has adopted a responsible attitude towards the environment and the prevention of environmental pollution, and has created a Programme on Environmental Restitution of Uranium Mining (PRAMU) which sets the following objectives: ensuring the environmental protection, health and other rights of present and future generations, by making a rational use of resources. PRAMU, within that framework, intends to improve the present conditions of uranium mining tailings deposits by considering that, even though at present they are under control, in the long term, different remediation actions have to be performed so as to ensure the protection of the environment and the public.

In December 2009, CNEA sent the Preliminary Safety Report (IPS), prepared by CAREM, to the ARN, thus fulfilling all the necessary requirements for obtaining license to build the reactor. Suggestions by the ARN are currently being analyzed in order to meet the requirements for authorization of land use.

The nuclear energy generation proposal, according to the strategic energy plan prepared by the Secretariat of Energy, indicates that it expects to incorporate 1,500 MW of nuclear power by 2020, and another 1,500 MW by the year 2030.

The technology to be introduced is currently under evaluation, and it is estimated that it will have the tender for international bidding by the end of 2012.

The policy related to the nuclear fuel cycle includes the recovery of all the national fuel cycle stages already developed, and adding those not assessed that will eventually allow for the completion of the cycle, mainly the enrichment and the reprocessing process.

In accordance with the National Law No. 25018 "Management of Radioactive Wastes", CNEA is responsible for supervising and treating wastes coming from any

Argentine nuclear utilities, to guarantee the final disposal of low-, medium- and high-level radioactive wastes.

Spent fuel elements coming from NPPs have high-level activity but are not considered radioactive wastes. These are temporarily stored in decaying pools and/or dry storage silos.

In the case of CNE, spent fuel elements are deposited in the decaying pools for 5 to 6 years, and are transferred after that period to transitory dry storage silos located in the same site as the NPP.

CNA I's spent fuel elements (which are roughly 5 m long) remain stored in the decaying pools from the beginning of NPP operation. At present, studies are being carried out in order to determine the feasibility of dry transitory storage of these fuels.

CNEA guarantees transitory storage and treatment of radioactive waste in CAE (Ezeiza Atomic Centre). This includes medium- and low-level radioactive waste of any origin in Argentina, as well as spent fuel groups in research and Argentine production reactors.

According to the same federal law (No. 25018), CNEA is responsible for each Argentine NPP at the end of its operation life and for all its stages of its decommissioning and decontamination.

According to this law, the "Fund for Radioactive Waste Management" is to be created. This fund would be intended for financing of the National Programme of Waste Management, under the charge of CNEA, and would be established by contributions from radioactive waste producers.

The State will continue to make financial contributions through CNEA for the National Programme of Radioactive Wastes budget until this article of the law is regulated, since neither this fund nor the percentage of the invoicing which the operator of the NPP should contribute to its constitution has been created.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION http://www.cnea.gov.ar/

NUCLEOELÉCTRICA ARGENTINA S.A. http://www.na-sa.com.ar/

LEGISLATIVE INFORMATION, CENTRE OF DOCUMENTATION AND INFORMATION FROM THE MINISTRY OF ECONOMY AFFAIRS AND PUBLIC FINANCES http://www.infoleg.gov.ar/.

2.3.2. Project Management

Currently, the management of CAN II's construction project (80% of the total work) is performed by NA-SA, while technological support is provided by CNEA. The management of the CAREM reactor prototype project is the responsibility of CNEA.

Main actors of the nuclear sector are those mentioned in section 2.1.2. The following private capital companies provide services in the nuclear area at present:

- Electro-Ingeniería S.A: Company devoted to the design, construction, operation and maintenance of major infrastructure and services activities. During the last years, it has worked on development and research as part of its expansion. It has an international certificate for its welding processes. During the Seventies, it acted as a subcontractor of NPPs under construction. It performs the piping assembly for CNA II, and also the assembly of primary pipes and moderator.

- Techint: In the nuclear area, it performs engineering and assembly tasks. It performs the piping assembly for CNA II in the conventional building.

- TECNA: Since the Seventies, it has participated in the nuclear area as a subcontractor. It performs engineering tasks in piping and support design, electricity, processes, instrumentation, supervision of welds and non-destructive assays.

- IEACSA S.A: It builds decaying pools for CNA II.

- INVAP S.E: It does maintenance and reparations in the least invasive manner, by means of robotic tele-commanded tools.

- IMPSA: Manufacturing of vapour generators and heat exchanger of the moderator for CNA II.

SOURCE: TECHINT. http://www.techint.com/group/es/

TECNA. http://www.tecna.com.ar/

ELECTROINGENIERÍA S.A. http://www.eling.com.ar/index1.htm

IECSA S.A. http://www.grupoods.com.ar/grupo-ODS/

INVAP S.E. http://www.invap.com.ar/

IMPSA. http://www.impsa.com.ar/

2.3.3. Project Funding

Traditionally, Argentine NPPs were partially financed through its own suppliers, as was the case with the KWU companies of Germany for CNA I's construction and with Canadian AECL for achieving CNE's financing. Additionally, these tasks received specific funds from the State, including the "Great Electric Works" as well as national treasury contributions.

Argentina has only considered its own suppliers as a private source of financing for its nuclear activities.

As another record of financing activities in the nuclear area, remediation tasks of mining tailings can be mentioned. At present, they are performed with funds provided by the World Bank and carried out through the Programme on Environmental Remediation of Uranium Mining (PRAMU).

As regards the activities to develop the future of the nuclear area, financing of the following sources is expected to be obtained:

Completion of CNA II: This project has to be divided into two major financial stages:

- Before interrupting the activities: it was financed by German KWU and with specific state funds and contributions from the Argentine public treasury.

- After resuming the activities: it was financed with specific public funds and contributions from the Argentine public treasury by means of a trusteeship named "Atucha II Completion Plan". The National Government entrusted NA-SA with the direction and administration of the activities in order to finish

them. Among other conditions, the following were established: "acts performed by NA-SA, through Atucha II's NPP Management Department, which will be ruled by regulations and principles of private law".

Life extension and revamping of CNE: This project will be by the Andean Association of Promotion/Development, this being the first case of an Argentine NPP being financed by a multilateral entity.

- For the construction of CAREM NPP, a trust administration agreement was signed for carrying out the work, between the National Atomic Energy Commission and *Banco de la Nación* of Argentina.

- Fourth and Fifth NPP: there is not any decision as regards the financing plan.

Additionally, National Law No. 26566, ruling nuclear activity, engulfs other financing options as follows:

- Creation of a trust fund to construct a fourth NPP with one or two modules.

- Creation of a trust fund to extend the life time of CNE: NA-SA is thus entitled to enter into the necessary agreements with the national public financial entities, whose selection will be done with the rules duly set forth by the Secretary of Energy, depending on the Ministry of Federal Planning, Public Investment and Services.

Those trusts created will be made up of:

a) Contributions of the National Treasure with those annual sums of money provided by the Law of General Budget of the National Administration.

b) Resources coming from credit operations in the internal or external market. Those financial means which are most convenient can be requested subject to the provisions of the following Laws: Law No. 19328 (General Dispositions concerning Determination of the Policy or Level of Indebtedness), Law No. 24156 (Financial Administration and Control Systems) and Law No. 24354 (National Public Investment), as well as modified and complementary laws, as long as these are not modified by the present law.

c) Resources owned by NA-SA, as well as those coming from special laws and those specifically assigned to this law with the aim of reconciling differences existing between future investments and resources coming from points a) and b).

d) Incomes made up of legacies or donations.

e) Funds provided by international entities or non-governmental organisations.

At present, the use of funds for CNEA's investment projects is expected through the Bank of Public Investment Projects (BAPIN), and those funds are part of the multi-annual budget. The BAPINs enable the identification, creation, monitoring, assessment and control of physical investment programmes that may be developed with the resources from the National Treasure or international financing, which are begun by any of the jurisdictions of the public sector and performed by the same.

Other public sources not included in the above sections are the following:

- Public trust funds specially created for each case.

- Regulation on financing with electricity fees/charges in the construction period.
- Creation of other posts in electric power sales.
- Creation of development banks.
- Regional focuses: projects covering more than one country.

Other private sources: working in obtaining financing through international credit organisations such as the Inter American Bank of Development.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar/

LEGISLATIVE ORGANISATION, CENTRE OF DOCUMENTATION AND INFORMATION OF THE MINISTRY OF ECONOMIC AFFAIRS AND PUBLIC FINANCE. http://www.infoleg.gov.ar/

2.3.4. Electric Grid Development

Transport grid nets of electric power in the Argentine Republic are divided by voltage tension level. They are classified as extra high, high, medium and low voltage tension. According to its capacity, grid nets are operated by national haulage contractors (extra high tension voltage) or regional haulage contractors (high and medium tension voltage).

Nets of the energy transmission grid have a radial configuration, with their centre in the city of Buenos Aires, but are under construction. Current projects involve lines that would close the energy ring.

The transport capacity of each line of 500 kV is 1,000 MWh.

As regards interconnections with neighbouring countries, there are two lines of transmission between Argentina and Brazil of 500 kV, two lines between Argentina and Uruguay of 500 kV, one with Paraguay of 220 kV, and also a line between Argentina and Chile of 330 kV.

As mentioned in IAEA's TRS 224, the characteristics of the grid net for the connection of an NPP are:

- An adequate interconnection, including multiple parallel grids.
- Modern dispatch system.
- An agile protection system in continuous operation.
- Adequate reserve margins.

SADI quite fulfils all these requirements. The system counts on a modern and independent dispatcher, performed by CAMMESA.

A Federal Plan is being implemented in Argentina. It is a plan of electricity transport whose main objective is to close the energy ring by connecting the mesh of the net grid, in order to increase safety of the required supply and decrease investment costs in the supply system, as long as low cost resources of localised opportunities in a distant geographical point manage to reach the demand centres. It also aims to contribute to removing transport restrictions in SADI in the short and medium term, and to manage balanced and equal development in the different regions of the country.

As regards the dispatch system, MEM's operation is carried out in real time, independently of the term contracts executed by generators in which every section between what is agreed and the effective operation is channelled through the spot market. In order to meet the demand in real time, constant measurements are performed of the environmental temperature in those areas of higher consumption, by estimating values expected from demand depending on the demand from the previous day and from the same day of the previous week by distinguishing it per hour, working day or holiday and by considering extraordinary events that may cause variations in demand (such as sports events, heat waves, and so on).

SADI also counts on a dynamic protection system that responds before failures in transport and/or forced outages of generators.

In every electric SADI region, it is possible that a 300MW NPP could be installed with minimum changes in the existing electric infrastructure. On the contrary, only some of them are capable of dealing with a NPP installation with a contribution larger than 1,000 MW. This takes into account the recommendations of the IAEA with respect to the participation of a nuclear reactor, which should not exceed 10% of the electricity generation installed capacity in a country.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar/,

WHOLESALE COMPANY OF THE ELECTRIC MAJORITY MARKET S.A. (CAMMESA): http://www.cammesa.com.ar/,

2.3.5. Site Selection

CNA II, currently under construction, and CNA I are located 100 km away from the city of Buenos Aires, on the right margin of the river Paraná de Las Palmas (average water flow: 17,300 m^3/s). In that same site, the indigenous prototype CAREM reactor is also under construction, which will produce 25 MWe.

The fourth NPP is also expected to be built there, since it is under license and has a water level intended for cooling the secondary system in order to assist every NPP sited there. The construction of a "Centre of Services provided for NPPs" is also intended.

CNEA (previously the Division Prospective and Energy Planning of CNEA) carried out a study intended for the macro location of potential sites. Thus, three levels of consecutive application of requirements are established according to the following description:

- Level I requirements:

-Legal framework.

-Cooling water availability.

-Regional seismic considerations.

- Level II requirements:

-Integration to the interconnected system.

-Infrastructure.

-Availability of free surfaces.

- Level III requirements:

-Study of soils/land.

-Climatic conditions.

-Study of the population of the region (radius 100 km).

-Study of economic activities of the region (radius 100 km).

In accordance with aid studies, the following possible sites were obtained and appear in Figure 2.6, whose references are:

It requires conventional engineering precautions which do not significantly modify the total cost of the building activities.

It requires engineering precautions that raise the total cost of the building activities by up to 15%. For the Demand aspect: it is a site with potentially unsatisfied demand.

It requires engineering precautions increasing the total cost of the building activity in a sensitive way (over 15%).

For the Demand aspect: it is a site with surplus of energy.

Location	Legal Framework [i]	Cooling Water	Seismic Risk	High tension lines	Infra-structure [ii]	Demand	Source
Lima (Buenos Aires)							[1]
Rio Tercero (Córdoba)							[2]
Bahía Blanca (Buenos Aires)							[3]
Los Nihuiles (Mendoza)							[4]
Timbúes (Santa Fe)							[5]
Hernandarias (Entre Ríos)							[5]
Cabra Corral (Salta)							[6]
Viedma (Rio Negro)							[-]
San Juan (San Juan)							[6]
El Cadillal (Tucumán)							[6]

Location	Legal Framework [i]	Cooling Water	Seismic Risk	High tension lines	Infra-structure [ii]	Demand	Source
Atlantic coast (Buenos Aires)							[6]
Formosa (Formosa)							[6]

Figure 2.6: Characteristics of potential sites.

[i] Legal framework: the necessary time to modify a regulation depends on its hierarchy. This raises the price of the total cost of the project due to the delay of the construction of the building tasks, at the beginning.

