11-25

(b)(1)
(b)(3)

BJ' Farley

You might be interested in Item 7.

(I have no comment.)

Also possibly Item 3.

JR

APPROVED FOR RELEASE
DATE: JUN 2005

State - Farley

JAKE

S/AE FILE COPY

S-E-C-R-E-T

A-G-E-N-D-A

THE JOINT ATOMIC ENERGY INTELLIGENCE COMMITTEE

BARTON HALL 1300 HOURS 3 DECEMBER 1959

ITEM 1.

Approval of the minutes of the meeting of 5 November 1959. (Copy distributed about 18 November)

ITEM 2.

Report on Current Activities

ITEM 3.

Consideration and approval of proposed SIC-JAEIC Statement of Paragraph 58 of Draft NIE 11-8-59. (Copy attached)

ITEM 4.

Approval of JAEIC clearance for Storage Working Group of Joint Board for Future Storage of Nuclear Weapons. (Memo attached)

ITEM 5.

Approval of Memorandum requesting exploitation of selected isotopes for intelligence purposes. (Memo attached)

ITEM 6.

Review of draft NIS 15, Switzerland. (Draft and approved NIS Outline attached)

ITEM 7.

Consideration and approval of the draft Terms of Reference for NIE 11-2-60. (Copy attached)

ITEM 8.

Approval of draft Section 17 - Annual (Rumania). (Copy attached)

S-E-C-R-E-T

TRANSMITTAL SLIP	DATE 24 November

TO: Mr. Philip Farley

ROOM NO.	BUILDING

REMARKS:

attached is a copy of the memo from NED to Chairman SIC re information on ANP and the proposed SIC-JAEIC statement as approved by SIC. This will be discussed at the 3 Dec. JAEIC meeting.

SPECIAL ASSISTANT TO THE SECRETARY S/AE

NOV 25 1959

AM 7,8,9,10,11,12,1,2,3,4,5,6,7 PM

FROM: JAEIC Secretariat

ROOM NO.	BUILDING	EXTENSION

FORM NO. 241 1 FEB 55 REPLACES FORM 36-8 WHICH MAY BE USED. (47)

Item # 3

USSR - NG

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S/AE FILE COPY

20 November 1959

MEMORANDUM FOR: Chairman, Scientific Intelligence Committee

FROM : Acting Chief, Nuclear Energy Division, SI

SUBJECT : Recent Evidence on the Soviet ANP Program July 1959 - October 1959

REFERENCE : Proposed SIC-JAEIC Restatement of Paragraph 58 of Draft NIE 11-8-59, "Soviet Capabilities for Strategic Attack Through Mid-1964," dated 14 October 1959

1. Per your verbal request, the information concerning the ANP problem received since July 1959 is listed below. This information is also being distributed to the members of the Joint Atomic Energy Intelligence Committee.

2. [redacted]

Source A: I asked Tupolev what they were doing in the field of nuclear powered aircraft but the only comment he would make was, "Very difficult".

Source C: In a general question to Arkangelski I asked what they were considering for the future and he said, "Mach 3". This was all he volunteered and I did not know if this pertained to nuclear aircraft or supersonic aircraft. I got the impression he was just talking generally about future developments beyond what the aircraft industry is doing today.

Source D: [who speaks Russian fluently] During the Electra flight I asked Major General Mikhail Kostiuk [the Soviet Air Attache in Washington] directly if they had an atomic aircraft. He said, "We have, we have". He did not elaborate.

Source E: At the dinner I asked Mr. Tupolev a leading question through a Soviet interpreter. The question was as follows: "I understand you have solved the nuclear propulsion problem". I have subsequently learned through a Russian-speaking US national who was present that the Soviet interpreter had relayed the question incorrectly. His question was, "I understand you are having problems with nuclear propulsion endeavors". Tupolev's reply came back as follows: "Of course, we are all having problems". Moreover, it is the opinion of the

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which in any [illegible] prohibited by law.

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SUBJECT: Recent Evidence on the Soviet AMP Program, July 1959 - October 1959

US national that the Soviet interpreter did not merely make a mistake in phrasing the question to Tupolev, but that he had done it purposely.

3. [redacted] dated 16 July 1959 -- Yeger said that they are working on a nuclear powered passenger type aircraft; he added that, in his opinion the application of nuclear power is only practical in passenger type aircraft. Yeger said that, despite many problems to be solved, their nuclear powered aircraft will be ready in the near future. He added that it will be subsonic.

4. [redacted] dated 24 July 1959 -- Tupolev was very skeptical concerning the probability of nuclear jet transports being practical in the foreseeable future. He outlined two reasons for this attitude. First, he believes the public would have to be trained to accept the idea of nuclear transportation. He believes no one would travel on nuclear transports without a long adjustment period. Second, the weight penalty would be tremendous due to the dimensions required for a nuclear transport and they are not practical from an economic viewpoint. He does believe that supersonic transportation in the Mach 2 to 3 range is practical and possible.

5. [redacted] dated 25 July 1959

Q. "Was this airplane (BOUNDER) his design, or was it Myasishchev's? There's been some question about that."

A. "We have a different type of bomber (sic) called BOUNDER (sic) in our country from the Tupolev design bureau."

Q. "The one he is speaking about - this airplane - has been set up as a nuclear testbed?"

A. Tupolev simply answered "No".

Q. "Would he be interested in that type of propulsion for his commercial airliners"?

A. "It is a very difficult question and in our opinion would damage the health (sic) of the passengers."

Q. "And then, you will have the opportunity of flying a prototype nuclear powered airliner; maybe you don't think a little to...."

A. "When the constructors have done a lot of work, then the aircraft will have come into being."

SUBJECT: Recent Evidence on the Soviet ANP Program, July 1959 - October 1959

Q. "You do not have it now?"

A. "No, not such."

6. [redacted] dtd 29 July 1959 -- Naturally, many of us discussed the nuclear powered aircraft at various times with the Tupolev delegation. One discussion with Tupolev himself was at the 4 July dinner, and Tupolev stated, at that time, that they were certainly having problems in the shielding requirements. At that same dinner Yeger expanded on Tupolev's "shielding problem" when he said that, in his opinion, a nuclear powered aircraft was not suitable for commercial use because of that shielding requirement. Yeger did say, however, that he thought it would be good for a bomber if they can ever get it off the ground. Kouzmin also told one of our group that shielding was certainly causing them many headaches. It is our joint impression that the entire group was either being extremely coy or they don't have a nuclear plane flying. However, if they have done enough work to know that it is hard to get this type aircraft off the ground, then they have certainly done considerable work in the field. It is the impression of one of our group that Arkhangelski is currently working at Kazan and it is possible that the Kazan aircraft plant might be concerned with heavy bomber development now going on in the USSR. If Arkhangelski is truly living at Kazan, his assignment there at this time when the plant is being expanded continously, could be a very important indication.

