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The Chilean Nuclear Program

An Intelligence Assessment

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September 1981

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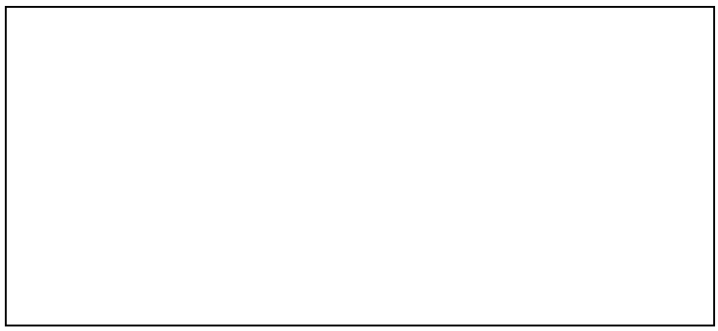

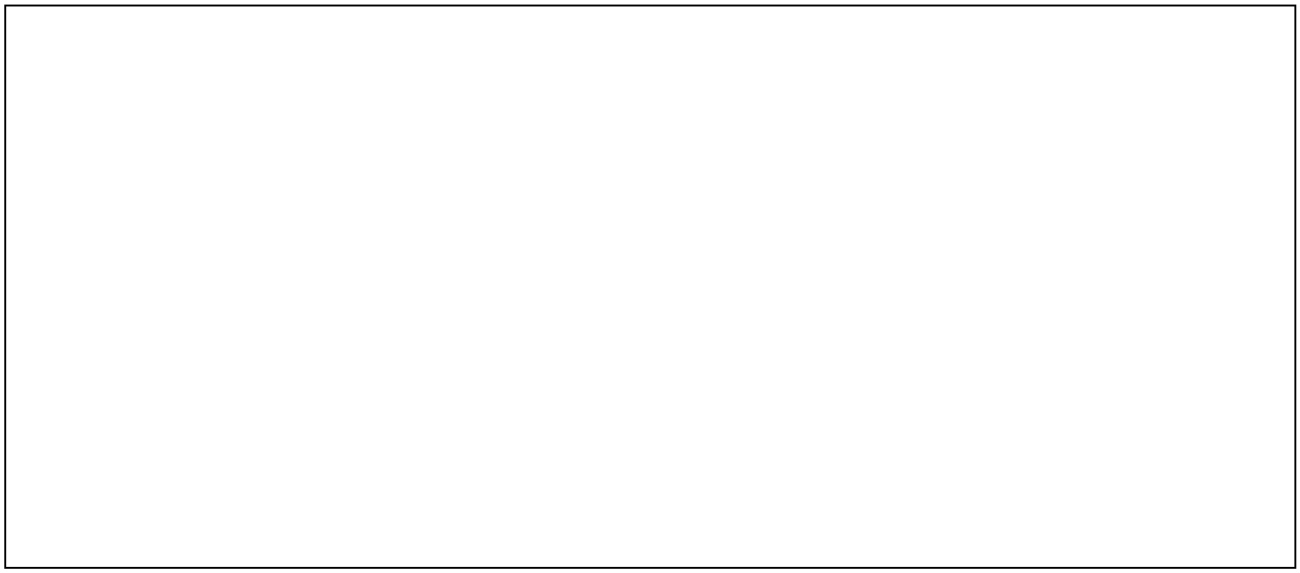

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The Chilean Nuclear Program

An Intelligence Assessment

Information available as of 16 September 1981 has been used in the preparation of this report.

This report has been coordinated with the Offices of Political Analysis and Economic Research, the Directorate of Operations, the National Intelligence Officer for Latin America, and the Special Assistant for Nuclear Proliferation Intelligence.

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The Chilean Nuclear Program

Key Judgments

the program has slowed significa tly.

As a result, a nuclear explosives capability probably will remain out of reach for Chile for the next 10 to 15 years.

It will be at least 1985 before the government decides whether to build a nuclear power plant. (S NF NC)

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Introduction

The Chilean nuclear program is still in its infancy compared with programs in the most advanced of the developing countries. Further, the program is limited in scope of research, and government support has recently declined. The program, however, has significant potential in terms of practical applications. It is oriented toward the near term, economically exploitable aspects of nuclear energy; basic nuclear physics is being investigated to a much lesser degree. The Chilean Nuclear Energy Commission (CCEN) administers most of the projects in nuclear development.

In the past, Chile has obtained foreign assistance for its nuclear program primarily from Spain and France. Recently, however, Santiago's refusal to submit its nuclear facilities to international safeguard inspection and controls has precluded or delayed significant assistance from the major nuclear suppliers. The government of President Augusto Pinochet **has refused to sign the nuclear Non-Proliferation** Treaty, and also has elected not to bring into force the Treaty of Tlatelolco (the Latin American Nuclear Free Zone Treaty).[1] Adherence to either of these treaties would require Chile's acceptance of International Atomic Energy Agency safeguards over its nuclear activities and provide foreign suppliers some assurance of Chile's peaceful intent in the field of nuclear energy.