[ii] Infrastructure: it refers to load transportation requirements for the construction, transporting either by sea, river, railway or road.

SOURCES:

[1] Study of pre investment. NPP for Gran Buenos Aires Area. Littoral/Coastline. CNEA 1965.

[2] Study of pre investment: NPP for Province of Córdoba. CNEA 1968.

[3] Study of NPP siting in the southern subsystem site of the Province of Buenos Aires. Bahía Blanca. CNEA 1976.

[4] Study of NPP siting for Cuyo Region. CNEA 1976.

[5] NPP. Argentine siting Los Timbúes y Hernandarias. NPPs CNEA 1986.

[6] INPRO. Methodology for the Assessment of Innovative Nuclear Reactors and Fuel Cycles. Stage I planning. Final Argentine report. Prospective and energy planning. CNEA 2006.

The Figure 2.7 shows locations of potential NPP sites.

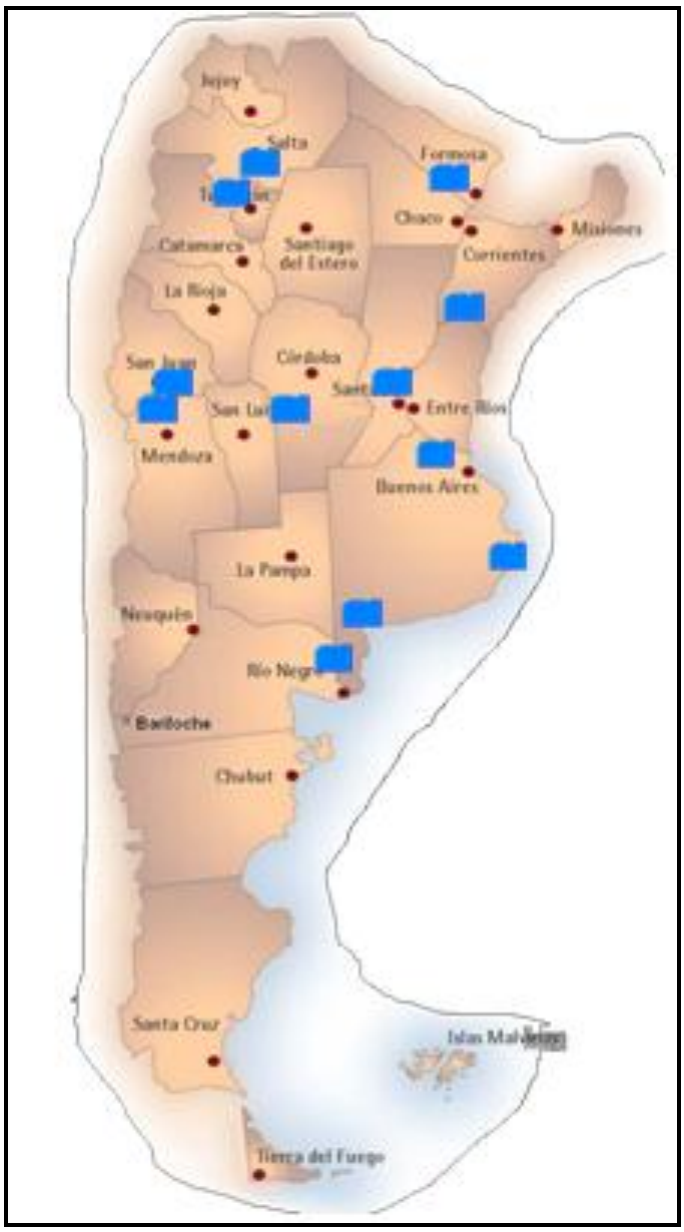


Figure 2.7: Location of potential sites.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar/

2.4. Organizations involved in construction of NPPs

From the beginning of the nuclear activity in Argentina, in negotiations and the signature of agreements beyond the provision of NPPs, it was expected that the comprehensive and complete programme of knowledge transference from technology suppliers to the national nuclear sector would occur, and that the broadest possible local participation would occur.

CNEA promoted the creation of national companies specialised in the nuclear area, essential for the Argentine nuclear programme (as mentioned in section 2.1.2), encouraging and monitoring their continuity.

Currently, in the maintenance, construction and installation of NPPs CNE, CNA I and beginning of CNA II, the following companies have participated:

Degremont S.A. http://www.degremont.com/

Essener Hochdruck Rohrleistungsbau (HER) www.essenerhochdruck.de

Mannesmann Analgenbau AG www.mannesmann.com/index2.html

Mellor Goodwin S.A. www.mellorgoodwin.com

SADE SACIF construction engineering SA

At present, NA-SA is responsible for finishing CNA II. The companies participating in the construction and commissioning of the current CNA II are as follows:

CNEA www.cnea.gov.ar

NA-SA www.na-sa.com.ar

AECL www.aecl.ca

ANDRITZ www.andritz.com/ANONID1CA12273F90A685B/index

AREVA www.areva.com/pre-home.html

ASEA BROWN BOVERI www.abb.com.ar

BHR-Electroingeniería SA www.eling.com.ar/index1.htm

BLANCO MONTAJES SA

CONUAR SA www.conuar.com.ar/home.htm

DIOXITEK SA www.dioxitek.com.ar

DYCASA SA www.dycasa.com/home_esp.htm

E & E POWER PLANT SERVICES www.powerplantserviceinc.com

ENSI SE www.ensi.com.ar

FAE SA www.fae.com.ar

Henisa Sudamericana SA www.henisa.com.ar

IECSA SA www.grpoods.com.ar/grupo-ODS/

IMPSA SA www.impsa.com.ar

INDIGO SRL www.indigoargentina.com.ar

INGENIERÍA INTEGRAL (integral engineering) www.ingintegral.com.ar

INVAP SE www.invap.com.ar

KSB www.ksb.com.ar/home/products/products.html

SA E CONSTRUCCIÓN Y MONTAJE DON FIERRO (Construction and assembly Corporation Don Fierro) www.donfierro.com.ar/init.htm

SCK: www.sckcen.be

SOLENER SA: www.solener.com

TECHINT www.techint.com/group/es/

TECNA www.tecna.com.ar

UNIVERSIDAD DE PISA (University of Pisa) www.unipi.it

UNIVERSIDAD NACIONAL DE SAN JUAN (National University of San Juan) www.unsj.edu.ar

CNEA is responsible for the construction of CAREM prototype reactor, which has not yet begun.

2.5. Organizations involved in operation of NPPs

Since 1994, operation of NPPs is NA-SA's responsibility. These NPPs belong to the State. Likewise, CNEA is the technical support of the NPPs. Main actors of the nuclear sector are described in section 2.1.2.

Commercial operations related to the sale of electric power are performed by NA-SA. CAMMESA is responsible for the administration and electric dispatch.

2.6. Organizations involved in decommissioning of NPP

Decommissioning of NPPs, research reactors and every radioactive facility is considered in Law No. 24804, governing nuclear activity. This law states that CNEA is responsible for documents and decommissioning activities when nuclear facilities reach the end of their life time.

As regards research reactors, their operation is the responsibility of CNEA, as well as providing information to execute the decommissioning plan, taking into account historic data of operation and the flows of wastes generated by said reactors.

NA-SA is in charge of the operation of the NPP, as well as the provision of information and the necessary funds for decommissioning, to be performed by CNEA.

The Nuclear Regulatory Authority is responsible for granting licenses for decommissioning and shut down. This is stated in rule AR 3.17.1: Decommissioning of NPPs.

At present, preliminary decommissioning plans are being formed by estimating the flows of waste in every relevant and non relevant nuclear facility in operation. Within this framework, the process of gathering information from historical data of each facility continues, in order to set forth requirements and guidelines in the necessary documents for later decommissioning management.

As regards NPPs, CNEA is creating an agreement with NA-SA in order to carry out the Preliminary Plan of Decommissioning of CNA I and to participate in the performance of treatment tasks and component and structure management during the life time extension of CNE. In order to achieve this institutional work, teams are being assembled.

Technological developments are coordinated and performed at a lab level, in order to decontaminate structures and components which are radiologically active by using different techniques such as: polishing with abrasive means in vibratory containers and application of electrochemical decontamination.

A lab to develop decontamination techniques is being assembled in Lima, province of Buenos Aires, so as to provide technological assistance to CNEA's projects and relevant nuclear facilities.

In order to reutilise structural components as non-radioactive elements, it is necessary to negotiate their classification as non-radioactive components before the ARN.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION.

www.cnea.gov.ar/xxi/legislacion/nacional/LEYACTIVIDADNUCLEAR.pdf

NUCLEAR REGULATORY AUTHORITY. www.arn.gov.ar

2.7. Fuel Cycle including Waste Management

Every activity of the Nuclear Fuel Cycle is oriented towards satisfying the main objective, consisting of: guaranteeing reserves and supply in the long term of the fuel requirements for the operation of the NPPs and production and research reactors in operation and to be built, with national uranium.

Productive activities of the fuel cycle which are at present performed in Argentina are the following: uranium prospecting, conversion and purification, fuel elements fabrication/manufacturing, and interim storage of spent fuels. Moreover, research is under development, works on a lab scale and a pilot plant in the following stages of the cycle: production, enrichment, reprocessing and waste management.

As regards the strategies of radioactive waste management, every activity is oriented towards guaranteeing the protection of the environment, public health and the rights of future generations, in accordance with the regulations set forth by ARN, regulations at national and provincial levels and regulations from the city of Buenos Aires, as well as relevant international agreements.

The stages and characteristics of the developed fuel cycle in the country are detailed as follows:

Mining, Prospecting and Production

The Argentine Mining Code, sanctioned under the Law No. 1919, entitles CNEA to perform prospecting, exploration and exploitation of nuclear minerals. CNEA performs activities throughout the country in order to develop uranium prospecting and exploration of uranium resources. As a result of the uranium prospects, it is worth mentioning prospecting in Vaquerías (Salta Province), El Gallo, Noya, Donatos and Diez (La Rioja Province), El Cruce, Cerro La Virgin, Sierra Cuadrada and Cerro Chivo (Chubut Province). Exploration of uranium resources is performed in the Pichiñán Uranium District, Cerro Solo, Laguna Colorada and Laguna Sirven, (Santa Cruz Province). Uranium reserves are expected to be reasonably guaranteed. CNEA has 16,500 tons under its control, and speculative resources totalling more than 24,000 additional tons.

Several private companies exist for the development of uranium prospects, but none of them is at the stage of exploring resources. Among the companies that develop these activities, the following can be mentioned: Calypso Uranium SA, Jackson Global Ltd., Uranio AG, Wealth Minerals Ltd., Marifil Mines Ltd., Madero Minerals SA, Globe Uranium Argentina SA, Mega Uranium Ltd. and the company of San Juan province, EPSE.

As regards the production of uranium concentrates, in Mendoza province, the San Rafael Industrial Mining Complex was brought to a standstill in 1994, since the price of the imported uranium concentrate was financially more convenient than that of uranium produced locally. CNEA is working in order to reopen this complex.

Uranium Conversion

Conversion of U_3O_8 to UO_2 has been performed in DIOXITEK SA. The processing capacity of the company is 170 t of UO_2 per year.

Currently, processed U_3O_8 is completely imported. Studies to improve the capacity and to transfer the plant with the aim of meeting new requirements, deriving from the start-up of CNA II and the future NPPs, are being undertaken.

Uranium Enrichment

Uranium enrichment is performed by CNEA in the Pilcaniyeu Technological Complex. Argentina wishes to maintain and consolidate uranium enrichment technologies so as to guarantee the manufacturing of fuel elements for present and future NPPs.

The technology applied for the enrichment process is gaseous diffusion, and the consolidation of this technology is currently under development.

Simultaneously, research is being carried out for laser and ultra centrifuge enrichment.

Fuel Fabrication

The factory of Special Alloys, FAE SA, is in charge of manufacturing Zircaloy rods and pellets used in the manufacturing of fuel elements from imported zirconium. The technology applied was developed in CNEA and is permanently updated. The fabrication of stainless steel alloys and titanium is undertaken, as well as the development of products of incalloy used as supplies in different components of NPPs.

Fuel element fabrication is performed in CONUAR SA, where UO_2 pellets and the assembly of fuel elements are fabricated for NPPs CNA I and CNE, and fuels type MTR for research reactor RA-3.

Moreover, fuel elements will be manufactured for future NPPs in Argentina.

In late 2011, the delivery of the 451 fuel elements constituting the first core of the CNA II was completed. The fuels were manufactured by CONUAR S.A. and FAE SA, with the UO_2 produced by DIOXITEK and the engineering provided by CNEA.

CNEA has a plant for the fabrication of fuel elements for Research Reactors (ECRI), made up of four areas: fabrication of compacts, fuel rods, assembly of fuel elements and quality control. The facility has as the objective of developing and fabricating the fuel elements for research reactors and irradiation blanks for the radioisotope production. Up until the present, its production has enabled it to meet part of local demand and some international requirements (reactors exported to: Peru, Egypt, Algeria and Australia).

Temporary Storage of Spent Fuels

Temporary storage of spent fuels is performed in situ in NPPs. In CNA I, fuels are stored in pools, as there are two pools containing all spent fuels since the beginning of the operation of the NPP. In CNE, storage is initially performed in decaying pools in order to be transferred to dry silos, after 5 or 6 years of storage, in the same site of the NPP.