7. Memorandum for the Files of John A. McCone dated 19 October 1959 -- In several discussions E. stated categorically that the Soviets had no construction underway on NPA but were doing extensive research in materials, fuel element development, etc. He stated that when these studies were completed, flight unit could be built in two years or less. E. gave different impressions on NPA and in several conversations indicated first he thought it was impracticable, wasteful and presented insurmountable problems, particularly in operating the plane, because of fission products. He later indicated confidence in the success of controlled nuclear fusion. In another conversation he indicated flight of NPA not possible earlier than 1965-1966. In a discussion at Krivoi Rog, S. N. Voloshchuk (Glavatom representative and a man of high authority) proposed Soviets and U.S. collaborate and place emphasis on use of atomic energy in mining and other activities which would save men from hard and dangerous work such as underground mining, stating this was better than spending time on NPA. From this I conclude considerable effort being placed on Soviet NPA program.

SUBJECT: Recent Evidence on the Soviet ANP Program, July 1959 - October 1959

E. stated that their nuclear power plants will operate at 300-310°C saturated steam and about 500°C superheat steam. He favors stainless steel and indicated its use at both temperatures; that zirconium was useful at lower temperatures but not at higher temperatures. He stated further that any increases in temperatures would necessitate ceramics. Their work with BeO indicated it was so brittle it could not be used. Furthermore, they had not solved question of containment of fission products. E. gave no indication of work with other metals such as nickel chrome or chrome iron, but did state his laboratories now had some very pure beryllium, 99.7%, as well as pure vanadium, titanium and other metals, and he will pursue alloy experiments which might indicate some metal useable at high temperatures. He stated that the Czech natural uranium gas-cooled reactor would use stainless steel. He did not indicate they would be working with uranium oxide and graphite in homogeneous fuel elements but knew this work was going on in U.K. and U.S. Throughout several discussions he repeated time and again they favored use of zirconium and stainless steel for fuel element cladding and did not reveal progress on their part with other materials for fuel elements.

[redacted]

Acting Chief
Nuclear Energy Division

Attachment (1)

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Proposed SIC-JAEIC Restatement of Paragraph 58 of Draft NIE 11-8-59, "Soviet Capabilities for Strategic Attack Through Mid-1964," dated 14 October 1959

Better than marginal improvement of present Soviet heavy bomber's capabilities could be achieved by the development of a nuclear powered aircraft. A bomber of this type could derive operational advantages from its virtually unlimited range and its concomitant ability to make very low altitude penetrations. We believe that the Soviets have a * program underway to develop a nuclear powered aircraft at the earliest feasible time. There is evidence that the Soviets are doing basic research leading to the development of a nuclear propulsion system for aircraft. We believe that they have not yet accomplished the research and development requisite for the final design and construction of a flying prototype and we have not yet identified any specific Soviet project for the construction of such a prototype. On the basis of all evidence we estimate that, even with a high priority, the Soviets probably will not achieve operational status with a militarily useful nuclear propelled aircraft during the period of this estimate.**

---

* The Air Force member believes that the word priority precede program.

** The Army, Air Force, JCS, NSA and OSD reserve their positions on this sentence.

a. The NSA member prefers the deletion of even with a high priority.

b. The Air Force, JCS and OSD members believe that there is insufficient evidence to change the judgement in NIE 11-8-58 "that a few subsonic nuclear powered bombers might be operational by 1964".

#4

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JAKE

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23 November 1959

MEMORANDUM FOR: Mr. Philip Farley
Dr. Edwin Davis
Dr. A. K. Brewer
Col. W. Donn Hayes
Dr. Charles Reichardt
Col. Andrew Cox
Mr. Meffert Kuhrtz
Mr. Neil Carson
Mr. Leslie Rutledge

SPECIAL ASSISTANT TO THE SECRETARY S/AE
NOV 2 · 1959
AM PM
7,8,9,10,11,12,1,2,3,4,5,6

SUBJECT: Proposed JAEIC Technical Consultants

1. Dr. Reichardt, Director of Intelligence, Atomic Energy Commission has suggested that JAEIC sponsor security clearances for certain members of the Storage Working Group of the Joint Board for Future Storage of Atomic Weapons. This would make available to JAEIC excellent assistance in evaluating available evidence on Soviet nuclear weapon production and storage operations. It would also permit this group to apply information on Soviet practices to the US policy problems now under study by the group. A list of members is attached.

2. All on the list are now cleared for Top Secret and have Restricted Data access. Dr. Reichardt suggested that the number of individuals cleared could be reduced if only members and not alternates would be proposed. Exceptions could be those alternates who should be included because the member himself is near the end of his tour with the group.

3. Your views on this proposal will be requested at the JAEIC meeting on 3 December 1959.

GLENN A. SMITH
Acting Chairman/JAEIC

Attachment (1)

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STORAGE WORKING GROUP

Chairman	B/Gen R. H. Harrison, USA Deputy Chief, Defense Atomic Support Agency
Army Member	Lt Col L. C. Thomas
Alternate	Lt Col J. J. Donahue
Army Member	Lt Col W. J. Till
Navy Member	Cdr J. M. Parsons
Alternate	Cdr R. W. Duborg
Air Force Member	Lt Col W. M. Long
Alternate	Col W. T. Shealy
AEC-DMA Member	Lt Col S. Goldenberg
Alternate	Maj A. Belmont
Secretary	Lt Col P. S. Brengle, USAF

