September 1985

Central Intelligence Agency, Directorate of Intelligence, 'Argentina: Seeking Nuclear Independence: An Intelligence Assessment'

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Summary:

According to the 1985 report, the Argentines “have achieved at least a proof of principle of uranium enrichment via gaseous diffusion.” In other words, they had a workable system.   Nevertheless, the enrichment plant would not be “fully operational until 1987-1988.”   While the assessment of Argentine interest in nuclear weapons did not change, CIA analysts asserted that “Argentina continues to develop the necessary facilities and capabilities that could support a nuclear weapons development effort.”

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Argentina: Seeking Nuclear Independence

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An Intelligence Assessment

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SW 85-10102X
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Directorate of
Intelligence

Argentina: Seeking Nuclear Independence

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An Intelligence Assessment

This paper was prepared by [redacted] 25X1
Office of Scientific and Weapons Research.
Comments and queries are welcome and may be
directed to the Chief, Nuclear Proliferation Branch,
[redacted] 25X1

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San Rafael by 1987. The additional output of U_3O_8 will be needed to support Argentina's nuclear power plants and its uranium enrichment facility [redacted]

Uranium concentrate is converted into uranium dioxide (UO_2) at two production facilities in Cordoba. One facility is Argentine built and produces 50 mt/y of unsafeguarded UO_2. The other facility, supplied by West Germany in 1982 and under international safeguards, produces 150 mt/y of UO_2. The combined output is more than enough UO_2 to fuel Argentina's two operating power reactors [redacted]

Argentina is constructing a third UO_2 production plant in Cordoba. This plant will have an output of 150 mt/y when it comes on line in 1986. Argentina claims the technology used in constructing this plant is indigenous and therefore free of safeguards [redacted]

Fuel Fabrication

Argentina can fabricate its own research and power reactor fuel. This technology has been developed over the last 20 years. In 1975 West Germany supplied some of the equipment needed to fabricate power reactor fuel for the West German–supplied Atucha I power reactor. With the purchase of Soviet laminating machines and locally produced equipment, CNEA fabricated its first nuclear power reactor fuel elements in 1976 [redacted]

The fuel elements were fabricated at a pilot facility within CAC and were not subject to IAEA safeguards. [redacted] During this period, however, the indigenous elements were safeguarded when inserted in the safeguarded Atucha I reactor. In 1982 power reactor fuel fabrication was transferred to the newly completed commercial-scale fuel fabrication plant at the Ezeiza Atomic Center (see figure 3 [redacted]

The opening of the fuel fabrication factory at the Ezeiza Atomic Center in March 1982 marked Argentina's first step to commercial manufacture of power reactor fuel elements. The first of three fabrication lines has a capacity of 280 Atucha-type fuel elements a year. The first 140 fuel elements manufactured in the factory were delivered in September 1982 to the Atucha I reactor. The two other production lines are to be constructed in order to supply the Embalse and Atucha II power reactors. Production of fuel elements for Embalse began in 1984 and is planned to begin for Atucha II in 1986-87 [redacted] 25X1 25X1 25X1

CAC developed the technology of fabricating plutonium/uranium mixed oxide (MOX) fuel elements at its Alfa facility. In 1972 CNEA purchased 1 kilogram of plutonium from West Germany for use in this project. 25X1

[redacted] 25X1 25X1 25X1 25X1

In early 1984 CNEA disclosed plans for a facility for the production of plutonium metal. The facility, to be called the Active Development Laboratory, will be located at either Ezeiza Center or CAC. It will be capable of producing 13 kilograms per year (kg/y) of plutonium metal, as well as 100 kg/y of plutonium oxide. Completion of the facility is to coincide with the startup of a reprocessing plant at the Ezeiza Center (see below) [redacted] 25X1

Heavy Water 25X1

The amount of heavy water Argentina will be able to produce in the near future is limited. This capability is critical to Argentina's plan for nuclear fuel cycle independence because heavy water is needed for the Argentine-designed natural-uranium-fueled reactors. The Swiss firm Sulzer Freres is constructing a heavy water production plant near Arroyito in Neuquen Province that is designed to have a production capacity of 250 tons annually (see figure 4). It originally was 25X1 25X1 25X1

[redacted] 25X1

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scheduled to be completed in 1984. Because of lack of payments, the Swiss firm has stopped its assistance, and Argentina is attempting to complete the plant on its own. The Argentines expected to supply the initial charge of heavy water for the Atucha II power reactor (560 tons) from the output of this plant. Because of construction delays of the power plant, they may not achieve this goal. It is more likely they will get the heavy water from a foreign source [redacted]