Temporary storage of fuels of research reactors is performed in different ways according to the reactor. Fuels of the RA-3reactor are stored in the Wet Interim Storage of Spent Fuels Deposit of Research Reactors located in the Management Area of Ezeiza (AGE) in CAE. Fuels from the RA-6reactor, located in Bariloche Atomic Centre, CAB, in Río Negro province, are temporarily stored in pools located at this facility/installation.

In order to gather together the storage of every spent fuel element coming from research reactors, the facility that will store irradiated fuels of research reactors (FACIRI) is under construction, and will be located in Ezeiza Atomic Centre, CAE. Its objective is to

replace the existing facility in AGE, as a system improvement. It is a pool where fuels under water will be disposed in perfectly controlled conditions in a specially designed structure.

Reprocessing

CNEA is the company that conducts research on spent fuel reprocessing. At present, it has several licensed facilities or facilities about to be licensed that would allow for simulation of reprocessing feasibility on a laboratory scale. The following are some of the prominent facilities: the Lab for Postirradiation Assays (LAPEP), Hot Cells (CELCA) located in CAE, and ALFA Lab located in CAC.

Radioactive Waste Management

Radioactive waste management is contemplated in the law of nuclear activity, No. 24804, in which CNEA's responsibilities are described. Subsection "d" states that CNEA has to "exert the responsibility for managing radioactive wastes by fulfilling the tasks assigned to the specific legislation" as long as in subsection "g" regulates that CNEA has to "exert the state property of special fissionable radioactive materials contained in irradiated fuel elements". In article 16, ARN's tasks are mentioned and its subsection "c", licenses, permits or authorisations for facilities are granted for radioactive waste or waste management.

In Decree No. 1390/98, regulatory of Law No. 24801, the constitution of trust funds is determined for nuclear power plants that go out of service and for management of radioactive waste of medium and high activity that has been produced. It is also determined that these funds must be constituted of contributions by the generators of nuclear electricity.

Law No. 25018 establishes the "National Programme of Radioactive Waste Management" (PNGRR), that states that CNEA is in charge of enforcing the law and creates the "Fund for the Final Disposal and Management of Radioactive Wastes". This fund replaces the one established by Decree No. 1390/98. It also establishes that a Radioactive Waste Management Strategic Plan has to be elaborated and that a Regime for the administration of the fund has to be approved by the National Congress by law.

CNEA has already created the PEGRR project on the basis of taxes on the incomes of electronuclear generation, and the project was transferred to the National Congress in 2009 by the Executive Power for its approval. Likewise, a bill is under elaboration in order to administer the Fund.

As regards wastes produced by uranium mining, a Programme on Environmental Restitution of the Uranium Mining is under development (PRAMU) and its objective is to achieve the environmental restitution of those sites where activities related to uranium mining were developed. Sites where the programme is applied are the following: Malargüe and Huemul (Mendoza Province), Córdoba and Los Gigantes (Córdoba Province), Pichiñán (Chubut Province), Tonco (Salta Province), La Estela (San Luis Province) and Los Colorados (La Rioja Province).

The restitution project will initially be financed with a loan from the World Bank applicable to the sites of: Malargüe, whose tasks are under development, Los Gigantes, Córdoba and Tonco. However, independently of the loan, different tasks of the project are to be carried out with CNEA's financial means.

PRAMU intends to create an Advisory Group of Environmental Mining Restitution as a long term objective, derived from the project management. This group would be conformed and linked to the National Secretary of the Environment and the National Secretary of Mining in related projects.

Policy for the Final Disposition of High Level Waste

The Argentine Republic has adopted a classification criteria based on activity levels, by achieving the confinement and isolation required in each case.

As regards the final disposal of high-level radioactive waste, during the Eighties, CNEA began a feasibility study and engineering draft for the construction of a deep geological repository. Stable granite formations were looked for in low seismic regions with scarce hydraulic conductivity. One of the possible options was the town of Gastre, province of Chubut, and studies to characterise the place were performed. The report with the obtained results was duly handed in to the National Congress. Subsequently, as a consequence of the public opinion, studies were suspended in that locality, and it was not possible to prospect other favourable regions in the rest of the country.

Some developments for the treatment of high-level radioactive waste are focused on research on technical and economic feasibility, in order to convert (transmute) radionuclides of the long decay period into others of short period or stable nuclides.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION

http://www.cnea.gov.ar/xxi/legislacion/nacional/LEYACTIVIDADNUCLEAR.pdf

NUCLEAR REGULATORY AUTHORITY. http://www.arn.gov.ar/.

NUCLEOELECTRICA ARGENTINA S.A. http://www.na-sa.com.ar/.

NUCLEAR ENERGY AGENCY. "Uranium 2007. Resources, Production and Demand". http://www.nea.fr/,

CALYPSO URANIUM S.A. http://www.calypsouranium.com/sp/home.asp,

JACKSON GLOBAL LTD. http://www.jacksonglobal.com.ar/,

URANIO AG http://www.uranio.ch/english//,

WEALTH MINERALS LTD. http://www.wealthminerals.com/s/Home.asp,

MARIFIL MINES LTD. http://www.marifilmines.com/s/Home.asp,

MADERO MINERALS S.A.

http://argentina.infomine.com/companies/listings/27366/MADERO_MINERALS_S.A.html,

GLOBE URANIUM ARGENTINA S.A.

http://argentina.infomine.com/companies/listings/28530/GLOBE_URANIUM_(ARGENTINA)_S.A.html,

MEGA URANIUM LTD. http://www.megauranium.com/main/?argentina,

EPSE http://www.epsesanjuan.com.ar/,

DIOXITEK S.A. http://www.dioxitek.com.ar/,

CONUAR S.A. http://www.conuar.com.ar/home.htm,

FAE S.A. http://www.fae.com.ar/.

2.8. Research and development

2.8.1. R&D Organizations

CNEA is a national institution oriented towards conducting research and development in every aspect related to the pacific uses of nuclear energy. CNEA duly fosters technological innovative activities in the nuclear areas and performs development and transference activities of new technologies in related areas.

As the referent of its sector, CNEA has established the technological support of the Argentine nuclear system as one of its main aims. Its other aims are to improve the quality of life of society through the contribution of science and technology since these improve production, to reduce the environmental impact that every human activity produces in the environment, to look for innovations and application of derived techniques and to train employees.

Most of production activities which were formerly performed by CNEA are at present handled by private companies, with the exception of radioisotope production and equipment development, and/or specific facilities.

Most of CNEA facilities are located in the following sites:

- Headquarters, city of Buenos Aires;
- Constituyentes Atomic Centre (CAC), in San Martín, Province of Buenos Aires;
- Ezeiza Atomic Centre (CAE), in Ezeiza, Province of Buenos Aires;
- Bariloche Atomic Centre (CAB), in San Carlos de Bariloche, Río Negro Province;
- Pilcaniyeu Technological Complex (CTP), 60 km away from San Carlos de Bariloche, Río Negro Province;
- San Rafael Industrial Mining Complex, site in San Rafael city, in Mendoza Province.

In the Atomic Centres and Complexes, projects are developed and administered on research, development, technology transfer and technical support in the technological field of CNEA.

At present, CNEA has four Regional Offices in Northwest, Cuyo, Centre and Patagonia, whose mission is to carry out the exploration and prospecting of mineral resources of nuclear interests, particularly uranium minerals in the jurisdictional area of each Office.

CNEA provides outstanding scientific and technological training in order to conduct technological nuclear activities for both Argentina and abroad. Academic services of CNEA's educational institutions exist, where graduate courses are offered as well as PhDs, postgraduate courses and undergraduate courses. These courses provide education for specialists in different domains, such as physics, engineering, nuclear applications, science and technology of materials. The educational centres are the following:

- Balseiro Institute, at CAB;
- Jorge Sábato Technological Institute, at CAC;
- Dan Beninson Nuclear Technological Institute, at CAE;
- Foundation School of Nuclear Medicine (FUESMEN) in Mendoza Province;
- Nuclear Diagnostic Foundation Centre (FCDN), in the City of Buenos Aires.

SOURCES:

CONSTITUYENTE ATOMIC CENTRE. http://www.cnea.gov.ar/cac/,

EZEIZA ATOMIC CENTRE. http://caebis.cnea.gov.ar/,

BARILOCHE ATOMIC CENTRE. http://www.cab.cnea.gov.ar/,

BALSEIRO INSTITUTE. http://www.ib.edu.ar/,

JORGE SABATO TECHNOLOGICAL INSTITUTE. http://www.isabato.edu.ar/,

DAN BENINSON NUCLEAR TECHNOLOGICAL INSTITUTE. http://www.cnea.gov.ar/institutobeninson/,

NUCLEAR MEDICINE FOUNDATION SCHOOL. http://www.fuesmen.edu.ar/,

NUCLEAR DIAGNOSTIC FOUNDATION CENTRE. http://www.fcdn.org.ar/.

Facilities:

Research reactors and operative production reactors in Argentina are the following:

- RA-0 in National University of Córdoba, oriented towards an educational use and nuclear diffusion.
- RA-1 in CAC, mainly used for research of irradiation damage, material and equipment assay, analysis through activation and teaching.
- RA-3 in CAE. Its main aim is to produce radioisotopes for medical and industrial purposes, research and material assays.
- RA-4 in the University of Rosario, Santa Fe province. The main objective is to educate and communicate the nuclear activity.
- RA-8 located in CTP, is a critical group designed for carrying out experiments related to the design of the CAREM reactor.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION.

http://www.cnea.gov.ar/xxi/reactores/RA0_RA4.asp

http://www.cnea.gov.ar/xxi/reactores/RA1.asp

http://www.cnea.gov.ar/xxi/reactores/RA3.asp http://www.cab.cnea.gov.ar/cab/ingNuclear/ra6_i.html

http://www.cnea.gov.ar/xxi/reactores/RA8.asp.

There are relevant facilities with different purposes as well as labs in different sites of CNEA, which are listed as follows:

CAB:

Linear Electron Accelerator, used for investigation and teaching purposes

Lab of Activation Analysis

Lab of Atomic Collisions

Lab of Metal Physics

Lab of Statistic Physics

Lab of Particles and Fields

Lab of Magnetic Resonance

Lab of Material Characterisation

Lab of Special Ceramics

Lab of Material Physicochemical

Lab of Nuclear Materials

Lab of Computer Mechanics

Lab of Metallurgy
Lab of New Materials and Devices
Lab of Process Control
Lab of Fuel Element Design
Lab of Physics of Advanced Reactors
Lab of Neutrons and Reactors
Lab of Nuclear Safety
Lab of Thermo hydraulics
Lab of Analysis by Neutron Activation
Lab of Radiological Protection
Lab of Chemical Cynetics
Lab of Electronic Developments
Lab SIGMA
Lab of Isotopic Separation

CAC:
TANDAR Electrostatic Accelerator
Fuel Elements Fabrication Plant for Research Reactors (ECRI)
Plant of Uranium Hexafluoride conversion to Uranium Oxide
ALFA Lab
Ceramic Core NPP
Analytic Chemistry Lab
Nuclear Chemistry Lab
Environmental Monitoring Lab (air management)
Lab of Colloids
Lab of Water and other Fluids
Lab of Structural Material Characterization
Lab of Condensed Matter
Lab of Cells and Solar Panels
Lab of Uranium Dioxide Characterization
Lab of Diffusion
Lab of Dosimeter Irradiation
Lab of Non Destructive Assays
Lab of Experimental Physics of Reactors
Lab Radar Dish of Synthetic Opening
Circuit of hydrodynamic assays of fuel elements

CAE:

Cyclotron for Radioisotope Production: production of radiodrug 18 fluoride dioxide glucose (18-FDG) for the local market supply.

Molybdenum-99 Fission Production NPP: capacity to produce the radioisotope molybdenum-99 and iodine-131 for supply for the local market and export.

Radioisotope Production NPP: conditioning and fractioning of radioisotopes iodine-131 and molybdenum-99 and phosphorus-32 production, chromium-51 and samarium-153, as well as the marked compound hafnium-181.

Semi industrial plant of Irradiation: provides advisory services, food irradiation and disposable biomedical material for institutional external and internal clients.

Lab of head

Lab of Enriched Uranium

Management Area of Radioactive Wastes: treatment plant of low level solid radioactive wastes, contention system of low level solid radioactive wastes, facility for solid disposal radioactive wastes, structural and canned sources and the deposit central of special irradiated fissionable material.

Radiochemical Facility Lab (LFR)

Postirradiation Assay Lab (LAPEP)

Detector Physic Lab

Lab of Analysis by Activation

Lab of radiotracers application

Regional Reference Centre of Secondary Patrons

Methodology Lab of Radioisotopes Applications

Lab of radiopharmacy

Lab of High Pressure and Temperature (LENAP)

Lab of High Doses Dosimeter

Lab of Handling/Management and Conservation of soils

Lab of Microbiology

Lab of Industrial Applications

High Pressure Circuit for Mechanisms Testing (CAPEM)

In the CAE site, industrial plants of two CNEA associated companies are located: Argentine Nuclear Fuels SA (CONUAR SA) and Special Alloy Factory SA (FAE SA). Moreover, DIOXITEK SA operates the cobalt-60 Sealed Source Fabrication Plant, meeting local demand and exporting sources with the highest quality standards, thus making Argentina the third largest exporter of sealed sources.