#5

SECRET

S/AE FILE COPY

23 November 1959

PROPOSED MEMORANDUM FOR: Chief FI/EE/OPS

SUBJECT: Procurement of Soviet Isotopes

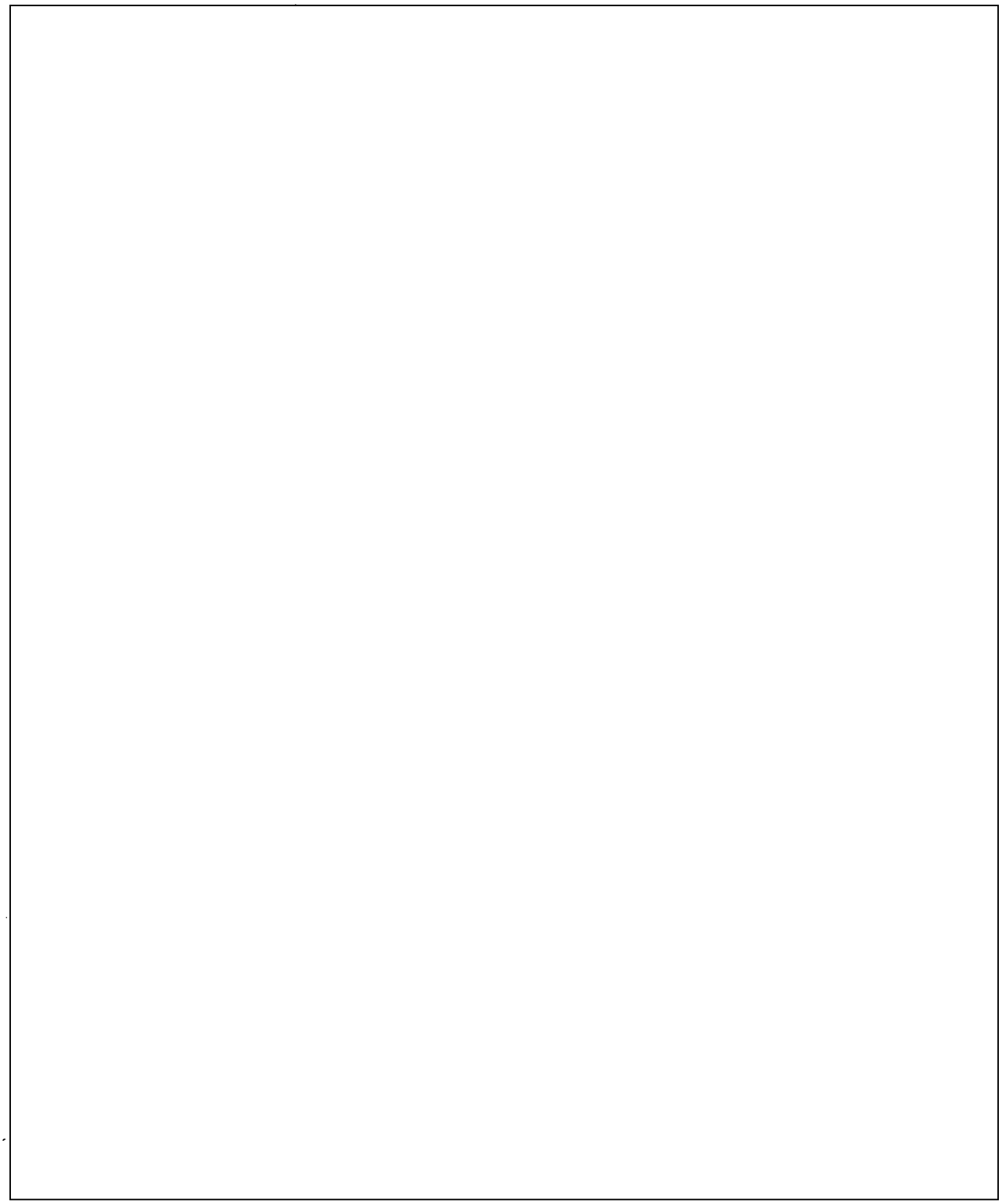
REFERENCE: Memorandum from Glenn A. Smith to Chief DD/P/EE/Poland
Same Subject, 26 August 1958, with enclosure

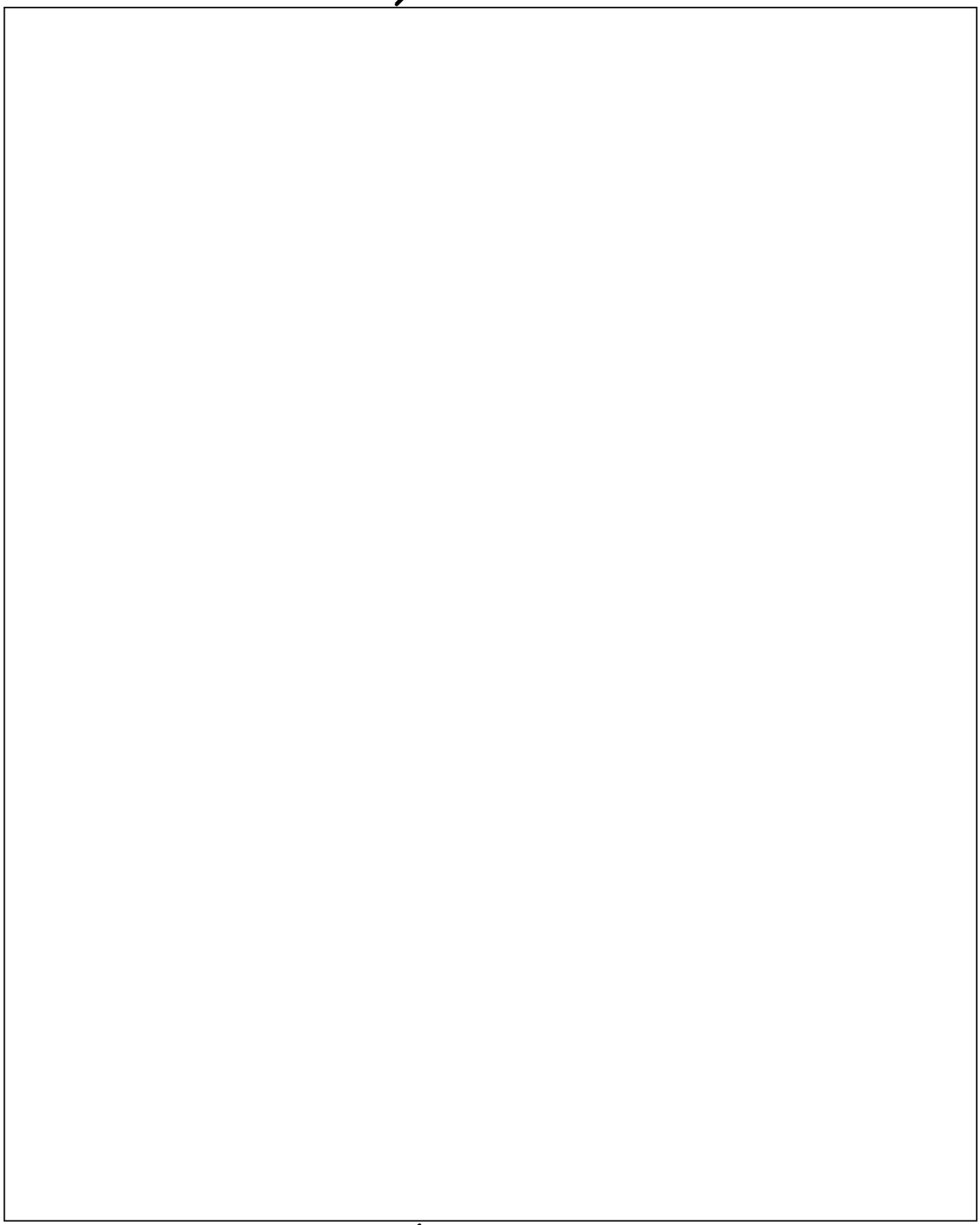
1. Enclosure to reference is a JAEIC memorandum dated 6 May, same subject, in which are listed isotopes which then merited procurement and analysis for intelligence purposes.