Nuclear Research Program

Under the guidance of the CCEN Chile initiated a plan for wide-scope nuclear research in the late 1960s and pursued it through the early 1970s.

Chile has the capability to perform relatively significant nuclear research, but such work has been extremely hampered by lack of government support and by problems with the Lo Aguirre Nuclear Center.

To return Chilean nuclear research to the level and scope of the early 1970s would require the strong backing of President Pinochet and his highest advisers.

La Reina Nuclear Research Center. Chile's principal operational nuclear research site, the CCEN's La Reina Nuclear Research Center, is located just east of Santiago. The center's main facility houses a **5-megawatt-thermal (MWt), pool-type research reactor** and associated laboratories. This reactor was acquired from the United Kingdom and achieved initial startup (criticality) in October 1974. It is presently fueled with 80-percent-enriched uranium supplied by the United States prior to the enactment of the US Nuclear Nonproliferation Act. The reactor supports studies involving neutron activation analysis and research into the applications of radioisotopes in mining, industry, and agriculture; it is also used in programs for the manufacture of nuclear instrumentation. Most important, this reactor is Chile's only domestic source of radioisotopes for medical use. Other programs planned for the La Reina center include further research on the applications of solid-state physics to the nuclear field, studies of the industrial feasibility of processing and preserving food by irradiation, and radioisotope labeling in hydrology.

[1] Although the government has signed and ratified the treaty, full ratification by all signatories is stipulated before it is implemented. Although a number of other signatories have elected to waive this provision, Chile has not. (U)

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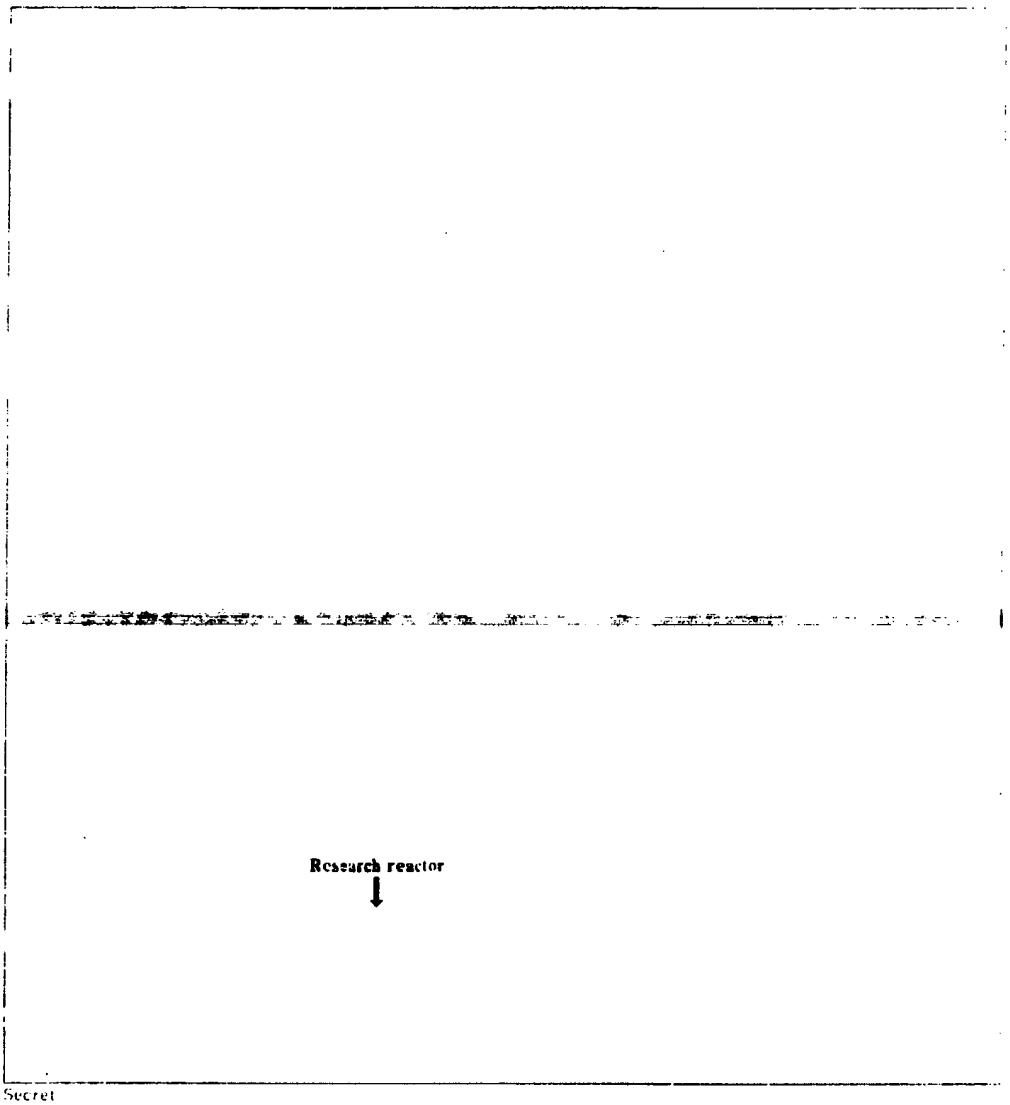
Of vital importance to all La Reina research is the need for additional fuel for the reactor by about the end of 1981. Should the CCEN fail to acquire the needed fuel soon, most of the La Reina center's research will begin to falter. The CCEN is investigating the use of less-than-80-percent-enriched uranium in the La Reina reactor. Chile has most recently approached France about the possibility of obtaining 45-percent-enriched "Caramel" fuel and has approached the United States for enriched uranium as well.