CTP:

Uranium Hexafluoride Conversion Plant

The Enrichment Uranium "Mock up" Pilot Plant (by gaseous diffusion)

Labs for CAREM Reactor Development

Porous Membranes Fabrication Plant

Fluorides Oils Fabrication Plant

Fluoride Production Plant

Analytical Chemistry Lab

The associated companies from which CNEA owns part of the stock are as follows:

- DIOXITEK SA: 99% of the stock participation is owned by CNEA.
- Argentine Nuclear Fuels S.A. (CONUAR SA): 33.33% corresponds to CNEA and 66.67% to the private company SUDACIA SA. It is located in Ezeiza Atomic Centre.
- Empresa Neuquina de Servicios de Ingeniería SE (ENSI SE): 49% corresponds to CNEA and 51% to the Province of Neuquén. It is located in Arroyito in Neuquén.
- FUESMEN: headquarters in Mendoza province. Quasi public corporation. CNEA owns 33.33% of the stocks, Mendoza, 33.33% and University of Cuyo, 33.33%.
- Foundation Centre of Nuclear Diagnostic: CNEA owns 50% and FUESMEN, the other 50%.
- NA-SA: CNEA owns 20% of the stocks, the Secretary of Energy representing the National State owns 79%, and the *Ente Binacional de Emprendimientos Energéticos S.A.* owns 1%.
- Polo Tecnológico Constituyentes SA (PTC SA): CNEA owns 20% of the stocks and is constituted by the association of technological development institutions with different and complementary capacities. They are located next to Constituyentes Atomic Centre, San Martín - Province of Buenos Aires.

SOURCE: DIOXITEK S.A. http://www.dioxitek.com.ar/,

CONUAR S.A. http://www.conuar.com.ar/home.htm,

FAE S.A. http://www.fae.com.ar/,

ENSI S.E. http://www.ensi.com.ar/,

POLO TECNOLÓGICO CONSTITUYENTES S.A. http://www.ptconstituyentes.com.ar/,

FUNDACIÓN CENTRO DE DIAGNÓSTICO NUCLEAR. http://www.fcdn.org.ar/.

The following are the companies and institutions related to CNEA:

- Investigaciones Aplicadas SE (INVAP SE), located in the city of San Carlos de Bariloche, Río Negro province.

- Centro de Medicina Nuclear del Hospital de Clínicas "Gral. San Martín" (Nuclear Medicine Centre of the Hospital Gral. San Martín), located in the city of Buenos Aires.

- Oncological Centre of Nuclear Medicine of the Oncological Institute Dr Ángel H. Roffo, located in the city of Buenos Aires.

- Service of Radiotherapy of the Oncological Institute Dr Ángel H. Roffo.

SOURCE: INVAP S.E. http://www.invap.com.ar/,

FUESMEN http://www.fmv-uba.org.ar/comunidad/INA/Medicina_Nuclear.htm,

INSTITUTO DE ONCOLOGÍA http://www.institutoroffo.com.ar/.

2.8.2. Development of advanced nuclear technologies

CNEA has organized its research and technological activities of scientific development in different fields. These activities involve advanced projects related to the nuclear activity and its applications, some of which are worth mentioning:

- Central Argentina de Elementos Modulares "CAREM", development and construction of the prototype reactor of the first NPP with complete domestic technology and design. The site will be at Lima, next to the site of CNA I. At present, the tasks of engineering and implementation of the engineering software continue. The conceptual and basic engineering of B.O.P (Balance of Plant) is running, the execution of the electrical detail and power plant processes engineering was recently contracted, and the components for test irradiation of fuel elements have been recently sent to the Halden's reactor, in Norway. The High Pressure Circuit for Mechanisms Testing (CAPEM) was also launched. In relation to the licensing of the reactor, the licensing process by the ARN, in the context of the form called "Routine Practice Certification", continues. In late 2011, the Trust Agreement with *Banco de la Nación* of Argentina was signed, to finance the project. It is expected that in late 2012, the Environmental Impact Study, commissioned to the National Technological University, Regional School Avellaneda, will be received.

- The project of building a new multipurpose research reactor, RA-10 for production of radioisotopes, is being developed. The conceptual engineering has been completed and the basic engineering tasks begun, through an agreement between CNEA and INVAP S.E. for joint development. In parallel, CNEA is working on the siting, which includes a preliminary assessment of potential sites for construction.

- Uranium Enrichment Project: its objective is to strengthen the technological capacity as regards uranium enrichment through the gaseous diffusion technology. Initial research studies are being conducted in order to enrich uranium by laser and ultra centrifuge methods.

- Since 2002, Argentina has become the only country worldwide that has developed and implemented technology to produce fissile radioisotopes (such as molybdenum-99 and iodine-131) by using low-enriched uranium targets (<20%). The importance of this achievement relates to the contribution to reducing the risk of assigning non-pacific uses to high enriched uranium originally destined for pacific uses. This achievement complies with the non-proliferation international policies promoted by the USA.

- In order to optimize the transport of nuclear materials between different facilities, the CNEA's Management of Nuclear Fuel Cycle designed a special package called DALMA 25, which will transport aqueous solutions of uranium enriched to 20%. The product obtained the quality certification issued by the ARN, which ensures compliance with national and international standards for the transport of radioactive materials by road, by land and by sea, thus increasing the possibility of its use in various issues of nuclear research and development.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar

2.8.3. International Cooperation and Initiatives.

The scope of international cooperation in the area of nuclear energy development and its application is very broad between the main entities that act in the Argentine nuclear sector and in the foreign and international companies, governments and organizations. Such cooperation is primarily promoted and carried out by CNEA, ARN and NA-SA, which have a special linkage with IAEA.

Specific links between the CNEA and foreign associates exist in various areas of Research and Development activities, including basic studies and development with the institutions of the first world.

NA-SA has a special collaboration agreement with the Brazilian company Eletronuclear, sharing Brazilian and Argentine labour during the maintenance shut-downs at the nuclear stations in Brazil and Argentina, as well as cooperating on other issues of interest to both countries.

There are also special links with Latin American countries, promoted in part by the OIEA through the Latin American Project Area, denominated the ARCAL projects.

Every year, CNEA has received an important number of foreign students and professionals, mainly from Latin American countries, Africa and Asia and especially by agreement of scholarships awarded by the IAEA, for training in a large number of areas.

In the context of its regulating task, the ARN has close and varied interactions with national and foreign, governmental and non-governmental, organizations, as well as with international organizations. This interaction has the following objectives:

- To promote the exchange of experiences and information and the participation in the development of the international recommendations to manage the matters related to radiological and nuclear safety, nuclear non proliferation, non proliferation guarantees and physical protection;

- To establish and develop the technical cooperation in the cooperation agreements that may be executed;

- To promote cooperation in order to improve efficacy and efficiency of the international safeguards system, through the participation of experts and the development of specific techniques in the country.

2.9. Human Resources Development

The training and coaching of young professionals and technicians is a permanent activity of CNEA. The Institution has more than forty years of experience in this area, and has an important scholarship system that supports the activity, involving two main types of scholarships: stimulus subsidies for academic instruction and improvement scholarships for "training on the job", which constitute the "Learning by Doing Program".

In the course of the years, this Program has been shown to be not only an educational tool, but also an efficient selection instrument, encouraging loyalty and commitment to nuclear activity.

The main guidance concepts of the development policy of acknowledgement and skills at CNEA involve a solid basic education, associated with an intense learning process, by means of the involvement in projects, acting under the guidance of experienced professionals and technicians.

For the development of intellectual capital and knowledge, there are several institutions and venues:

- Three academic institutions: "Instituto Balseiro", located at the CAB, "Instituto Sabato" located at the CAC and "Instituto Dan Beninson" at CAE, created in association with national universities, where physicists, nuclear, mechanical and material sciences engineers are trained, as well as specialists in reactors, radiochemistry, nuclear medicine and technological applications of nuclear energy. Recently, the Balseiro Institute was nominated "IAEA Collaboration Centre for the Development of Human Resources for Nuclear Technologies and their applications."

- Two training centers in the health areas: the FUESMEN and the Nuclear Diagnosis Center Foundation.

- Premises and laboratories, among them: research and production reactors, critical facilities, operation console simulators, warm cells, ultimate generation microscopes, particle accelerators.

- Libraries and availability of books and periodical publications, and access to specialized electronic libraries.

These institutes and facilities provide education for professionals and technicians for the Argentine nuclear sector activities, offering training to CNEA, ARN and NA-SA, as well as educational services on specific issues for the Latin American region and for the world.

From time to time, according to their needs, NA-SA organizes specific training activities for new staff at different levels of responsibility and specialization, as well as complementary activities for permanent staff. This includes short courses for different operative and maintenance functions, specific training in partial scope simulators, and regular yearly education and re-training in the total scope simulators.

Due to the requirements associated with the termination and start-up of the CNA II NPP, NA-SA opened a welder school, specialized in nuclear quality, on the premises of the power plant.

At the same time, ARN maintains permanent control of the nuclear activities related to the training of the staff for the award of installation operation licenses, organizing and performing the examinations for the official candidates to obtain or renew licenses or specific authorizations. As a complement to these activities, ARN also offers a yearly teaching program at post graduate level in radiological protection and nuclear security areas.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION http://www.cnea.gov.ar/,

NUCLEAR REGULATORY AUTHORITY. http://www.arn.gov.ar/,

NA-SA NUCLEOELECTRICA ARGENTINA S.A. http://www.na-sa.com.ar/,

2.10. Stakeholder Communication

With the reactivation of nuclear activity in the country, the vital need to create communication strategies has arisen in order to offer society the necessary information on nuclear activity, underlining its permanent contribution to the well-being and development of the country.

In this sense, long term strategies are being prepared and put into practice, within the frame of the development of the Strategic Planning of the National Atomic Energy Commission, in order to reach the political, corporate, professional, teaching and journalism levels, along with opinion leaders in general, in order to achieve mass and effective circulation of the benefits of the pacific applications of nuclear energy, in the area of energy as well as in health care, and applications in the industry and agriculture.

During several years, specific communication programs are in execution within this framework, with reference to the management of radioactive waste and spent fuels, and the environmental restitution of the sites where uranium mining related activities have been performed in the past.

As part of these efforts, a Technical Cooperation Project with IAEA is under development, which involves assistance in the definition of a Communication Plan, communicator training, and a series of activities.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar/,

3. NATIONAL LAWS AND REGULATIONS

3.1. Regulatory framework

3.1.1. Regulatory Authority(s)

CNEA was created by Decree No. 10936, in 1950. One of its specific functions was defined as the control of nuclear development activities within the country.

Different legal regulations later determined the competence of the CNEA as Regulatory Authority in the area of radiological and nuclear safety, especially in aspects concerning the protection of individuals and the environment with respect to the adverse effects of ionizing radiation, the safety of nuclear facilities and the control of the use of

nuclear materials. The main legal regulations corresponding to these aspects are Decree Law No. 22498 of 1956 ("Organization of the National Atomic Energy Commission (CNEA), the Application Authority"), ratified by Law No. 14467 of 1958 ("Ratification Law of Decree Laws of the provisional government between September 23rd. 1955 and April 30th.1958") and by Decree No. 842/58.

The above mentioned Decree-Law also determined the competence of CNEA to issue the necessary regulatory standards and the requirements for the permanent vigilance with regard to activities related to radioactive materials, and to supply the means of control necessary for the existence, marketing and use of the materials related to the pacific uses of nuclear energy.

On the other hand, Decree No. 842/58 approved and placed the "Regulation for the use of Radioisotopes and Ionizing Radiation" in force, with the object of regulating the uses and applications of radioactive materials and the radiation they emit or emitted by nuclear reactions and transmutations, clearly determining that the CNEA would control the application and sanctions of those regulations. The use and regulation of X-ray generators was excluded from the competence of that standard, belonging exclusively to the area of the Ministry of Health.

As a consequence of the constant increase in nuclear activities in the country, the functional independence of the regulatory branch has strengthened with respect to other activities of the CNEA.

Based on these considerations, the Executive Power, with Decree No. 1540/94, has reorganized the Argentine nuclear system creating, the "National Nuclear Regulation Entity". This was constituted as a regulatory authority in radiological and nuclear safety, safeguards and physical protection in the whole national territory, performing all the regulation and control functions of the nuclear activity that until then belonged to the regulatory branch of CNEA.

In 1997, Law No. 24804 was enacted ("National Law of Nuclear Activity. Functions. Regulation Criterion"), determining the creation of the Nuclear Regulatory Authority (ARN), in charge of the regulation and control activities concerning nuclear and radiological safety, safeguards and physical protection, as well as the consulting function for the executive power on issues of its competence.

ARN, as a self-sufficient entity, independent from the Presidency of the Nation, has legal power to act in areas of public and private law as successor of the regulatory branch of the CNEA and the National Nuclear Regulation Entity.

3.1.2. Licensing Process

The regulatory system, through the AR 0.0.1 Rev. 2 Policy, considers licenses for the construction, start up, operation and final closing of nuclear facilities. This system determines the conditions that the licensee must comply with in each stage.

With reference to the licensing of facilities, the ARN must approve the permission to start construction. It must therefore be demonstrated that the facility will not cause damage to the public or to the environment, backed by documentation. As such, a prior Environmental Impact Evaluation (EIE) must be carried out, subject to the national legislation.

The complete process of the EIE comprises the following essential steps:

- Preliminary Report (PR): as affidavit by the owner of the project, in the cases that may correspond; due to the importance and complexity of a nuclear power plant, this step is avoided.

- Environmental Impact Study (EIS), also under the charge of the owner of the project, in the cases that may correspond.

- Revision of the Environmental Impact Study (REIS): responsibility of the competent environmental authority.

- Public participation instance.

- Environmental Impact Declaration (EID): responsibility of the competent environmental authority.