Argentina is also building an experimental indigenous heavy water pilot plant at the Atucha complex. It is designed to produce about 2 tons a year. The plant was originally scheduled for completion in 1983, but probably will become operational in 1986. If this experimental pilot plant is successful, Argentina also plans to construct a follow-on pilot plant that will produce 80 to 160 tons of heavy water a year. Unlike the Swiss-supplied plant, neither of the indigenous heavy water plants will be safeguarded. [redacted] 25X1

Spent Fuel Reprocessing

In early 1979 Argentina began construction of an indigenously designed reprocessing plant called the 25X1

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Laboratory for Radiochemical Processes at the Ezeiza Center (see figure 5). It was scheduled to be completed by 1982. We believe, however, that late 1988 is the soonest the plant could begin operation.

It has a designed handling capacity of 6 tons of spent fuel. This amount of fuel will yield 18 to 20 kilograms of plutonium annually. The CNEA does not plan to accept international safeguards on the laboratory. However, any plutonium produced as a result of reprocessing spent fuel from the Atucha I or Embalse power reactors, (the only current source of spent fuel in Argentina) will be safeguarded because the fuel itself is safeguarded.

An Argentine company, Techint S.A., was the original contractor to build the facility. In early 1981 CNEA approached the Italian nuclear engineering firm, SNIA-Techint, for assistance in completing the project. In February 1981 SNIA-Techint signed an agreement with CNEA to provide a radioactive waste treatment and storage facility for the laboratory. 25X1

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Argentina: Seeking Nuclear Independence 25X1

Key Judgments

Information available as of 1 August 1985 was used in this report.

For the past 30 years Argentina has had an ambitious nuclear program that has made the country a leader in the Third World, a nuclear exporter, and enhanced its nuclear weapons options. Thus far, the nuclear program has been motivated by a need for prestige more than a need for energy independence or weapons. Nevertheless, important elements of Argentine society support the nuclear program at least in part because of the weapons options it provides. 25X1

Argentina could have the essential elements to produce unsafeguarded fissile material for nuclear weapons by 1990, although financial cutbacks and revisions by the Alfonsin government could lengthen the timetable. Further, Argentina is not a party to the international nonproliferation regime. These actions have reinforced international suspicions concerning the ultimate objective of its nuclear program. We judge that Argentina will have the capability to develop nuclear weapons at that time, but we have no evidence of its intention to do so. 25X1

Argentina is acquiring nuclear fuel cycle technology and facilities that will do much to fulfill its goals of self-sufficiency in nuclear power generation and of freeing its nuclear activities from safeguards or foreign dependency. Although budget cuts and delays are likely because of financial difficulties and new governmental policies, work probably will continue on indigenous and foreign-supplied fuel cycle facilities. Argentina could have a complete nuclear fuel cycle by the late 1980s 25X1

A spent fuel reprocessing plant that has been under construction for six years could be completed by 1987 if suitable funding is provided. The facility is unsafeguarded and has the capability to separate 18 to 20 kilograms of plutonium (equivalent to the amount needed for two to three nuclear explosives) from reactor spent fuel. The only source of spent fuel for this purpose, however, is safeguarded power reactor fuel 25X1

Argentina has plans for two additional research reactors completely indigenous in design and construction. If built, either of these reactors could become a source of unsafeguarded spent fuel and allow the separation of unsafeguarded plutonium 25X1

Argentina claims to have developed the capability to enrich uranium via the gaseous diffusion method and plans to begin production of low-enriched uranium by 1986. We believe that Argentina has developed a proof of

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principle of enrichment technology via gaseous diffusion. Technical problems, however, probably will delay production of significant quantities of enriched uranium before the late 1980s. 25X1

Despite adequate oil reserves to satisfy its needs and vast undeveloped hydroelectric resources, Argentina has the most advanced nuclear power program in Latin America. It has two reactors in operation, supplied by Canada and West Germany, and a third that is under construction by West Germany. All of the reactors are heavy water moderated and use natural uranium fuel. The government has plans for three to four more reactors. Although Argentina's economic situation is forcing delays in construction of the nuclear power plant, we believe it will be completed by 1990. 25X1

Argentina has enhanced its image as the leader in nuclear energy in Latin America by developing a nuclear export capability. The nuclear exports provide Argentina with needed foreign exchange, greater prestige throughout the Third World, and the potential to provide technology and facilities to countries desiring a weapons program. Although Argentina is not required to safeguard its exports, thus far it has asked for safeguards on exports. Its customers are Peru, Algeria, and Brazil. Negotiations are under way with Colombia, Ecuador, Romania, and China. 25X1

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Figure 1
Argentine Nuclear Activities