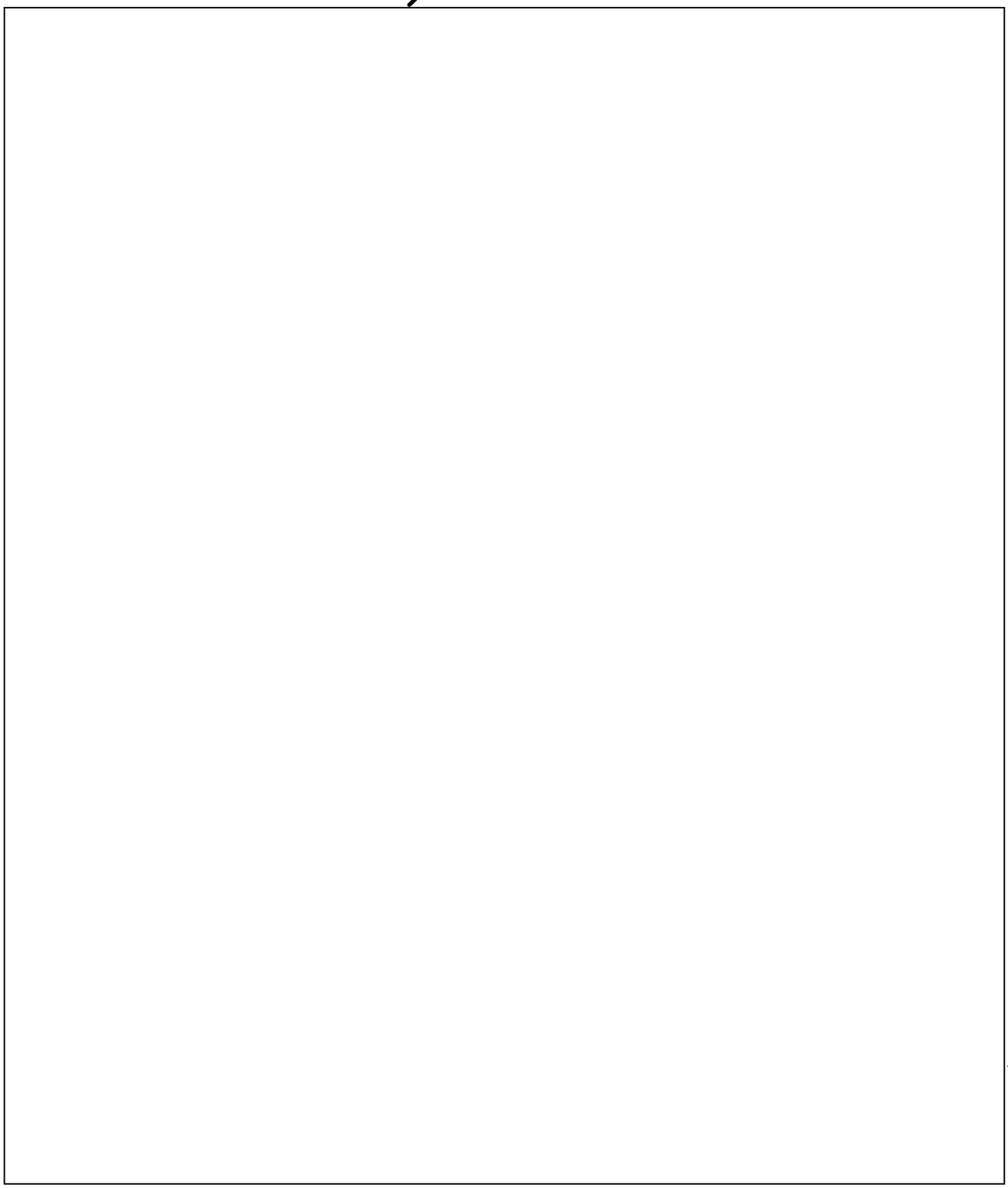
2. Reconsideration by NED/SI of the above referenced JAEIC memo after discussions with members of the Research and Production Division of the AEC, has resulted in the following list of isotopes that merit procurement and analysis for intelligence purposes.