Figure 3.1 describes the stages of the performance and approval process of the EIE.

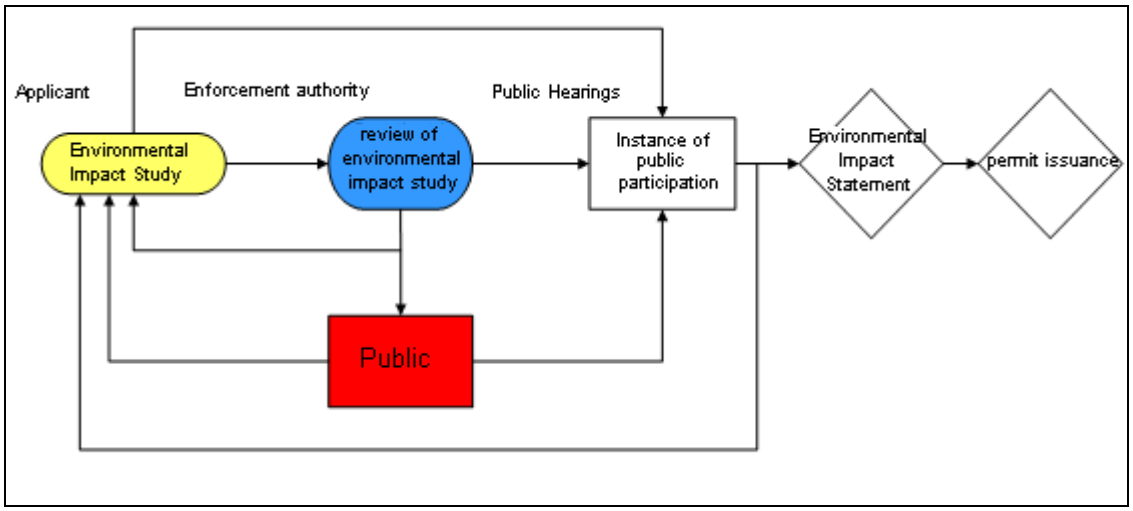


Figure 3.1: Stages of the environmental impact evaluation in Argentina.

Once the environmental license has been obtained, the EIE is delivered to the ARN with the object of beginning proceedings to obtain the construction license. The EIE contains the greater part of the information required by the ARN to authorize the construction license.

The construction license is issued once the compliance with the standards and requirements for the site, basic design, and conditions expected for the operation prior to start up have been verified. The applicable standards, in coinciding completely with international recommendations, determine the security criteria to be complied with by the design of the facility and define the chronograms and type of mandatory documentation that must be presented together with the license application (Standard AR 3.7.1).

Specifically, nuclear power plants must comply with the radiological criteria relative to accidents (Standard AR 3.1.3). Once the construction license is requested, a constant interaction between the constructor or operator of the future facility and the ARN begins, constituting an interactive process. Likewise, from the beginning of construction, the capacities of the licensee to fulfil his responsibilities are evaluated.

The start-up license determines the conditions for the loading of fuel and moderator, operation with power increase up to the nominal value, as well as the verification and testing of the components, equipment and systems, to determine if they comply with the design principles. In order to comply with the license, the licensee must appoint a start-up committee

ad hoc constituted by senior specialists who continuously evaluate the execution of the start-up program, recommending its continuation (Standards AR 3.7.1, AR 3.8.1. and AR 3.8.2).

The operation license is issued once the ARN verifies that all conditions, standards and specific requirements applicable to the facility have been complied with. This conclusion is the result of analysis of the technical documentation and, as well as of the results of the inspections performed during the construction and start-up and the recommendations of the ad hoc start-up committee. The operation license is a document by which the ARN authorizes the business operation of a nuclear facility, under stipulated conditions which must be complied with by the licensee (Standard AR 3.9.1). The non-compliance with any of the imposed requirements without the corresponding authorization by the ARN results in the application of sanctions that may lead to the suspension or cancellation of the operation license.

At the end of the useful life of the facility and by requirement of the licensee, the ARN authorizes the ending of the business operation of the nuclear power plant and issues a dismantling license. This document determines the safe dismantling conditions of the facilities, and the licensee will be in charge of planning and the provision of the necessary means for its compliance. The licensing process for nuclear power plants is shown in Figure 3.2.

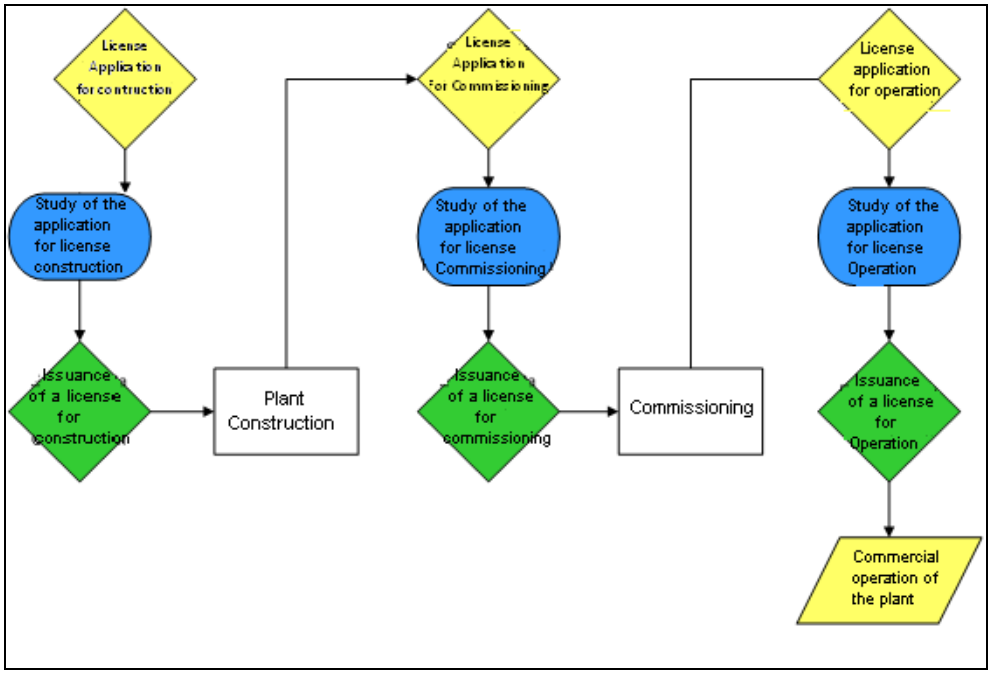


Figure 3.2: Licensing process for nuclear power plants in Argentina

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar/,
NUCLEAR REGULATORY AUTHORITY. http://www.arn.gov.ar/.

3.2. Main National Laws and Regulations in Nuclear Power.

The Argentine legal and regulatory system contemplates different aspects, from the ratification of international treaties for the pacific use of nuclear energy, to the different standards for the regulation and vigilance of the nuclear activity within the country.

Bilateral treaties and agreements for the pacific use of nuclear energy:

In 1991, in the city of Guadalajara, a bilateral agreement was signed between the Argentine Republic and the Federative Republic of Brazil for the exclusively pacific use of nuclear energy. In virtue of this agreement, an agency was created "Brazilian-Argentine Accounting and Control Agency of nuclear material" (ABACC – Agencia Brasilero-Argentina de Contabilidad y Control de material nuclear). Its essential objective is the implementation of a Common System for the Accounting and Control of nuclear material, with the object of ensuring that the material is not used to manufacture nuclear weapons or other nuclear devices.

Once the Agency was created, the signature of the Agreement was executed between Brazil, Argentina, the IAEA and the ABACC (four-partite agreement), to consolidate the application system of safeguards presently in force in both countries.

Tlatelolco Treaty: Treaty for the Ban of Nuclear Weapons in Latin America and the Caribbean. Argentina adhered to this international treaty and, in this manner, committed to use the material and nuclear facilities under its jurisdiction exclusively for peaceful objectives, and to forbid and impede the use, manufacturing, production, possession and dominion of all nuclear weapons in its territories, as well as the participation, in any manner, in this type of activity.

Non-Proliferation Treaty of Nuclear Weapons: Argentina is one of the signatories of the treaty, in which it relinquishes the use of nuclear weapons.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION

http://www.cnea.gov.ar/xxi/legislacion/internacional/24272f.pdf,

http://www.cnea.gov.ar/xxi/legislacion/internacional/24448.pdf,

BRAZILIAN ARGENTINE ACCOUNTING AND CONTROL AGENCY OF NUCLEAR MATERIAL (AGENCIA BRASILERO-ARGENTINA DE CONTABILIDAD Y CONTROL DE MATERIAL NUCLEAR). http://www.abacc.org/home.htm.

Main National Laws:

Law No. 1919
Mining Code. Approval.
Enacted: November 25th 1886.

Decree/ Law No. 6673
Patents and Trademarks – Model or Industrial Design. Regulatory Standards.
Enacted: August 9th 1963.

Law No. 17048
Nuclear Damage. Vienna Convention on Civil Liability for Nuclear Damage.
Approved by the International Conference on Civil Liability for Nuclear Damage, held in Vienna, Republic of Austria, in 1963 (amended and complemented by a Protocol and Complementary Convention approved by Law 25.313).
Enacted and promulgated: December 2nd 1966.

Law No. 21947
Convention on Prevention of Marine Pollution by Dumping of Wastes and Other Matters, open for signature on December 29th 1972 in London, Mexico, Moscow and Washington.
Enacted and promulgated: March 6th 1979.

Law No. 22455
Convention related to Civil Liability within the sphere of nuclear materials sea transport, signed in Brussels, Belgium, on December 17th 1971.
Enacted and promulgated: March 27th 1981.

Law No. 22507
Treaty concerning the Prohibition of Placing Nuclear Weapons and other Weapons of Massive Destruction on Sea and Ocean beds, and Underground beds, signed in London, Moscow and Washington on February 11th 1971
Enacted and promulgated: October 7th 1981.

Law No. 23340
Nuclear Energy: Nuclear Weapons Test-Ban
Treaty on Nuclear Weapons Test-Ban in the Atmosphere, in the Outer Space and in Submarine Waters, concluded in the city of Moscow on August 3rd 1963.
Enacted: July 30th 1986.
Promulgated: August 19th 1986.

Law No. 23620
Physical Protection of Nuclear Materials.
Convention on the Physical Protection of Nuclear Materials, signed in Vienna, Republic of Austria, on March 3rd 1980.
Enacted: September 28th 1988.
Promulgated: October 20th 1988.

Law No. 23731
Nuclear Accidents or Radiological Emergency.
Conventions on the Immediate Notification of Nuclear Accidents and Assistance in case of Nuclear Accident or Radiological Emergency, approved by the General Conference of the International Institution of Atomic Energy, in Vienna, Republic of Austria, on September 26th 1986.
Enacted: September 13th 1989.
Promulgated: October 6th 1989.

Decree No. 603/1992
Nuclear Exports. Control System.
Control system of sensitive exports and military material. Constitutes the National Commission for the Control of Sensitive Exports and War Material.
Published in the Official Bulletin on April 14th 1992.
Amended by Decrees No. 1291/1993, 102/2000, 437/2000.

Law No. 24272
Prohibition of Nuclear Weapons. Treaty.
Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean, adopted in Mexico on February 14th 1967, with amendments introduced on July 3rd 1990, May 10th 1991 and August 26th 1992 (Tlatelolco Treaty)
Enacted: November 10th 1993.
Promulgated: December 7th 1993 (Application Art.70, National Constitution).

Decree No. 1540/94
Atomic Energy. Reorganization of the National Entity.

Reorganization of the National Atomic Energy Commission. Creation of the "Ente Nacional Regulador Nuclear y Constitución de la Sociedad Nucleoeléctrica Argentina S.A" Privatization Process.
Enacted: August 30th 1994.
Published in the Official Bulletin on September 2nd 1994.

Law No. 24448
Nuclear Weapons.
Treaty on Non Proliferation of Nuclear Weapons, open for signature in London, Washington and Moscow on July 1st 1968 (TNP)
Enacted: December 23rd 1994.
Promulgated: January 13th 1995.

Law No. 24776
Nuclear Safety.
Convention on Nuclear Safety adopted in Vienna, Republic of Austria, on September 20th 1994.
Enacted: February 19th 1997.
Promulgated: April 4th 1997 (Application Art.80, National Constitution).

Law No. 24804
National Law on Nuclear Activity. Functions. Regulation Criteria.
Enacted: April 2nd 1997.
Promulgated in part: April 23rd 1997.

Law No. 25018
Radioactive Waste Management System. General Dispositions.
Enacted: September 23rd 1998.
Promulgated: October 19th 1998.

Law No. 25022
Comprehensive Nuclear Test Ban.
Comprehensive Nuclear Test Ban Treaty, accepted by the General Assembly of the United Nations in New York, United States of America, on September 10th 1996.
Enacted: September 23rd 1998.
Promulgated: October 20th 1998.

Decree No. 1390/98
Regulation of the National Law of Nuclear Activity No. 24804.
Enacted: November 27th 1998.

Law No. 25279
Safety in Radioactive Waste and Fuel.
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, adopted in Vienna, Republic of Austria, on September 5th 1997.
Enacted: July 6th 2000.
Promulgated: July 31st 2000 (Application Art.80, National Constitution).

Law No. 25313
Nuclear Damages.
Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damages and the Convention on Supplementary Compensation for Nuclear Damages, adopted in Vienna,

Republic of Austria, on September 12th 1997. (Modifies and complements the Vienna Convention approved by Law No. 17048).
Enacted: September 7th 2000.
Promulgated: October 6th 2000 (Application of Art.80, National Constitution).