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[redacted] 25X1

Argentina: Seeking Nuclear Independence [redacted] 25X1

Introduction

For the past 30 years, Argentina has had an ambitious nuclear program that has made the country a leader in the Third World, a nuclear exporter, and enhanced its nuclear weapons options. Despite recurrent political and economic problems, the Argentine commitment to nuclear development has remained high. Thus far, the program has been motivated by a need for prestige more than a need for energy independence or for weapons. Argentina has sufficient oil reserves to satisfy its needs and has yet to develop fully its vast hydroelectric potential. [redacted]

The program is under the direction of the National Atomic Energy Commission (CNEA), an autonomous governmental agency answerable only to the President. The goals of the nuclear program as established by the CNEA have largely been achieved. The CNEA has made substantial progress in developing its own nuclear technology, building a complete nuclear fuel cycle—with minimum foreign assistance and controls—to support the nuclear power program, and developing an export capability. Figure 1 shows locations of Argentina's nuclear activities. [redacted]

Nuclear Power Reactor Experience

Nuclear Power Reactors

Argentina has the most advanced nuclear power program in Latin America. Two reactors are in operation—one supplied by West Germany and the other Canada—and a third is under construction by West Germany (see table 1). The Argentine military government had authorized construction of three more power reactors by the year 2000. The Alfonsin government, however, has postponed a decision on their construction [redacted]

In March 1974 Argentina became the first Latin American country to operate a nuclear power reactor when its Atucha I reactor reached full operation. The reactor has a unique design employing a pressure vessel and can be refueled while operating. It was built by Kraftwerk Union (KWU), a subsidiary of Siemens of West Germany. Atucha I is the only reactor of its kind that West Germany has built for export. Argentina's second power reactor is the CANDU type. It is located at Embalse and became operational in 1983. The reactor was shut down for a number of months because Argentina was unable to pay for needed repairs. A third nuclear power reactor—designated Atucha II—is under construction by West Germany near the Atucha I. It is scheduled to be completed in 1990. [redacted] 25X1

The Atucha II contract contained clauses for increased Argentine participation in design, engineering, construction of the site, and erection of the reactor. It also called for increased technical cooperation between KWU and the CNEA. As a result, a joint nuclear engineering and development company, Empresa Nuclear Argentina de Centrales Electricas (ENACE), was formed in 1980. This may allow CNEA to acquire the Latin American license to manufacture and export KWU heavy water type power reactors. Argentina's participation in building power reactors has increased from 40 percent of the Atucha I reactor to 93 percent of the Embalse reactor [redacted] 25X1 25X1

CNEA has yet to decide which kind of heavy water reactor technology to use for its next three power reactors. Many CNEA engineers prefer the Canadian CANDU type. However, because of the experience CNEA will gain with the KWU reactors as well as the technology transfer it will acquire under the ENACE agreement, we believe Argentina will choose the West German reactor [redacted] 25X1

Nuclear Research Reactors

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The CNEA built and put into operation Argentina's first research reactor, the RA-1, in 1958 at the

Table 1
Argentine Nuclear Power and Research Reactors

Reactor	Type	Power	Date of Operation	Safeguards	Location
Nuclear power reactors					
Atucha I	Natural uranium fueled, heavy water moderated	370 megawatts electric (MWe)	1974	Yes	Zarate
Embalse	Natural uranium fueled, heavy water moderated	630 MWe	1983	Yes	Cordoba
Atucha II	Natural uranium fueled, heavy water moderated	685 MWe	1990	Yes	Zarate
Unnamed	Pressurized heavy water	600 MWe	Planned/projected	Yes	Mendoza
Nuclear research reactors					
RA-1	Tank	150 kilowatts (kW)	1958	Yes	Buenos Aires
RA-0	Tank	Zero	1958	Yes	Cordoba [a]
RA-2 [b]	Tank	Zero	1966	Yes	Buenos Aires
RA-3	Tank	10 MW	1967	Yes	Buenos Aires
RA-4	Solid homogeneous	1 watt	1971	Yes	Rosario
RA-5	Natural uranium	Zero	Planned/projected	No	Unsited
RA-6	Tank	550 kW	1982	Yes	San Carlos de Bariloche
RA-7	Natural uranium	100 MW	Planned/projected	No	Unsited
RA-8	Enriched (4 or 5 percent) uranium	50 MW	Planned/projected	No	Pilcaniyeu
RP-10	Tank	10 MW	1986	Yes	Peru
Unnamed	Tank	Unknown	Planned/projected	Yes	Algeria

[a] Moved to Peru in 1979 and designated RP-0.
[b] Shut down in September 1983 because of a criticality accident.