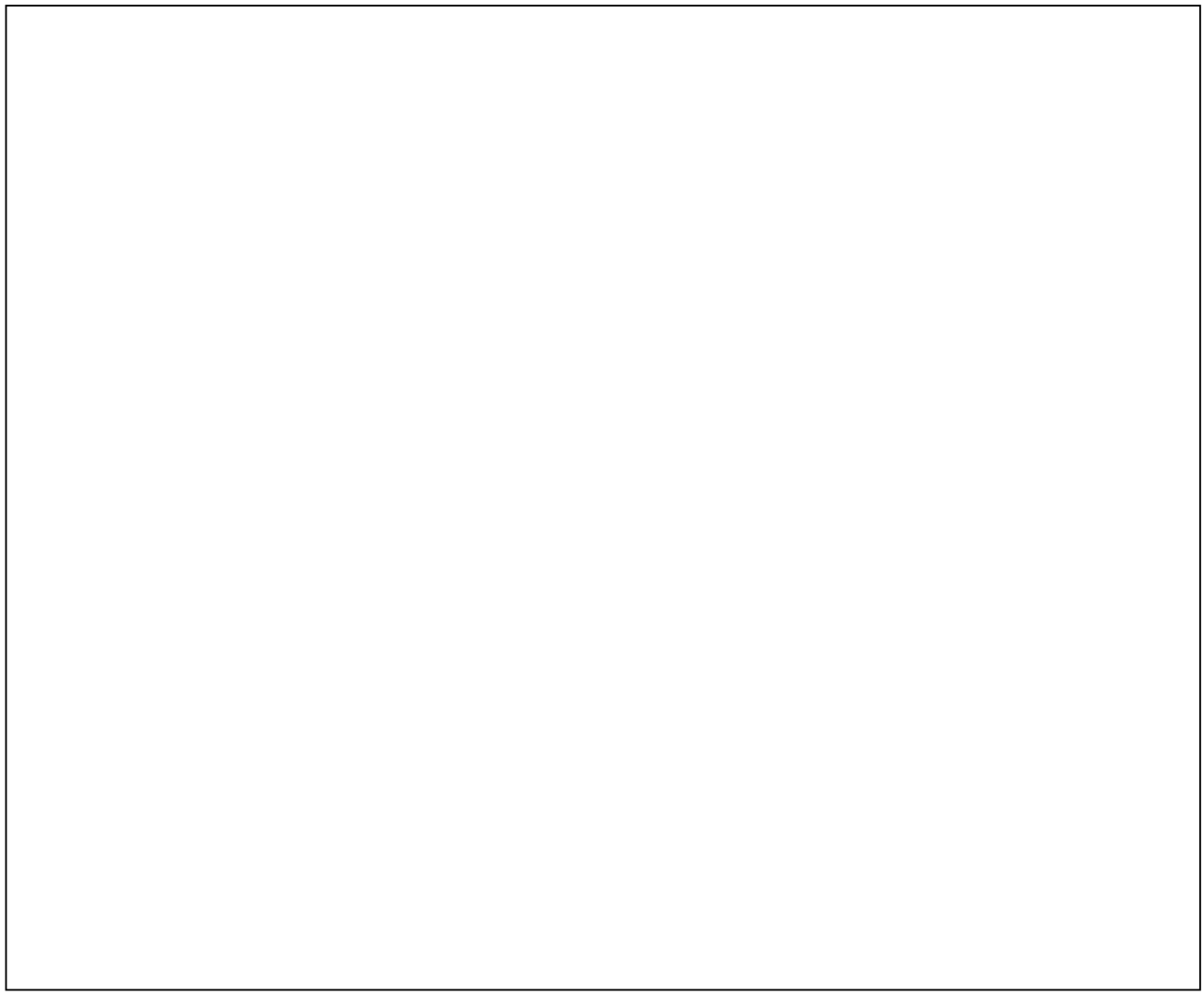
[redacted]

SECRET









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#6

4 November 1959

NIS 15

SWITZERLAND

SECTION 73
ATOMIC ENERGY

This is a preliminary draft of Section 73, NIS 15. It has not been finally edited or reconciled with other NIS sections and should not be reproduced. This section was approved on _____ 1959 by the Scientific Estimates Committee for use in the NIS. This section was approved by the Joint Atomic Energy Intelligence Committee on _____ 1959.

S-E-C-R-E-T
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NIS 15

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LIST OF FIGURES

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A. GENERAL

1. Capabilities and Trends

Switzerland has established a modest atomic energy program which is confined to basic nuclear research and the development of the peaceful uses of atomic energy. It has no capability for the production of nuclear weapons, but some government and military leaders are urging that the armed forces be equipped with these weapons. Switzerland does not have the economic and technological strength, nor the scientific manpower, to sustain a militarily significant or extensive nuclear program.

Although Switzerland began investigating to possibilities of utilizing atomic energy in 1945 and has some scientists of high reputation, shortages of research facilities, financial resources, personnel, and raw materials limited the development for a number of years to basic nuclear physics research in the universities. In 1955 private industry was instrumental in establishing a nuclear research program with the formation of a reactor center, Reaktor AG., at Würenlingen, and the acquisition of the research reactor displayed by the U.S. at the First U.N. Conference on the Peaceful Uses of Atomic Energy. This undertaking by private industry gave Switzerland its first opportunity for applied nuclear research and emphasis was shifted from basic nuclear research

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to the development of research and power reactors. A second reactor of Swiss design is also being constructed at the Würenlingen center, and the research reactor displayed at the Brussels Fair in 1958 by the U.S. was purchased by the Swiss National Fund for Scientific Research for the University of Basel. A prototype power reactor is being developed by one private group while another private group is building a pilot power reactor obtained from the General Electric Company (US). One of the basic problems facing the Swiss is the duplication of educational and other facilities in the German-speaking and French-speaking sections. Officials close to the nuclear program fear that Switzerland does not have sufficient resources to maintain a dual educational and research program. Because of the increasing expense the Swiss Government has had to appropriate for the support of the research center at Würenlingen, it is becoming apparent that it will in the next few years come under government control. The development of atomic power stations will be left entirely to private industry.

Although legislative control over atomic energy was placed under the Federal Government by a national referendum on 24 November 1957, a federal atomic energy law has not been put into effect. The lower house

of the Federal Assembly in September 1959 passed the basic law on atomic energy which had been approved by the Council of States in the spring of 1959. However, an amendment to raise the minimum private insurance coverage was made and this necessitated sending the law back to the Council of States for further consideration. The problem of insurance coverage has caused the most difficulty in the passage of the basic law on atomic energy, but it is hoped that some agreement will be reached during the present session of Parliament.