Law No. 25675
National Environmental Policy. Minimum Budget for Sustainable Management.
Minimum budgets in order to achieve sustainable and adequate environmental management, the preservation and protection of the biological diversity and the implementation of sustainable development. Principles of environmental policy. Minimum budget. Judicial competence. Policy and management instruments. Environmental order. Evaluation of the environmental impact. Education and information. Citizen participation. Environmental insurance and restoration fund. Federal environmental system. Ratification of federal agreements. Self-management. Environmental damage. Environmental compensation fund.
Enacted: November 27th 2002.
Published: Official Bulletin of the Argentine Republic, November 28th 2002.

Law No. 25842
Agreements. Promotion of Nuclear Science and Technology.
Cooperation Agreement for the promotion of nuclear science and technology in Latin America and the Caribbean, adopted by the Board of Governors of the International Atomic Energy Organization in Vienna, on September 25th 1998.
Enacted: November 26th 2003.
Promulgated: January 9th 2004.
Published: Official Bulletin of the Argentine Republic, January 15th 2004.

Law No. 25837
Agreements. Comprehensive Nuclear Test Ban Treaty.
Agreement on the performance of activities related with international vigilance facilities at the service of the Comprehensive Nuclear Test Ban Treaty, signed with the Provisional Technical Secretariat of the Preparatory Commission of the Organization for the Comprehensive Nuclear Test Ban Treaty, on December 9th 1999, in Vienna, Republic of Austria.
Enacted: November 26th 2003.
Promulgated: February 19th 2001.
Published: Official Bulletin of the Argentine Republic, February 20th 2004.

Law No. 26566
Nuclear Activity.
Declaration of national interest of the activities in order to extend the life of the CNE and CNA I, the completion of the construction, start-up and operation of CNA II, the construction and start-up of a fourth power plant of one or two nuclear source energy modules and the construction and execution of the CAREM project.
Enacted: November 25th 2009.
Effectively promulgated: December 17th 2009.

SOURCE: NATIONAL ATOMIC ENERGY COMMISSION. http://www.cnea.gov.ar/,

ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT SECRETARIAT OF THE NATION. http://www.ambiente.gov.ar/?aplicacion=normativa&IdNorma=85&IdSeccion=0,

LEGISLATIVE INFORMATION. http://www.infoleg.gov.ar/,

NATIONAL INSTITUTE OF INTELLECTUAL PROPERTY.

http://www.inpi.gov.ar/pdf/Leymodelosentera.pdf y http://www.inpi.gov.ar/pdf/LeyesTransferenciaTec.pdf.

Nuclear Regulatory Standards – Nuclear Regulatory Authority:

AR 0.0.1.
Licensing of Class I facilities.

AR 0.11.1.
Licensing of Class I facility staff.

AR 0.11.2.
Psychophysical capacity requirements for specific authorizations.

AR 0.11.3.
Re-training of Class I facilities staff.

AR 2.12.1.
Radiological safety criteria for the management of radioactive waste from mining manufacturing facilities.

AR 3.1.1.
Occupational exposure to nuclear power reactors.

AR 3.1.2.
Limitation of radioactive effluents in nuclear power reactors.

AR 3.1.3.
Radiological criteria with reference to accidents in nuclear power reactors.

AR 3.2.1.
General safety criteria for the design of nuclear power reactors.

AR 3.2.3.
Fire safety in nuclear power reactors.

AR 3.3.1.
Design of the core of nuclear power reactors.

AR 3.3.2.
Heat removal systems in nuclear power reactors.

AR 3.3.3.
Primary pressure circuit in nuclear power reactors.

AR 3.3.4.
Safety in combustible elements for nuclear power reactors.

AR 3.4.1.
Protection and instrumentation system related to the safety of nuclear power reactors.

AR 3.4.2.
Extinction systems for nuclear power reactors.

AR 3.4.3.
Confinement system in nuclear power reactors.

AR 3.5.1.
Essential electrical supply in nuclear power reactors.

AR 3.6.1.
Quality system in nuclear power reactors.

AR 3.7.1.
Schedule for the presentation of documents prior to the commercial operation of a nuclear power reactor.

AR 3.8.1.
Preliminary tests and start-up of nuclear power reactors.

AR 3.9.1.
General safety criteria for the operation of nuclear power reactors.

AR 3.9.2.
Communication of relevant events in nuclear power reactors.

AR 3.10.1.
Protection against earthquakes in nuclear power reactors. Under revision process, taking into account the "state of the art".

The following standards are also under analysis process:

AR 3.10.2.
General safety criteria for the location.

AR 3.10.3.
Safety criteria for the evaluation of external events.

AR 3.10.4.
Criteria for the determination of potential effects of a nuclear power plant in the region.

AR 3.17.1.
Dismantling of nuclear power reactors

AR 4.1.1.
Occupational exposure in research nuclear reactors.

AR 4.1.2.
Radioactive effluent limitation in research nuclear reactors.

AR 4.1.3.
Radiological criteria relative to accidents in research reactors.

AR 4.2.1.
Design of critical compounds.

AR 4.2.2.
Design of research reactors.

AR 4.2.3.
Fire safety in research reactors.

AR 4.5.1.
Design in the electric energy supply system in research reactors.

AR 4.7.1.
Schedule for the presentation of documents prior to the operation of a research reactor.

AR 4.7.2.
Schedule for the presentation of documents prior to the operation of a critical compound.

AR 4.8.1.
Preliminary tests and start-up of critical component.

AR 4.8.2.
Preliminary tests and start-up of research reactors.

AR 4.9.1.
Operation of critical component Revision 1.

AR 4. 9.2.
Operation of nuclear research reactors.

AR 5.1.1.
Occupational exposure in Class I particle accelerators.

AR 5.7.1.
Schedule for the presentation of documents prior to the operation of a particle accelerator.

AR 6.1.1.
Occupational exposure of Class I radioactive facilities.

AR 6.1.2.
Limitation of radioactive effluents in Class I radioactive facilities.

AR 6.2.1.
Design of fixed irradiation plants with mobile underwater irradiation sources.

AR 6.7.1.
Schedule for the presentation of documents prior to the operation of an industrial irradiation plant.

AR 6.9.1.
Operation of fixed irradiation plants with mobile underwater irradiation sources.

AR 7.9.1.
Industrial gammagraphy equipment operation.

AR 7.9.2.
Operation of radiation sources for industrial applications.

AR 7.11.1.
Individual permits for industrial gammagraphy equipment operators.

AR 7.11.2.
Individual permits for radiation sources operators for industrial application.

AR 8.2.1.
Use of sealed sources in brachytherapy.

AR 8.2.2.
Operation of linear accelerators for medical use.

AR 8.2.3.
Telecobaltotherapy facility operation.

AR 8.2.4.
Use of non-sealed radioactive sources in nuclear medicine facilities.

AR 8.11.1.
Individual permits for the use of radioactive material or ionizing radiations in humans.

AR 8.11.2.
Minimum clinical training requirements to obtain individual permits for medical use.

AR 8.11.3.
Individual permits for specialists and technicians in radiotherapy physics.

AR 10.1.1.
Basic Standard of Radiological Safety.

AR 10.12.1.
Radioactive Waste Management.

AR 10.13.1.
Physical protection standard for nuclear materials and facilities.

AR 10.13.2.
Physical safety standard for sealed sources.

AR 10.14.1.
Non-deviation guarantees of nuclear materials and materials, facilities and equipment of nuclear interest.

AR 10.16.1.
Transport of radioactive materials.

SOURCE: NUCLEAR REGULATORY AUTHORITY. http://www.arn.gov.ar/ y http://200.0.198.11/normas/index.htm

REFERENCES

Not provided

APPENDIX 1: INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

The National Commission of Atomic Energy has entered into international agreements on the nuclear area both with other entities and with other countries.

I. TREATIES AND AGREEMENTS ON NON PROLIFERATION OF NUCLEAR WEAPONS

Treaties and Multilateral Agreements

- Antarctica Treatment (Section V). Signed by the Argentine Republic on June 23rd, 1961, and ratified on that same date jointly with the remaining initial signatories, thus coming into effect as of the abovementioned date. Its duration is unlimited.

- Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space, and Under Water (Moscow Treaty). Signed by the Argentine Republic in Washington on August 8th and in London and Moscow on August 9th, 1963, it was approved by Law No. 23340, later enacted on August 19th, 1986 (Official Gazette 2/IV/69) and ratified on March 26th, 1969, thus coming into force in Argentina on that date. Its duration is unlimited.

- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. The Argentine Republic signed it in Washington on January 27th and in Moscow on April 18th, 1967. It was approved by Law No. 17989, later enacted on December 4th, 1968 (Official Gazette 2/IV/69), and ratified on March 26th, 1969, thus coming into effect in Argentina on that date. Its duration is unlimited.

- Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco). The Argentine Republic signed it in Mexico on September 27th, 1967 with interpretative declaration. It was approved by Law No. 24272, promulgated on December 7th, 1993 (Official Gazette 14/XII/93), and ratified with exemption of the referred conditions on January 18th, 1994, thus coming into effect in Argentina on that date. Its duration is unlimited.

- Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil. The Argentine Republic signed it in Washington, London and

Moscow on September 3rd, 1971. It was approved by Law No. 22507, promulgated on October 7th, 1981 (Official Gazette 13/X/81), and ratified on March 21st, 1983, thus coming into effect in Argentina on that date. Its duration is unlimited.

- Treaty on the Non Proliferation of Nuclear Weapons (NPT). The Argentine Republic adhered to it in Washington on February 10th, 1995. It came into effect in Argentina on that date. Its duration is unlimited.

- Comprehensive Test Ban Treaty (CTBT). Open for signature in New York on September 24th, 1996. Not yet in effect as the necessary quantity of ratifications has not been met. Signed in New York on that date, it was later approved by Law No. 25022, promulgated on October 20th, 1998 (Official Gazette 28/X/98), and ratified on December 4th, 1998. Its duration is unlimited.

Bilateral Agreements

- Agreement between the Governments of the Argentine Republic and the Federative Republic of Brazil for the exclusive pacific use of nuclear energy (Guadalajara Agreement or Agreement SCCC). It was signed in Guadalajara on July 18th, 1991 (Official Gazette 24/XII/91), and later ratified on December 12th, 1991, thus coming into effect on that date. Its duration is unlimited.

- Protocol on Privileges and Immunities of the Brazilian-Argentine Agency of Accountancy and Nuclear Material Control in Brazil (Venue Agreement). It was added to the Agreement between the Argentine Republic and the Federative Republic of Brazil for the exclusive pacific use of the nuclear energy. Signed in Brasilia on August 20th, 1991, it was later approved by Law No. 24048, enacted on January 2nd, 1992 (Official Gazette 9/I/92), and ratified on February 10th, 1992, thus coming into effect on March 12th of that year. Its duration is unlimited.

- Agreement on Immunities and Privileges of the Brazilian-Argentine Agency of Accountancy and Nuclear Material Control in Argentina. Signed in Rio de Janeiro on May 19th, 1993, it was later approved by Law No. 24580 and then enacted on November 22, 1995 (Official Gazette 27/XI/95). Ratifying notes are still to be exchanged. Provisionally in force since October of that year. Its duration is unlimited.

Agreements with IAEA

- Statute of IAEA. In force in Argentina since May 2002, with its four amendments.

- Agreement on Privileges and Immunities of IAEA. Approved by Decree-Law No. 7672 on September 13th, 1963 (Official Gazette 29/XI/63), it was later ratified by Law No. 16478 and then enacted on September 29, 1964 (Official Gazette 30/IX/64). The acceptance document was handed down in Vienna on October 15th, 1963, thus coming into force in Argentina on that date. Its duration is unlimited.

- Agreement between IAEA and the Government of Argentina. Through this agreement, the Agency will advise Argentina on carrying out a project related

to an experimental reactor and a production reactor (RA-3 INFCIRC/62). Signed in Vienna on December 2nd, 1964, within the framework of the Agency's statute, it came into effect on that date. It was amended by the Second Agreement of Property Ownership Transference (INFCIRC/62/Add.1), signed in Washington on December 13rd and in Vienna on December 30th, 1965. Suspended application on March 4th, 1994, in virtue of the Four Party Agreement coming into force.

- Agreement between the Government of the Argentine Republic and the International Atomic Energy Agency for the Safeguard Application in relation to the Agreement between the Government of the Argentine Republic and the Canadian Government for the Cooperation in the Development and Application of the Atomic Energy with Peaceful Purposes (INCIRC/251). Signed in Vienna on July 22nd, 1977, within the frame of the Articles of Association of the Agency, which have been binding ever since. Suspended application on March 4th, 1994 in virtue of the Four Party Agreement coming into effect.

- Agreement between the Government of the Argentine Republic, the Peruvian Government and the United States of America related to Enriched Uranium Transference for an NPP of Nil Power (RP-0) (INFCRC/266). Signed in Vienna on May 9th, 1978, within the frame of the Articles of Association of the Agency, it has been in force since that date. Its validity shall last as long as the nuclear material is under the Peruvian jurisdiction or control, or until the parties convey that no nuclear activity can be used which holds interest for safeguards.

- Agreement between the International Atomic Energy Agency and the Government of the Argentine Republic for the Application of Safeguards in Atucha II NPP (INFCIRC/294). Signed in Vienna on July 15th, 1981, within the frame of the Articles of Organisation, which has come into force since that date. Suspended application of March 4th, 1994, in virtue of the Four Party Agreement coming into effect.