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Constituyentes Atomic Center (CAC). CNEA then designed and built three additional research reactors, including its largest, a 10-megawatt (MW) radioisotope production reactor. A fifth research reactor was donated by West Germany as part of the Atucha I power reactor agreement (see table 1). All of these reactors are fueled with 20-percent and 90-percent enriched uranium purchased from the United States.

Argentina's most recent research reactor technology is the RA-6, a 550-kW tank-type reactor at the Bariloche Atomic Center. Unlike the other research reactors, all of the components and equipment including instrumentation were supplied by local Argentine firms and institutes. The RA-6 operates on partially spent fuel from one of the earlier CNEA-built reactors. CNEA plans, however, to fuel the reactor with Soviet-supplied 20-percent enriched uranium in the future. 25X1

CNEA has also designed research reactors that are fueled with natural uranium and use heavy water as a moderator. The first reactor design, the RA-5, has been scaled down from the 40- to 60-MW power level to a zero-power research reactor. It is to be constructed at the Ezeiza Atomic Center. CNEA was to begin 25X1

Table 2
Argentine Nuclear Fuel Cycle Facilities

	Capacity	Startup Date	Safeguards	Location
Uranium concentration	900 metric tons (mt)	1987	NA	Salta, Cordoba, Mendoza, San Rafael
Uranium dioxide	50 mt	1978	No	Cordoba
Uranium dioxide	150 mt	1983	Yes	Cordoba
Uranium dioxide	150 mt	1986	No	Cordoba
Fuel fabrication (of Atucha I fuel)	70 mt	1982	Yes	Ezeiza
Fuel fabrication (of Embalse reactor fuel)	100 mt	1984	No	Ezeiza
Fuel fabrication (of Atucha II reactor fuel)	100 mt	1989	Yes	Ezeiza
Heavy water production	250 mt	1987	Yes	Arroyito
Heavy water production	2-3 mt	1986	No	Atucha
Heavy water production	80-160 mt	?	No	Unknown
Fuel reprocessing	6 mt	1988	No	Ezeiza
Fuel reprocessing	35 mt	?	No	Ezeiza
Uranium enrichment	15,000 to 20,000 kg separative work units (SWU) per year	1986	No	Pilcaniyeu

[redacted]

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construction in 1982 of its largest design effort, the RA-7. This project was canceled after the Falklands war because of budgetary constraints. The RA-7 is similar to West Germany's 50-MW materials testing reactor; both use natural uranium oxide as fuel and are heavy water moderated and cooled [redacted]

A design modification of the RA-7 was completed in mid-1983, and, according to a generally reliable source, the reactor was to be constructed at the Pilcaniyeu nuclear complex. As of July 1985, however, we have been unable to identify any reactor construction at the complex [redacted]

Naval Propulsion Reactor

We believe the Argentines have a program under way to build a nuclear reactor to power a submarine. [redacted] the Navy commissioned Investigaciones Aplicades S.A. (INVAP), a company owned jointly by CNEA and the State of Rio Negro, to design a nuclear reactor to be built by Argentina and installed in a West German–designed submarine modified by the Argentines. Although President Alfonsin ostensibly canceled the program in December 1983, funds reportedly were allocated for it in the 1984 and 1985 defense budgets. [redacted] 25X1

[redacted] in June 1985 INVAP was preparing to construct a research reactor named the RA-8 at its Pilcaniyeu site. The RA-8 is a pressurized water reactor having a power level of 40 to 50 MW thermal and fueled with slightly (4 or 5 percent) enriched uranium. [redacted] The Argentine submarine reportedly measures 70 meters and will have a single pressure hull. Its propulsion system will be a

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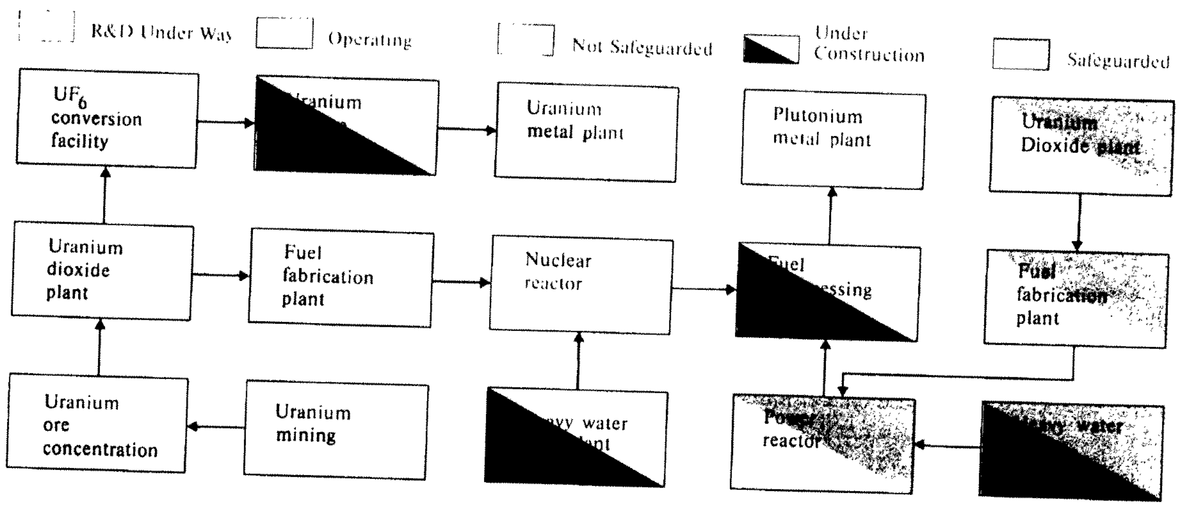
Figure 2
Argentine Nuclear Fuel Cycle Facilities