Industry, the universities and the Institute of Technology are keeping pace with nuclear developments. Certain industries have successfully devoted themselves to the study of nuclear materials, and each of the universities has established a nuclear physics department to the extent of its means. Nuclear training is being carried on in the universities and the nuclear research fields are quite varied. The specialization of each of the seven universities in their own fields and their current capabilities favor the development of nuclear research so as to allow them to work together profitably, thus avoiding duplication.

Swiss capabilities are much smaller than those of its larger neighbors, but greater than those of Austria. The participation of

Switzerland in international agencies and bilateral agreements with western nations will aid in the development of their atomic energy program, but it will not achieve the large scale program that is being developed in France, Italy and West Germany. Bilateral agreements for the peaceful uses of atomic energy have been negotiated between Switzerland and the United States, France and Canada.

The program will also be assisted by Swiss membership in various international nuclear energy organizations such as the International Atomic Energy Agency (IAEA), The European Agency for Nuclear Energy of the Organization for European Economic Cooperation (OEEC), and The European Center for Nuclear Research (CERN). CERN, a high-energy nuclear physics research center, is located at Geneva and is readily accessible to Swiss scientists.

2. Background and Organization

The Swiss Commission for the Study of Atomic Energy (Schweizerische Studienkommission für Atomenergie), the SKA, was formed in 1945 by the Swiss Government to begin investigating the possibilities of utilizing atomic energy in Switzerland. The first objective of the Commission was the construction of an experimental nuclear reactor. The

SKA was also instructed to:

1. conduct research on the basic question of atomic energy;
2. provide a reservoir of trained scientists in this field;
3. give advice to the military as to the maximum amount of protection that could be given to troops and population against the radiological effects of atomic weapons; and
4. maintain contact with private industry.

The driving force behind SKA was Prof. Paul Scherrer, the chairman, who had originally convinced the Swiss Government that there was a need for an atomic energy group. Private industry was also interested in the industrial aspects of atomic energy and wanted to develop and manufacture equipment (turbines, heat exchangers, etc.) that would be necessary in the utilization of power from atomic energy. In spite of the functioning of the SKA and the interest of private industry little progress was made for a number of years, and the money appropriated by the Swiss Government for atomic research was in reality used to sponsor basic nuclear physics research in the universities.

In 1955 a Consultative Commission for Nuclear Energy was set up by the Federal Government to coordinate planning activities in the atomic energy field and in January 1956, a Delegate for Atomic Questions was appointed. The appointment of a Delegate of the Federal Council is the

Swiss method of establishing a semi-independent agency outside the usual channels. The Delegate was charged with the responsibility of coordinating the efforts of scientific establishments, private industry, and government for the peaceful use of atomic energy and the study of peculiarly Swiss problems.

Because of expansion in the atomic energy program the Study Commission for Atomic Energy, set up in 1945, was dissolved at the end of 1958, as was the Consultative Commission for Nuclear Energy. By a decision of the Federal Council, they were replaced on 1 January 1959 by the Federal Commission for Atomic Energy, which is composed of 23 prominent people from science, industry, and government, and which is the high-level consultative body of the Confederation for all governmental atomic affairs. The Swiss National Fund for Scientific Research, is responsible for handling the subsidies appropriated by the Swiss Government. These appropriations are handled by the Fund's Commission for Atomic Science, established in 1958, whichhas the responsibility for establishing a general plan of research, coordinating the work in the universities, supervising the execution of subsidized research, and maintaining contact with international atomic energy groups. Other organizations which are involved in developing atomic energy in Switzerland are the Federal Commission for the Control of Radioactive Fallout, and the Swiss

FIG
73-1

Association for Atomic Energy.

A group of private industries founded a research organization, Reaktor A. G. in 1955, and furnished 200 million Swiss francs to establish the first reactor center in Switzerland. Reaktor A. G. is the main atomic energy research establishment in Switzerland, and has a one thermal megawatt swimming pool reactor in operation and a 12.5 thermal megawatt heavy water reactor under construction. Two other private organizations, Energie Nucleaire S. A. and Suisatom S. A. have been formed to promote nuclear power developments. The goal of Energie Nucleaire S. A. is to build, in the French-speaking part of Switzerland, an experimental center for the production of energy. Suisatom S. A. has a pilot nuclear power plant, purchased from General Electric, under construction not far from the location of Reaktor A. G.

Switzerland has seven universities and an Institute of Technology. The Institute of Technology is a federal institution, while the universities are under the jurisdiction of the cantons in which they are located. Training in various fields of nuclear physics is carried out in each of these institutions. The number of persons being trained each year is increasing, but there is still a shortage of trained personnel to meet the demands of the growing nuclear program.

3. Financing

The major financial support for the development and operation of the atomic energy program in Switzerland comes from private industry and the federal government. In the early years of the Swiss program the Federal Government appropriated 18,500,000 Swiss francs* (US$4,650,000)

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* 4.29 Swiss francs = $1.

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for the construction of a research reactor. Because of the apathy on the part of the majority of scientists and private industry, little progress was made on a reactor project, and the appropriation was used largely to promote the training of young nuclear physicists. In 1954 plans were being developed for the construction and operation of a research reactor by private industry. This project was financed largely by private industry and the cantons with 15 million Swiss francs. The Swiss Government also appropriated about 11 million Swiss francs toward this project. In early 1958 the Swiss Government appropriated a special subsidy of 10.5 million Swiss francs (US $2,500,000) to be administered by the Swiss National Fund for Scientific Research for the development of atomic energy, as well as a grant of 4.5 million Swiss francs (about US $1.1 million) for laboratory equipment of the research center of

Reaktor A. G. at Würenlingen. At the same time a study was begun to work out a long-range program covering the period 1959-1962. In October 1958 the Swiss Government appropriated 40 million Swiss francs for atomic research during the period 1959-1962. An additional appropriation of 30 million Swiss francs was made to the Würenlingen Center, which is administered by Reaktor A. G. Although the government wants to keep the initiative in atomic energy development in the hands of private industry, the increasingly large governmental appropriations makes this virtually impossible.

FIG 73-2

4. Manpower and Training

The Swiss nuclear energy program has been limited by a shortage of scientists and technicians. Many of those who had the required qualifications emigrated because of more attractive possibilities abroad. Swiss authorities are aware that Switzerland can only keep up with the rapid progress in this field if there is a supply of highly skilled native scientists and technicians, and although the bulk of the appropriations alloted for atomic energy research were earmarked for the training of nuclear specialists there is still a serious lack of trained personnel in this field.