Lo Aguirre Nuclear Center. The Lo Aguirre Nuclear Center, more properly called the Army Nuclear Studies Center (CENE) (figure 1), was on the drawing boards for many years before it was built. Since at least 1969, the Chilean Army has been interested in the study of nuclear energy and in the establishment of a nuclear research effort separate from that of the CCEN.[7] Accordingly, in 1973 the Army published a proposal outlining plans, costs, and goals for the CENE. The center was to be under the jurisdiction of the Army's Production Command and was to consist of laboratories and a high-flux research reactor. In May 1973 the proposal was approved, and by 1974 construction had started at a site 30 kilometers west of Santiago. Although the proposal stated that the CENE would investigate areas of both civilian and **military interest, it nowhere stated explicitly the** nature of the military research to be undertaken.

The Lo Aguirre reactor reached initial criticality in 1977. The reactor was designed and supplied by Spain after consultation with Chilean engineers.

Figure 1

Lo Aguirre Nuclear Center



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[redacted]

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Nuclear Power and Fuel Cycle Programs

Nuclear Power Studies. The CCEN has been advocating the use of nuclear energy for electric power generation since at least 1973. In 1978 a group was formed within the CCEN to evaluate the many considerations associated with the import and construction of a nuclear power plant. The CCEN approach was fairly comprehensive and included market and other economic studies, siting analysis, construction considerations, and health and safety appraisals. In addition, the Chilean National Electric Company (ENDESA) and the Chilean National Electric Distribution Company (CHILECTRA) filed with the National Energy Commission recommendations based on studies of the nuclear power question. These studies addressed the advantages and disadvantages of nuclear power as compared with other power generation schemes, such as hydroelectric. [redacted]

In 1980, on the basis of what amounted to primarily economic considerations, the Chilean Government shelved all plans to introduce nuclear power in Chile. President Pinochet reportedly was impressed by the high projected costs of a first nuclear power plant; his appraisal of Chile's nuclear capability was another reason for his cautious stance. [redacted] In its decision against nuclear power, the government indicated that it would reconsider the nuclear power question in 1985, and would proceed if economic conditions and electrical demand justified it. [redacted]

Fuel Cycle Development. The CCEN is just beginning to investigate areas related to the nuclear fuel cycle, particularly uranium ore exploration and exploitation. Although exploration for uranium continues, the CCEN has considered only reserves that would be exploitable as a byproduct of existing copper mining operations. [redacted] The largest uranium extraction operation currently planned is a pilot plant project to recover uranium from the Mina Sur mine in the area of Chuquicamata. Under the supervision of the CCEN's Division of Nuclear Materials, the plant is expected to produce approximately 40 tons of uranium concentrate per year operating at full capacity. Industrial-scale expansion is planned for the plant, and three additional uranium ore projects are scheduled. As in other areas of nuclear research, Chile has relied primarily on Spain for assistance in its ore processing projects. [redacted]

Chile's plans for development of the nuclear fuel cycle are very modest. Activity is planned in the areas of uranium prospecting, mining, and ore purification. In addition, laboratory-scale projects for the production of uranium tetrafluoride and uranium metal are planned. Neither the CCEN nor the military nuclear

fuel cycle projects will increase capability significantly. The lack of a serious commitment by Chile to develop uranium reserves on a larger scale probably reflects the government decision to delay consideration of the nuclear power question.

Nuclear Weapons Research

At this time Chile does not have the technical capability to produce nuclear explosives.

His opposition is based primarily on the economics of nuclear development in light of Chile's present situation, but also results from uncertainty concerning Chilean ability to conduct meaningful nuclear research. Recently, however, Pinochet has shown that he is not unalterably opposed to the development of nuclear weapons.

Prospects

The inability of the Lo Aguirre reactor to attain a useful power level will continue for the next year or two to be a major obstacle to the military's attempts to conduct nuclear research. In addition, President Pinochet's doubts about the need for nuclear research may have been reinforced by the unresolved problems of the Lo Aguirre project. The redesign and completion of this reactor remain the single most important step to be taken by Chile to get its nuclear development, for either military or civilian aims, back on line.