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consolidated steam reactor similar to the West German Otto Hahn nuclear propulsion system. The Navy plans either to build the submarine or convert one of its West German TR-1700 conventionally powered submarines to nuclear power 25X1

We believe the RA-8 is intended to be the Navy's land-based prototype propulsion reactor. It probably can be built within the next five years. Despite severe cutbacks in funding for other Navy projects, construction of the reactor probably will be adequately funded, because of the priority placed on Naval propulsion. An operational nuclear submarine probably could not be completed before the late 1990s 25X1

Nuclear Fuel Cycle Developments

Argentina's acquisition and development of a nuclear fuel cycle has been accomplished with a mix of foreign-supplied and indigenous facilities. Commercial-scale facilities for fuel fabrication and heavy water production are safeguarded. Pilot-scale reprocessing, heavy water, and uranium enrichment remain unsafeguarded. When completed, the Argentine nuclear fuel cycle will assure self-sufficiency in nuclear power generation. It will also provide fissile material that could be used in a nuclear weapons program (see table 2 and figure 2) 25X1

Uranium Processing

Argentina has plentiful uranium reserves and produces 200 metric tons per year (mt/y) of yellowcake (U_3O_8) at four uranium concentration plants at Salta, Cordoba, Mendoza, and San Rafael. Production is scheduled to increase to 900 mt/y with the completion of a larger capacity uranium concentration facility at 25X1

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Uranium Enrichment Project

After five years of secret research and development, the former head of CNEA, Vice Admiral (Ret.) Carlos Castro Madero, publicly stated on 18 November 1983 that "Argentina has obtained the technological capability of enriching uranium by the gaseous

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diffusion method." According to Madero, testing of the process had been carried out in pilot scale, followed by the design and construction of a medium-size uranium enrichment plant near Pilcaniyeu Nuclear Complex, 60 km from Bariloche. Madero stated that the plant is scheduled to be completed in 1985 and would be capable of producing 500 kg/y of uranium enriched to 20 percent. According to Madero, the decision to undertake the project was made in 1978 after Argentina's supply of enriched uranium was cut off by the United States [redacted]

We believe [redacted] that the Argentines have achieved at least a proof of principle of uranium enrichment via gaseous diffusion. The scale of the facilities that exist and those under construction could support operation of a plant with a capacity of 500 kg/y of 20-percent enriched uranium. [redacted]

[redacted] INVAP began experimenting with aluminum oxide diffusion barriers in 1978. Upon successful completion of this work, INVAP built a small-scale pilot plant at Barrio Golf in the Bariloche area. This pilot plant used imported equipment and materials purchased from several West European companies through dummy companies created by INVAP. After initial successes with the small-scale pilot plant, INVAP began construction of a larger scale pilot plant at Pilcaniyeu. [redacted]

The existence of a "secret nuclear facility" at Pilcaniyeu has been known since 1981. [redacted] The complex consists of three separate areas—Pilca one, two, and three—named in order of their establishment. Pilca two is the largest of the three areas and houses the enrichment equipment (see figure 6). Two large enrichment buildings are externally complete and ground has been cleared for a third. Pilca two also contains a probable uranium hexafluoride conversion facility, a large ceramic plant (possible barrier tube production), two electric generating plants totaling 8.5 MW, a nickel plating plant, a number of shops, warehouses, and administrative offices [redacted]

[redacted] 25X1 25X1 25X1 25X1

Argentina has never stated that the plant could produce highly enriched uranium (HEU) suitable for use in nuclear weapons, that is, uranium enriched to 90 percent. The 1,840-stage plant cannot produce HEU when operated in a nonbatch mode from natural uranium feed without the addition of approximately 700 more stages. Batch/recycle operations could, however, be used to produce HEU. [redacted] 25X1 25X1 25X1 25X1