Each of the universities and the polytechnic schools has a physics department or an Institute of Physics that is doing basic nuclear

physics research and training. Several industrial firms have established atomic energy sections which are providing training in the industrial applications of atomic energy which are of particular interest to their special needs. The research center, Reaktor A. G. has at present a personnel strength of 220. This will likely be increased when this center is taken over by the Federal Government.

Switzerland has also taken advantage of the training programs of other countries, which are available to foreign personnel, particularly that of the United States. Swiss personnel have attended the International School of Nuclear Science and Engineering (a reactor training school) at Argonne National Laboratory, Lamont, Illinois, studied at the Joint Norwegian-Netherlands reactor center at Kjeller, Norway, and have participated in the basic and pure research of the European Center for Nuclear Research (CERN) located in Switzerland.

B. MAJOR RESEARCH AND DEVELOPMENT

The main nuclear research center in Switzerland is Reaktor A. G. located at Würenlingen, on the Aare River near Baden. Reaktor A. G. was founded in March 1955, with the necessary investment capital furnished by over 170 Swiss corporations from industry, banking, insurance and public utilities. On the other hand, the funds required for the actual operation and the maintenance of the installations in Würenlingen are

provided by the Federal Government in the form of subsidies. The aims of the enterprise are statutorily fixed as follows:

a. Building and operation of research reactors for the purpose of establishing scientific and technical bases for the construction and operation of power reactors, and to study the development of the necessary machines and equipment for this purpose.

b. Research into methods for protection against nuclear radiations.

c. Production of radioactive isotopes for medical uses, chemistry, agriculture and industry.

d. Training technical personnel for the operation and maintenance of reactors and to provide students with practical knowledge about the properties and behavior of reactors.

This center has a 1 MW swimming pool type research reactor (SAPHIR) in operation, and a heavy water moderated, natural uranium research reactor (DIORIT) under construction. SAPHIR was acquired from the United States after the First UN Conference on the Peaceful Uses of Atomic Energy in 1955, and after some modification went critical in May, 1957.

SAPHIR is used for shielding experiments, small engineering tests, and some neutron physics work. Under construction at Reaktor A. G. is a DIORIT, 12.5 MW, heavy water reactor of Swiss design. This thermal, heterogeneous, natural uranium, heavy water cooled and heavy water moderated research reactor will provide beam holes for general neutron physics, good irradiation facilities for isotope production and material testing, space for installation of hot loops and fuel element test loops. The center also has physics, electronics, chemistry and metallurgical laboratories. The question of fuel composition and cladding will be the major subject for research and development of the chemistry and metallurgical groups.

FIG 73-1

Other developments in the atomic energy field are largely concerned with the development of electric power by private syndicates. Suisatom A.G. Zürich, was formed by a group of important electrical enterprises in the northwestern part of the country. This group in collaboration with the International General Electric Company, U.S.A., plans to erect a pilot power plant which will be located in an underground installation at Villigen not far from Würenlingen. At the beginning of operation, the plant will have an electric output of about 16 MW which will later be increased to 27 MW. Special parts of the plant will be supplied

by IGE, with Swiss manufacturers constructing the rest of the reactor according to the designs of IGE.

Energie Nucleaire S. A., (ENUSA), Lausanne, is another group formed for the development of nuclear power. This syndicate is composed of public corporations, electric power companies, industrial organizations, insurance companies and consulting engineering offices. The goal of this group is the construction, in the French-speaking part of Switzerland, of an experimental nuclear power plant. Plans call for this prototype to be built in an underground installation at Lucens in the valley of Broye, in the vicinity of Lausanne. It will be a 20 thermal MW light water boiling reactor, cooled and moderated with natural water and will use slightly enriched uranium oxide (approx. 1.4%). This center, which it is planned to have in operation by 1963, will be available to professors and students, particularly those of the Polytechnic School of the University of Lausanne, while also furnishing a training ground for experience on the industrial plane.

A syndicate composed of several large German-Swiss concerns has plans for the construction of an experimental nuclear center. This project is being developed mainly by Sulzer Brothers Corporation. These plans call for a 30 thermal MW pressurized water reactor using heavy water

as a moderator and coolant, with natural uranium as fuel. The center will be situated in a series of underground caverns which afford a high degree of containment, and will form an extension to the existing District Heating Station of the Federal Institute of Technology in Zürich. At the present time the project is under consideration by the Federal Institute of Technology and the Federal Authorities.

Basic nuclear physics research and training is carried out at the seven universities and the polytechnic school in Switzerland.

C. SOURCES AND PRODUCTION OF BASIC MATERIALS.

In view of the increasing importance of radioactive minerals a "Working Committee for the Investigation of Swiss Rocks and Minerals for Atomic Fuel and Rare Elements" was set up at the end of 1956 which is financed by the Federal Government. The main task of this committee is to locate economically exploitable uranium deposits. Though extensive prospecting is being carried out, only very small uneconomic deposits

have so far been located. The Swiss have a small capability for the production of heavy water by Holzverzuckerungs AG, and Cece Graphite of Zürich has done research work on graphite for nuclear reactors. The other basic materials necessary in the nuclear energy program are acquired through regular commercial channels or from other countries under the terms of bilateral agreements.

D. REACTIVE MATERIALS

Switzerland has a 1 MW swimming pool type reactor in operation and is capable of producing only very small amounts of plutonium. Plutonium produced in the reactors using fuel purchased from the United States is to be handled as prescribed by the bilateral agreement, and the United States has established a price schedule for the re-purchase of the used fuel elements at prices that vary with the amount of irradiation. This bilateral agreement also contains arrangements under which Switzerland may obtain small quantities of plutonium, uranium-235, and uranium-233 for research purposes.

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Sec 73

E. APPLICATIONS

Since a developing shortage of electric power will become more acute in the next ten to fifteen years, one of the principal objectives of the Swiss nuclear energy program is the development of economic applications of atomic energy, particularly for the production of electric power. At present Suisatom AG, Zürich, has under construction a small pilot plant facility which will be equipped with a reactor purchased from the International General Electric Company, USA. Other power projects are being planned by Energie Nucleaire S. A., Lausanne, with an experimental 20 thermal MW nuclear power plant to be put into operation in 1963, and by a group of industrial firms for a 30 thermal MW plant to be built as an extension to the District Heating Station of the Federal Institute of Technology.