- Agreement between the Government of the Argentine Republic and the International Atomic Energy Agency for the application of safeguards in relation to the heavy water production NPP in Arroyito (INFCIRC/296). Signed in Vienna on October 14th, 1981, within the frame of the Articles of Organisation, it has come into effect since that date. Application suspended on March 4th, 1994, in virtue of the Four Party Agreement coming into effect.

- Agreement between the Government of the Argentine Republic and the International Atomic Energy Agency for the safeguards application to the heavy water supplied by the USSR (INFCIRC/297). Signed in Vienna on October 14th, 1981, within the frame of the Articles of Organisation, it has come into effect since that date. Its application was suspended on March 4th, 1994, in virtue of the Four Party Agreement coming into effect.

- Agreement of Supplementary Supply entered into by and between the International Atomic Energy Agency and the Governments of the Islamic Iranian Republic and the Argentine Republic so as to transfer enriched uranium (enriched to a 20%) destined for a research reactor from Iran

(INFCIRC/97/Add.2). Signed in Vienna on December 9th, 1988, within the frame of the Articles of Organisation of the Agency, it has been in effect since that date. Its validity shall last as long as the nuclear material is under Iranian jurisdiction or control or until the parties agree that no nuclear activity can be used holding interest for safeguards.

- Agreement between the Argentine Republic, the Federative Republic of Brazil, the Argentine-Brazilian Agency of Accountancy and Nuclear Material Control and the International Atomic Energy Agency for the application of safeguards (Four Party Agreement). Signed in Vienna on December 13th, 1991, it was approved by Law No. 24113, later enacted on August 27th, 1992 (Official Gazette 7/IX/92), and ratified on March 4, 1994, thus coming into effect on that date. It shall be valid as long as Brazil and Argentina are part of the Guadalajara Agreement (or SCCC Agreement).

- Agreement by means of note exchange between the International Atomic Energy Agency and the Argentine Republic so that Argentina could apply the Four Party Agreement in relation to the Tlatelolco Treatment and the TNP. Notes dated November 6th, 1996 and January 23rd, 1997, accordingly. They were exchanged in Vienna, thus coming into effect on March 18th, 1997. It will be valid as long as Argentina is part of the Tlatelolco Treatment, TNP or Guadalajara Agreement (or SCCC Agreement).

II. CONVENTIONS AND REGULATORY AGREEMENTS OF NUCLEAR ACTIVITY

International Conventions

- Vienna Convention on Civil Liability for Nuclear Damage. Open for signature in Vienna on May 21st, 1963, it has come into effect on November 12th, 1977. Argentina signed it in Vienna on October 10th, 1966. It was approved by Law No. 17048 later enacted on December 2nd, 1966 (Official Gazette 16/XII/66), and was ratified on April 25th, 1967. It came into force in our country on November 12th, 1977. Its duration is unlimited.

- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972. (London Convention) Signed in London on November 13th, 1972, it was approved by Law No. 21947, enacted on March 6th, 1979 (Official Gazette 9/III/79) and ratified on September 11th, 1979. In our country, it came into force on that date. Its duration is unlimited.

- International Convention for the Safety of Life at Sea. Signed in London on November 1st, 1974, it was approved by Law No. 22079, enacted on September 18th, 1979 (Official Gazette 24/XII/79) and ratified on December 5th, 1979, thus coming into effect in our country on that date. Its duration is unlimited.

- Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (signed in Brussels on 17th December, 1971). It was approved by Law No. 22455, enacted on March 27th, 1981 (Official Gazette 6/IV/81), and ratified on May 18th, 1981. It came into force in our country on that date. Its duration is unlimited.

- Convention on the Physical Protection of Nuclear Material was open for signature in Vienna and New York on 3rd March, 1980. It came into force on February 8th, 1987. Argentina signed it in Vienna on February 28th, 1986, and it was approved by Law No. 23620, enacted on October 20th, 1988 (Official Gazette 2/XI/88), and ratified on April 6th, 1989, with reserves, thus coming into force in our country on May 6th, 1989. Its duration is unlimited.

- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention. Opened for signature in Vienna on September 21st, 1988, it entered into force on April 27th, 1992. Argentina signed it in Vienna on that date, and it is under a constitutional process of approval and ratification. Its duration is unlimited.

- Convention on Early Notification of a Nuclear Accident. Opened for signature in Vienna on September 26th, 1986, it entered into force on October 27th, 1986. Approved by Law No. 237231, it was enacted on October 6th, 1990 (Official Gazette 30/I/90). Argentina adhered to this Convention in Vienna on January 17th, 1990, thus entering it into force in Argentina on February 17th, 1990. Its duration is unlimited.

- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Opened for signature in Vienna on September 26th, 1986, it entered into force on February 26th, 1987, approved by Law No. 23731, and was enacted on October 6th, 1989 (Official Gazette 30/I/87). Argentina adhered to it in Vienna on January 17th, 1990. It entered into force in Argentina on February 17th, 1990. Its duration is unlimited.

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Signed in Basel on March 22nd, 1989, it was approved by Law No. 23922, enacted in April 1991 (Official Gazette 24/IV/91) and ratified on June 27th, 1991. In Argentina it entered into force on May 5th, 1992. Its duration is unlimited.

- Convention on Nuclear Safety. Opened for the signature in Vienna on September 20th, 1994, it entered into force on October 24th, 1996. Argentina signed it on October 20th, 1994, and it was later approved by Law No. 24776, enacted on April 4th, 1997 (Official Gazette 11/IV/97) and ratified on April 17th, 1997, thus entering into force in Argentina on July 16th, 1997. Its duration is unlimited.

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Opened for signature in Vienna on September 29th, 1997, it entered into force on June 18th, 2001. Signed by Argentina on December 19th, 1997, it was approved by Law No. 25279, enacted on July 31st, 2000 (Official Gazette 4/VIII/00) and ratified on November 14th, 2000. Its duration is unlimited.

- Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage. Opened for signature in Vienna on September 29th, 1997, it entered into force on October 4th, 2003. Signed by Argentina on December 19th, 1997, it was approved by Law No. 25313, enacted on October 6th, 2000 (Official

Gazette 18/X/00) and ratified on November 14th, 2000. Its duration is unlimited.

- Convention on Supplementary Compensation for Nuclear Damage. Opened for signature in Vienna on September 9th, 1997, it has not come into effect since ratification is still pending, as it has yet to be ratified by one country. Signed by Argentina on December 19th, 1997, it was approved by Law No. 25313, enacted on October 6th, 2000 (Official Gazette 18/X/00) and ratified on November 14th, 2000. Its duration is limited.

III. COOPERATION AGREEMENTS

Multilateral Agreements

- IAEA Statute. Signed in New York on October 26th, 1956, thus entering into force on July 29th, 1957. It was approved by Decree Law No. 5011 on May 15th, 1957 (Official Gazette 22/V/57), ratified by Law No. 14467, later enacted on September 23rd, 1958 (Official Gazette 29/IX/58), ratified on October 3rd, 1957 and entered into force in our country on that date. Its duration is unlimited.

- Agreement on Privileges and Immunities of the IAEA. Approved by Decree-Law No. 7672 on September 13th, 1963 (Official Gazette 29/XI/63), which was ratified by Law No. 16478, enacted on September 29th, 1964 (Official Gazette 30/IX/64). The acceptation instrument was deposited in Vienna on October 25th, 1963, thus entering into force in our country on that date. Its duration is unlimited.

- Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA to the Government of the Argentine Republic. Signed in Vienna on February 27th, 1991, within the frame of the IAEA Statute, and in force since that date. Its duration is unlimited. (It substituted the Supplementary Agreement concerning the Provision of the Technical Assistance to the Government of the Argentine Republic by the IAEA, signed on April 11th, 1966, and in force from that date up until the agreement signed in 1991 entered into force).

- European Community of the Atomic Energy (EURATOM)

- Agreement between the Government of the Argentine Republic and the European Community of the Atomic Energy (EURATOM) related to the pacific uses of the nuclear energy. Signed in Brussels on June 11th, 1996, it was approved by Law No. 24869, later enacted on September 11th, 1997 (Official Gazette 18/IX/97), entering into force on October 29th of that year. Its duration is of 10 years, and it is automatically renewed by successive 5-year periods.

- Cooperation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL) was sponsored by the IAEA. Signed in Vienna on December 4th, 1998, it was approved by Law No. 25842, later enacted on January 9th, 2004 (Official Gazette 15/I/04) and ratified on March 30th, 2004. It entered into force in September 2005. Its duration is of 10 years and it is extendable by the parties agreeing upon that for five-year successive periods.

Bilateral Agreements

- Armenia

Cooperation Agreement on Pacific Uses of Nuclear Energy between the Government of the Argentine Republic and the Government of the Republic of Armenia. Signed in Yerevan on June 30th, 1998, it was approved by Law No. 25285, enacted on December 6th, 2000 (Official Gazette 13/XII/00), and entered into force on September 7th, 2001. Its initial duration is of five years and it is automatically renewed by five-year successive periods.

- Australia

Cooperation Agreement between the Argentine Republic and Australia on Pacific Uses of the Nuclear Energy. Signed in Melbourne on August 8th, 2001, it was approved by Law No. 26014, enacted on January 10th, 2005 (Official Gazette 14/I/05) and it entered into force on January 22nd, 2005. Its duration is unlimited.

- Bolivia

Cooperation Agreement on the pacific uses of the nuclear energy between the Republic of Bolivia and the Argentine Republic. Signed in La Paz on March 19th, 1970, it was approved by Law No. 18814, enacted on October 14th, 1970 (Official Gazette 23/X/70), and entered into force on February 18th, 1971. Its duration is unlimited.

- Brazil

Cooperation Agreement between the Argentine Republic and the Federative Republic of Brazil for the development and application of the pacific uses of nuclear energy. Signed in Buenos Aires on May 17th, 1980, it entered into provisional force on that date. It was approved by Law N. 22494, enacted on September 10th, 1981 (Official Gazette 16/XI/81), and ratified on October 20th, 1983. Its initial duration was of ten years and it is automatically renewed by two-year periods.

Cooperation Protocol between the Argentine Republic and the Federative Republic of Brazil on the immediate notification and mutual assistance in case nuclear accidents and radiological emergencies should occur (Protocol No. 11 of the Argentine Brazilian Integration Minutes). Signed in Buenos Aires on July 29th, 1986, and entered into force since that date. Its duration is unlimited.

Nuclear Cooperation Protocol (Protocol No. 17 of the Argentine Brazilian Integration Minutes). Signed in Brasilia on December 10th, 1986, and entered into force since that date. Its duration is unlimited.

Agreement between the Argentine Republic and the Federative Republic of Brazil for the Exclusively Pacific Use of the Nuclear Energy (June 1991) (creation of the Argentine Brazilian Accountancy and Nuclear Material Control Agency, ABACC).

Agreement between the Argentine Republic and the Federative Republic of Brazil, IAEA and ABACC. It was signed on December 13th, 1991. The signatories accept the application of safeguards to every nuclear material in every nuclear activity undertaken in both countries.

Joint Declaration concerning the creation of the Argentine Brazilian-Nuclear Energy Application Agency (ABAEN). Signed in Buenos Aires on August 14th, 2001, and coming into force on that date. Its duration is unlimited.

Joint Declaration on Nuclear Policy signed in Puerto Iguazú on November 30th, 2005 coming into force on that date. Its duration is unlimited.

Additional Protocol to the Cooperation Agreement for the development and application of the pacific uses of the nuclear energy regarding reactors, nuclear fuels, radioisotopes and radiodrugs and radioactive waste management, signed in Puerto de Iguazú on November 30th, 2005, coming into effect on that date. Its duration is unlimited.

Additional Protocol to the Cooperation Agreement for the development and application of pacific uses of nuclear energy in the regulatory and implementation areas, between the Argentine Republic and the Federative Republic of Brazil. Signed in Puerto Iguazú on November 30th, 2005, and coming into force on that date. Its duration is unlimited.

Protocols of the Day of the Friendship. Signed on November 30th, 2005, in Iguazú. They include the following cooperation items:

1. Joint Declaration on nuclear policy.

2. Additional Protocol regarding reactors, nuclear fuels, radioisotope supply and radio drugs as well as radioactive waste management.

3. Additional Protocol in the regulatory areas and the implementation for nuclear regulations.

Anniversary Joint Declaration ABACC. Signed in Buenos Aires on December 12th, 2006.

Joint Declaration February 2008. Signed in Buenos Aires on February 22nd, 2008. It sets the creation of the Binational Commission on Nuclear Energy, trains agencies to create a binational uranium enrichment company and conducts a Technical Binational Seminar in both countries.

- Bulgaria

Cooperation agreement between the Government of the Argentine Republic and the Government of the Republic of Bulgaria concerning pacific uses of the nuclear energy. Signed in Buenos Aires on August 1st, 2000, it was approved by Law No. 25809 and enacted on November 28th, 2003 (Official Gazette 2/XII/03); exchange ratification notes are still pending. Its initial duration will be of five years, automatically renewed every five-year successive periods.

- Canada

Agreement between the Government of the Argentine Republic and the Government of the Republic of Canada for the cooperation on the pacific uses of nuclear energy. Signed in Ottawa on June 21st, 1994, it was approved by Law No. 24646, enacted on June 26th, 1996 (Official Gazette 28/VI/96), and coming into force on that date. Its

duration is of thirty years, and it is automatically renewed by ten-year periods. (Substitutive of the Agreement between the Government of the Argentine Republic and the Government of the Republic of Canada for the cooperation in the development and application of the atomic energy with pacific uses signed on January 30th, 1976 coming into force on that date until the signed instrument entered into force in 1994).