The projected production of 500 kg/y of 20-percent enriched uranium equates to a gaseous diffusion plant capacity of about 15,000 to 20,000 kg of separative work units per year (SWU/y). Assuming that the Argentine plant will require about 4,000-kilowatt hours per SWU, a total of 9.5 MW of electricity would be needed to operate the completed plant. We estimate that approximately 8.5 MW are already available at Pilcaniyeu. A 750,000-kilowatt hydroelectric plant along the Limay River in Neuquen Province is operational and can provide more than enough electric power for the facilities at Pilcaniyeu. [redacted] 25X1 25X1 25X1 25X1

We believe the uranium enrichment plant will not be fully operational until 1987-88. Argentina plans to begin test runs of the plant by the end of 1985, and

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production is scheduled to begin sometime in 1986. This is a very optimistic schedule. It is doubtful that the plant will be able to produce the large quantity of 500 kg of 20-percent enriched uranium during 1986.

On the basis of the experience of other countries that have developed the gaseous diffusion process, we believe Argentina will have to overcome several technical problems before the facility operates successfully. For example, other countries have also had difficulties with welding the equipment adequately to prevent leakage of uranium hexafluoride gas. Also, during initial operation, vibrational problems have caused the barrier tubes to break. The barrier tubes can also plug, causing a loss of separative work capacity 25X1

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Once the plant is fully operational, Argentina will have a facility that can serve many purposes. Argentina will have a supply of fuel for its research and power reactors, as well as be able to provide enrichment services as part of its growing nuclear export capability. Argentina will also have the capability to produce fissile material for use in nuclear weapons development 25X1

Table 3
Argentine Nuclear Products

Facility	Completion	Safeguards	Products
Embalse Power Reactor	In operation	Yes	Cobalt-60
Arroyito Heavy Water Plant	1987/88	Yes	Heavy water, 250 tons per year
Atucha Heavy Water Plant	1985	No	Heavy water, 3 tons per year
Uranium Concentration	In operation	NA	Yellowcake, 180 tons per year
Uranium Conversion, Cordoba (West Germany)	In operation	Yes	Uranium dioxide, 180 tons per year
Uranium Conversion, Cordoba (NTL Line)	1987	No	Uranium dioxide, 150 tons per year
Fuel Element Fabrication, Ezeiza	In operation	Yes	Atucha I fuel elements
Fuel Element Fabrication, Ezeiza	In operation	No	Embalse fuel elements
Special Alloys Plant, Ezeiza	In operation	NA	Zircalloy tubing
Plutonium Reprocessing, Ezeiza	1988	No	Plutonium, 15 kilograms per year
Uranium Enrichment, Pilcaniyeu	1985 (phase I)	No	20-percent enriched uranium, 500 kilograms per year; uranium hexafluoride; zirconium sponge; sulfur hexafluoride
RA-1 Research Reactor, Constituyentes	In operation	Yes	Radioisotopes
LEU Fuel Fabrication, Constituyentes	1985	No	Low-enriched uranium fuel
RA-3 Research Reactor, Ezeiza	In operation	Yes	Radioisotopes

[redacted] 25X1

Growing Export Capabilities and Nuclear Cooperation [1]

Nuclear Exports

Argentina's 30-year vision of becoming Latin America's first nuclear supplier is approaching reality. Through nuclear exports, the country hopes to gain international prestige and political leverage as well as to realize earnings. Recently concluded agreements with China and Algeria gave a much-wanted boost to Argentina's nuclear industry. And although Argentina has little chance of competing broadly with traditional nuclear supplier countries, political factors, including Argentine Government nonproliferation policies, make Argentina an attractive alternate in some cases. [redacted] 25X1

At present, Argentina can export nuclear materials such as yellowcake (natural uranium), uranium dioxide, zircalloy tubing, and radioisotopes for research, medicine, and agriculture. Exports of nuclear services include basic training of nuclear physicists and engineers in Argentina, radiological protection and safety techniques, and postgraduate research for foreigners in Argentina's nuclear laboratories. Argentina also exports research and training reactors, production plants for radioisotopes, and physics, chemistry, and biology laboratories (see table 3) [redacted] 25X1

[redacted] 25X1

In the near future, Argentina hopes to be capable of exporting enriched uranium (1986), plutonium (1988), and heavy water (1987). The Argentines will also add the capability to export low-enriched fuel elements for research reactors (1986) and of producing small- and medium-power reactors (up to 300 MW) by the end of the century 25X1

Nuclear Cooperation

Argentina has nuclear cooperation accords with a number of countries. Although many of the agreements are inactive, Argentina is supplying significant nuclear training, technology, and material to several countries:

- *Algeria.* Argentina will construct in Algeria a nuclear research reactor similar to the RA-6 training/research reactor at the atomic center in Bariloche. The bilateral agreement also provides for cooperation in the production and utilization of radioisotopes in medicine, industry, and agriculture, as well as CNEA grants to Algerian scientists for training in Argentina.

- *Brazil.* In addition to the basic nuclear accord, there are agreements between the atomic energy commissions of Brazil and Argentina for human resources training and technical information exchange. Argentina loaned 240 tons of yellowcake and is providing 140,000 meters of zircalloy tubing for Brazil's Angra fuel elements. Brazil is fabricating the pressure vessel for the Argentine Atucha II reactor. Recently, the two countries agreed to increase mutual access to each other's nuclear facilities.

- *Chile.* In 1983 Argentina and Chile signed a supplementary nuclear agreement, under which radioisotopes produced in Chile's research reactor will be provided to Argentina when the latter's RA-3 reactor is out of service. The accord also calls for cooperation in fuel cycle and heavy water technology, areas of Argentine expertise. In August 1984 the two countries concluded an agreement for assistance in the manufacture of nuclear fuel elements for research reactors, the training of Chilean personnel, and the construction of an experimental fuels manufacturing plant.

- *China.* Although no details have yet been formulated, Argentina and China are studying cooperation in nuclear power plants, the nuclear fuel cycle, low-power reactors, and technician training.

- *Colombia.* In December 1981 Argentina and Colombia agreed on a two-year action plan, extended in 1983, for nuclear cooperation calling for exchanges of nuclear experts and scholarships and for training Colombian scientists in Argentina. Argentina completed an evaluation study for the installation in Colombia of a pilot plant for the treatment of uranium ore and the production of yellowcake. The Colombian Institute for Nuclear Affairs also adopted in 1982 an Argentine proposal for the installation of a 3-MW research, training, and radioisotope production reactor, including a radioisotope-handling facility and associated laboratories, at an estimated cost of $50 million. Aside from some technical contacts, no action has been taken to implement the project because of Colombian budget restrictions.

- *Peru.* Initiated in 1977, "Project Peru" commenced with the installation in laboratories in Lima of a zero-power reactor for research and training. A second phase, presently under way, involves the construction of a 10-MW reactor at the nuclear research center being constructed at Huarangal. In addition to the reactor, Argentina is building a radioisotope production facility and laboratories for radioisotopes, radiological protection and safety, and nuclear physics and chemistry research. Argentine financing includes a $90 million loan. Enriched uranium for the reactor is being provided by the Soviet Union and has already been delivered to Argentina for fabrication into fuel elements. The project suffers from delays caused by Peruvian and Argentine economic difficulties; completion of the project is scheduled for the end of 1986.

- *Uruguay.* Argentina has trained Uruguayan scientists in CNEA facilities and supplies radioisotopes for use in medicine and agriculture 25X1

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Prospects for Future Cooperation

According to CNEA's director of international cooperation, Roberto Ornstein, agreements are under negotiation with four additional countries. Nuclear discussions have taken place with Guatemala and Turkey, according to press reports. Under present agreements, the Argentines have discussed building a subcritical facility for Bolivia and are undertaking a feasibility study for the construction of a nuclear center for Uruguay. According to Ornstein, Argentina is also discussing additional nuclear cooperation with India

Government sources indicate CNEA President Constantini recently concluded a confidential agreement with KWU under which CNEA is to act as the KWU representative for Latin America. Reportedly signed in West Germany following the October 1984 IAEA meeting in Vienna, the agreement authorizes CNEA to export nuclear reactor parts designed with West German technology

The Argentine nuclear industry is also intensely interested in participating in the Chinese nuclear power program, and there have been several Argentine visits to China to discuss possible participation. In addition, Argentine participation with West Germany in China was discussed during recent CNEA visits to West Germany. The results of the Argentine-German consultations reportedly were "very positive.