- Chile

Agreement between the Government of the Republic of Chile and the Government of the Argentine Republic on cooperation in the pacific uses of the nuclear energy. Signed in Santiago de Chile on November 13th, 1976, it was approved by Law No. 22886, enacted on August 31st, 1983 (Official Gazette 14/IX/83), and entered into force on September 1st of that year. Its initial duration was of five years, and it was automatically renewed by annual successive periods.

- China

Agreement between the Government of the Argentine Republic and the Government of the People's Republic of China for the cooperation in pacific uses of nuclear energy. Signed in Beijing on April 15th, 1985, it was approved by Law No. 23712, enacted on October 6th, 1989 (Official Gazette 12/X/89), and entered into force on October 30th of that year. Its duration is of fifteen years and it is automatically renewed by five-year successive periods.

- Colombia

Cooperation Agreement in the pacific uses of nuclear energy between the Argentine Republic and the Republic of Colombia. Signed in Bogotá on September 15th, 1967, it was approved by Law No. 19505, enacted on February 23rd, 1972 (Official Gazette 18/VII/72), and coming into force on March 27th of that year. Its duration is unlimited.

- South Korea

Agreement between the Government of the Argentine Republic and the Government of the Republic of Korea on cooperation in peaceful uses of nuclear energy. Signed in Buenos Aires on September 9th, 1996, it was approved by Law No. 24860, enacted on September 10th, 1997 (Official Gazette 16/IX/97), and came into force on September 10th, 1997. It is valid for 10 years and is automatically renewed every five years.

Memo of Understanding between the Ministry of Federal Planning, Public Investment and Services of Argentina, and the Ministry of Economic Knowledge of the Republic of Korea, on Cooperation in Nuclear Energy. Signed in Seoul on September 16th, 2010

- Costa Rica

Cooperation Agreement between the Government of the Argentine Republic and the Government of the Republic of Costa Rica on the development and application of peaceful uses of the nuclear energy. Signed in Buenos Aires, on June 18th, 1992, it was approved by Law No. 24981 and enacted on July 10th, 1998 (Official Gazette 15/VII/98). Its initial duration is ten years, and it will be automatically renewed by two-year successive periods.

- Cuba

Memorandum of Understanding on the cooperation in peaceful uses of the nuclear energy. Signed on January 19th, 2009.

- Ecuador

Cooperation Agreement on the peaceful uses of nuclear energy between the Government of Ecuador and the Government of the Argentine Republic. Signed in Buenos Aires on April 5th, 1977, it was approved by Law No. 21896, enacted on October 30th, 1978 (Official Gazette 03/XI/78), and entered into force on June 4th, 1979. Its initial validity was of five years, and it was automatically renewed by annual successive periods.

- Spain

Special Cooperation Agreement between the Government of the Argentine Republic and the Kingdom of Spain for the development and application of the peaceful uses of the nuclear energy. Signed in Buenos Aires on November 30th, 1978, it entered into force on that date. Its initial validity was five years, automatically renewed by two-year successive periods.

- United States of America

Agreement between the Government of the Argentine Republic and the Government of the United States of America on the peaceful uses of the nuclear energy. Signed in Buenos Aires on February 29th, 1996, it was approved by Law No. 24862, enacted on September 10th, 1997 (Official Gazette 17/IX/97), and entered into force on October 16th of that year. Its duration is 30 years. (Substitute of the Agreement between the Government of the Argentine Republic and the Government of the United States of America on civil uses of nuclear energy, signed on June 25th, 1969, and entered into force as of July 25th of that year, until the signed instrument entered into force in 1996).

- France

Cooperation Agreement between the Government of the Argentine Republic and the Government of the Republic of France for the use of nuclear energy for exclusively peaceful and non explosive purposes. Signed in Buenos Aires on April 21st, 1994, it was approved by Law No. 24647, enacted on June 26th, 1996 (Official Gazette 1/VII/96), and entered into force on July 10th of that year. Its duration lasts 10 years, automatically renewed by 10-year successive periods.

- Greece

Agreement between the Government of the Argentine Republic and the Government of the Hellenic Republic on the cooperation in the peaceful uses of nuclear energy. Signed in Athens on July 13th, 1997, it was approved by Law No. 25286, enacted on December 6th, 2000 (Official Gazette 13/XII/00), and entered into force on December 12th, 2000. The duration is ten years. It shall be automatically renewed on a five-year basis.

- Guatemala

Cooperation Agreement between the Government of the Republic of Guatemala and the Government of the Argentine Republic for the development and the application of peaceful uses of nuclear energy. Signed in Guatemala on May 14th, 1986, it was approved by Law No. 24645, enacted on June 26th, 1996 (Official Gazette 28/VI/96), and entered into force on March 5th, 1997. This agreement was executed for a period of five years. It is automatically renewed on a two-year basis.

- Indonesia

Agreement between the Government of the Argentine Republic and the Government of the Republic of Indonesia for the cooperation in the pacific uses of the nuclear energy. Signed in Buenos Aires on May 17th, 1990, it was approved by Law No. 24161, enacted on October 26th, 1992 (Official Gazette 02/XI/92), and entered into force on February 23rd, 1993. This Agreement is executed for a period of five years and it shall be automatically renewed on a yearly basis.

- Morocco

Cooperation Agreement between the Government of the Kingdom of Morocco and the Government of the Argentine Republic on peaceful uses of atomic energy. Signed in Rabat on June 13th, 1996, it was approved by Law No. 24980 and enacted on July 10th, 1998 (Official Gazette 15/VII/98). Ratification notes have not been exchanged yet. It shall be initially executed for five years and automatically renewed on a yearly basis.

- Paraguay

Cooperation Agreement on the peaceful uses of nuclear energy between the Republic of Paraguay and the Argentine Republic. Signed in Buenos Aires on July 20th, 1967, it was approved by Law No. 18436, enacted on November 7th, 1969 (Official Gazette 19/XI/69), and entered into force on January 20th, 1970. Its execution is unlimited.

- Peru

Cooperation Agreement on peaceful uses of nuclear energy between the Argentine Republic and the Republic of Peru. Signed in Lima on May 25th, 1968, it was approved by Law No. 18255, enacted on June 10th, 1969 (Official Gazette 18/VII/69), and entered into force on July 13th, 1969. Its duration is unlimited.

- Romania

Agreement between the Government of the Argentine Republic and the Government of the Republic of Romania for the cooperation in the peaceful uses of the nuclear energy. Signed in Buenos Aires on November 27th, 1990, it was approved by Law No. 24217, enacted on June 24th, 1993 (Official Gazette 1/VII/93), and entered into force on July 29th, 1993. It is executed for ten years and automatically renewed on a five-year basis.

- Russia (State succession since 1992 from the former USSR)

Agreement between the Government of the Argentine Republic and the Government of the Union of Soviet Socialist Republics for the cooperation in the peaceful uses of the nuclear energy. Signed in Moscow on October 25th, 1990, it was approved by Law No. 24253, enacted on November 12th, 1993 (Official Gazette 18/XI/93), and entered

into force on November 18th of that year. This Agreement was executed for ten years and automatically renewed on a five-year basis.

Joint Declaration of the Ministry of Federal Planning, Public Investment and Services of the Argentine Republic and the State Corporation of Atomic Energy "ROSATOM", on the cooperation in the peaceful uses of the Nuclear Energy. Signed in Moscow on December 10th, 2008.

Memo of Understanding between the State Corporation of Atomic Energy (ROSATOM) and the Ministry of Federal Planning, Public Investment and Services of Argentina, on cooperation concerning the peaceful uses of Nuclear Energy. Signed in Buenos Aires on February 3rd, 2010.

Agreement on the Cooperation Guidelines between the Ministry of Federal Planning, Public Investment and Services of Argentina and the State Corporation of Atomic Energy (ROSATOM), within the framework of the peaceful uses of Atomic Energy. Signed in Buenos Aires on April 14th, 2010.

Memorandum of Understanding between the Ministry of Federal Planning, Public Investment and Services of Argentina and the State Atomic Energy Corporation "ROSATOM" on Cooperation in the Peaceful Uses of Nuclear Energy. Signed in Moscow on May 24th, 2011.

- Thailand

Agreement between the Government of the Argentine Republic and the Government of the Kingdom of Thailand on cooperation in peaceful uses of the nuclear energy. Signed in Bangkok on June 7th, 1996, it was approved by Law No. 24861, enacted on September 10th, 1997 (Official Gazette 16/IX/97), and entered into force on June 25th, 1998. It was executed for five years and automatically renewed on a yearly basis.

- Turkey

Agreement between the Government of the Argentine Republic and the Government of the Republic of Turkey on the cooperation in peaceful uses of the nuclear energy. Signed in Buenos Aires on May 3rd, 1988, it was approved by Law No. 23914, enacted on April 16th, 1991 (Official Gazette 22/IV/91), and entered into force on February 24th, 1992. It was executed for fifteen years and automatically renewed for five-year subsequent periods.

- Uruguay

Cooperation Agreement on peaceful uses of the nuclear energy between the Argentine Republic and the Eastern Republic of Uruguay. Signed in Buenos Aires on July 8th, 1968, it was approved by Law No. 17938, enacted on October 21st of that year (Official Gazette 25/X/68), and entered into force on December 30th, 1972. It shall be executed for an unlimited amount of time.

Memorandum of Understanding between the Eastern Republic of Uruguay and the Argentine Republic. Signed in Buenos Aires on July 5th, 2007. It shall be executed for 5 years and automatically renewed for five-year periods.

- Venezuela

Complementary Agreement on technical scientific cooperation between the Government of the Argentine Republic and the Government of the Republic of Venezuela in the nuclear energy for peaceful purposes. Signed in Caracas on August 8th, 1979, it was approved by Law No 22314, enacted on October 31st, 1980 (Official Gazette 7/XI/80), and entered into force on November 17th of that year. It was initially executed for five years, automatically renewed on a yearly basis.

- Vietnam

Agreement between the Government of the Argentine Republic and the Government of the Socialist Republic of Vietnam on cooperation in peaceful uses of the nuclear energy. Signed in Hanoi on November 19th, 2001, it was approved by Law No. 25776, enacted on September 12th, 2003 (Official Gazette 16/IX/03). It entered into force on February 24th, 2004. This agreement shall be executed for ten years and automatically renewed for five-year consecutive periods.

APPENDIX 2: MAIN ORGANISATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

The main organisations, entities and companies previously mentioned in Section 2 appear as follows, with the corresponding contact information.

NATIONAL ATOMIC ENERGY COMMISSION

Address: Av. del Libertador 8250 - 1429 - Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 4704-1000

Web site: http://www.cnea.gov.ar/

AUTORIDAD REGULATORIA NACIONAL

Address: Av. del Libertador 8250 - (1429) - Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 6323-1770

Fax: +54 (0) 11 6323-1771/1798

Web site: http://www.arn.gov.ar/

NUCLEOELECTRICA ARGENTINA S.A.

Address: Arribeños 3619 - (1429) - Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 4701-7070

Web site: http://www.na-sa.com.ar/

INVAP S.E.

Address: Av. Cmte. Luis Piedrabuena 4950 (ex RN 237) - (8403) - S.C. de Bariloche - Río Negro.

Phone number: +54 (0) 2944 409300

Fax: +54 (0) 2944 409339

Address: Esmeralda 356 1st floor - (1035) - Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 4394-3344

Fax: +54 (0) 11 4394-3543

Web site: http://www.invap.com.ar/

CONUAR S.A.

Address: Presbítero Juan González y Aragón 15 - Centro Atómico Ezeiza - (1802) - Ezeiza - Buenos Aires

Phone number: +54 (0) 11 6326-1300

Fax: +54 (0) 11 6326-1490

Web site: http://www.conuar.com.ar/home.htm

DIOXITEK S.A.

Address: Av. del Libertador 8250 3er. Piso - (1429) - Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 4704-1035

Fax: +54 (0) 11 4704-1043

Address: Rodríguez Peña 3250 - Alta Córdoba (5001) - Córdoba

Phone number: +54 (0) 351 470-3653 /3669 /3317 /3553

Fax: +54 (0) 351 470-8143

Web site: http://www.dioxitek.com.ar/

FABRICACIÓN DE ALEACIONES ESPECIALES S.A. (FAE S.A.)

Address: Pbro. Juan González y Aragón 15 - (1802) - Ezeiza - Buenos Aires.

Phone number: +54 (0) 11 6326-1493 /1494 /1495

Fax: +54 (0) 11 6326-1496

Web site: http://www.fae.com.ar/

EMPRESA NEUQUINA DE SERVICIOS DE INGENIERÍA S.E.

Address: Ruta nacional 237 Km 1278 - (8300) - Arroyito, Neuquén. Casilla de Correo 636

Phone number: +54 (0) 299 449-4100

Fax: +54 (0) 299 449-4199

Address: Correa 1603 (1429) - Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 4704-1071 /72 /73

Fax: +54 (0) 11 4704-1074

Web site: http://www.ensi.com.ar/

COMPAÑÍA ADMINISTRADORA DEL MERCADO MAYORISTA ELÉCTRICO S.A.

Address: Av. Madero 942 Piso 1° - (1106) Ciudad Autónoma de Buenos Aires.

Phone number: +54 (0) 11 4319-3700

Web site: http://www.cammesa.com.ar/

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