Argentina's Objectives as a Nuclear Supplier

Argentina hopes to become the nuclear supplier of choice for Latin America, offering the full range of nuclear services, including research reactors, heavy water, low-enriched fuel elements, and eventually the construction of small-power (150 to 200 MW) reactors (the Argentines believe these will be easier to construct and be more useful for the smaller electric networks found in Latin countries.) Through such exports, the Argentine Government hopes to realize earnings to justify years of heavy investment in its nuclear program

More important, many in CNEA and the nuclear industry see nuclear cooperation and exports as the only way to guarantee Argentine freedom of nuclear action internationally and to assure the very survival of the nuclear industry. Argentina also sees its role as a nuclear supplier as a means to increase its leadership role in the region, furthering political interests by reinforcing cooperative ties. 25X1

Nonproliferation Implications

Alfonsin's government this year committed itself to IAEA safeguards on all nuclear exports but, in conformity with the Argentine Government's policy on its own program, has not chosen to seek full-scope safeguards as a condition of supply. The government sees this policy as contributing to Argentine export competitiveness. For example, the government's willingness to export nuclear technology to Algeria without requiring full-scope safeguards probably was a factor in its winning a contract to build a nuclear reactor over US competition. 25X1 25X1

Even with safeguards, Argentine exports of sensitive nuclear material, such as enriched uranium and heavy water, would affect US interests if exports were made to Middle and Far Eastern countries such as Libya, Iran, or Pakistan. This is unlikely under Alfonsin; we cannot rule it out, however, under future Argentine governments. Thus, US efforts to win Argentina's acceptance of full-scope safeguards on its own program, as well as to promote a responsible Argentine attitude toward nuclear exports, are increasingly important as Argentina's capabilities as a nuclear supplier grow 25X1 25X1

Nuclear Weapons Potential 25X1

Although we have no evidence that CNEA has embarked on a specific nuclear weapons program, Argentina continues to develop the necessary facilities and capabilities that could support a nuclear weapons development effort. If the Argentines decide to pursue a nuclear weapons development program, they would have to acquire sufficient fissile material for a nuclear device—either plutonium or highly enriched uranium—and develop the high-explosive (HE) and nonnuclear components of a nuclear device 25X1

25X1

Argentina could acquire fissile material in the near term (before 1990) only by diverting safeguarded spent fuel from its two operating power reactors and by reprocessing it to obtain plutonium. If a diversion of spent fuel were accomplished and the fuel reprocessed, late 1988 is the earliest plutonium would be available and 1989 the earliest a nuclear explosive device could be built [redacted]

Because safeguards have been ineffectively enforced on the Atucha I reactor,[2] CNEA may believe that spent fuel or stored plutonium could be diverted from its power reactors without detection by IAEA inspectors. However, a large amount of spent fuel would have to be diverted from Atucha I to acquire enough plutonium for a device—on the order of 50 fuel rods. The Argentines probably would find it necessary to disregard safeguards openly in order to separate sufficient material [redacted]

[redacted]

When completed, the gaseous diffusion plant has the potential to provide CNEA with the highly enriched uranium necessary for nuclear weapons. The plant could be operated to produce a lower-enriched (3 percent) uranium. This could then be used as feed to produce 90-percent enriched uranium. Alternatively, Argentina could purchase 3-percent enriched uranium from past suppliers as feed to reach highly enriched levels. These choices will require some time and operating experience on the part of the Argentines and cannot be attempted as soon as the gaseous diffusion plant becomes operational. After the plant becomes operational and experience is acquired by plant personnel, Argentina may attempt to produce highly enriched uranium [redacted] 25X1

In addition to producing fissile material for a weapons program, Argentina would have to design and develop technology for the HE and other components of a nuclear device. If plutonium is used as the fissile material, the Argentines will have to develop an HE implosion system, a complex design. On the other hand, if uranium is used, a simpler gun-type system could be developed [redacted] 25X1 25X1

Argentina would also have to produce, fabricate, and test HE components, such as TNT, RDX, or PETN. Argentina has such capabilities. Most of Argentina's major explosives research and development occurs at two plants—Jose de la Quintana and Villa Maria, both in Cordoba Province. The more modern facility is the Jose de la Quintana explosives plant. This plant can produce RDX and PETN. The production facilities, mothballed before the Falklands war, were activated during the conflict. The plant is the only known Argentine HE production facility with an HE test point. The test point, however, is too small for testing the amounts necessary for nuclear design work. No such testing has ever been observed at the plant [redacted] 25X1 25X1 25X1

The explosives and solid-propellant production plant at Villa Maria produces a variety of explosives, including nitrocellulose, nitroglycerine, TNT, dynamite, RDX, and military munitions. It also produces propellants that are used by the Argentine Air Force in its missile program. Although the plant can produce sophisticated explosives, we have not observed any HE test points at the plant. However, Argentina could build clandestine HE test facilities that would be difficult to detect [redacted] 25X1

[2] Since its startup in 1974, the Atucha I reactor has had extensive lapses in IAEA inspection because of faulty camera coverage. In September 1981 the IAEA noted that the reactor had never been under effective safeguards and doubted that a diversion of spent fuel could be detected by its inspectors [redacted] 25X1