The facilities of the nuclear research center at Würenlingen are providing the Swiss the opportunity to produce radio-isotopes for medical, agricultural and industrial uses, and to do power reactor research. Isotopes have been used for basic research and for medical research and therapy.

F. SUPPORTING FACILITIES.

The Swiss atomic energy program is supported by work conducted at the universities and polytechnic schools in Switzerland, and by a number of industrial organizations. The major supporting organizations are:

Physics Institute, University of Basel (Physikalische Anstalt, Universität Basel). The university's Physics Institute is under the direction of Prof. Paul Huber and the main field of interest is in work on the physics of neutrons and physics of light nuclei. Other research is done on nuclear measurement techniques and absolute precision determinations of radioactive source strength and of neutron sources. Equipment at the Physics Institute includes the AGN-211 research reactor displayed by the United States at the Brussels Exposition, a 1 MEV linear accelerator, and a 200 KEV Cockcroft-Walton.

Physics Institute, University of Bern (Physikalische Institut, Universität Bern). This institute is under the direction of Prof. F. G. Houtermans, and research is carried on in five main fields. These are: 1) mass spectrometry; 2) radiation measurements; 3) cosmic rays; 4) carbon 14 dating; and 5) registration of neutrons on Jungfraujoch.

Institute of Physics, University of Fribourg (Institut de physique, Université de Fribourg). Research on beta and gamma spectroscopy is being done here. Plans are underway for the development of a bubble

chamber to measure particles of high energies.

Institute of Physics, University of Geneva (Institut de physique, Université de Genève). The main activities at the Institute of Physics, under the direction of Prof. Otto Huber, are in the nuclear field. These include the study of slow and fast neutrons, cross sections, nuclear magnetic resonance in very low fields and in very high fields, and paramagnetic resonance. The institute has also received grants from the Swiss Ministry of Public Economy for beta-ray spectrograph development and from the U. S. Air Force for bubble chamber development.

Physics Institute, University of Neuchâtel (Institut de Physique, Université de Neuchâtel). This institute under the direction of Prof. Jean Rossel is doing research on neutron-induced reaction, nuclear emulsions, and reactor development. A 3 Mev Van de Graaff machine will be installed soon and will serve to do extensive research in the field of reactions of inelastic diffusions of neutrons.

Institute of Physics, University of Zürich, (Physikalisches Institut, Universität Zürich). The Institute of Physics under the direction of Prof. Hans Staub has a 2 Mev Van de Graaff which has been in operation for some years, and has a new 2.5 Mev Van de Graaff which was recently installed. Research studies are concerned with measurement of nuclear reactions, cosmic rays, low energy nuclear physics, and nuclear magnetic

resonances. The resonances of several nuclear species have been discovered here.

Physics Institute, Federal Institute of Technology (Physikalisches Institut, Eidgenossische Technische Hochschule), Zürich. The nuclear physics laboratories of the Federal Institute of Technology (ETH) are mainly engaged in medium and low energy research, under the direction of Prof. Paul Scherrer. The ETH has a long tradition as an excellent technological education center, and is one of the outstanding centers for physics in Europe. Prof. Scherrer, who has done much in building up this reputation for the ETH, will retire at the end of the 1959-60 academic year. His place will be taken by three new professorships in experimental nuclear physics. Prof. Pierre Marmier, will head the first of these new institutes and will carry out research using a 10 Mev Van de Graaff. The exact nature of the other two institutes has not yet been determined. Present research is being carried on at the Physics Institute with a fixed frequency cyclotron accelerating protons to an energy of 7.5 Mev and deuterons to 12 Mev, a high voltage generator, and a Cockcroft-Walton generator.

Institute for Nuclear Research, Polytechnic School of the University of Lausanne, (Institut de recherche nucleaire, Ecole Polytechnique

Université de Lausanne). The Institute for Nuclear Research is under the direction of Prof. Charles Haenny, and its main research is with high energies, nuclear emulsion techniques, absolute measurements of neutron flux, fast neutron generation, and nuclear reactors. The institute has a strong interest in obtaining a research reactor for research and training purposes.

Brown-Boveri & Cie Corporation (Brown Boveri & Cie AG) Baden. Brown Boveri & Cie. and its president, Dr. Walter Boveri, have played a leading role in the development of the nuclear energy program in Switzerland. It was through Dr. Boveri's influence and interest that the research organization Reaktor AG was founded. The company has completed the design and manufacture of components for the Swiss nuclear research reactor, DIORIT, of Reaktor AG, and presently has a contract for designing a 27 thermal MW nuclear power plant for Suisatom AG, Zürich. It has a betatron development program and also participates either directly or through its associated companies in various power plant design projects.

Escher-Wyss Machine Works (Escher-Wyss Maschinenfabriken AG.,) Zürich. This company has engaged in design studies and consulting contracts with the Air Force Office of Scientific Research and Air

Research and Development Command in the United States. It manufactures parts and materials for research reactors. These have included shielding materials, shielding assemblies, heat exchangers, reactor vessels and tanks. Escher-Wyss has given financial support to a number of reactor projects.

Emil Haefeli & Cie, Basel. This company in collaboration with the ETH in Zürich has developed and produced cyclotron equipment. It has also developed a high-voltage Cockcroft-Walton generator.

Sulzer Brothers Corporation (Gebrüder Sulzer AG.,) Winterthur. Sulzer is the main private share holder of Reaktor AG. It is building a plant to produce heavy hydrogen for the making of heavy water. The technical studies and reactor development for the syndicate planning a 30 thermal MW power reactor at the ETH is being done by Sulzer. It is also doing work on fuel elements and has developed zirconium clad uranium fuel elements.

G. OUTSTANDING PERSONALITIES

Boveri, Walter, Dr., Industrialist, Chairman of the Board, Brown-Boveri and Cie. and President of Reaktor AG. Boveri is the most outstanding single private industrialist in the atomic energy field in Switzerland. He was influential in the purchase of the swimming pool

reactor by Switzerland and he exerted considerable influence in the negotiations leading to the signing of an atomic energy bilateral agreement with the United States. Boveri was a delegate to the Second United Nations Conference for Peaceful Uses of Atomic Energy in 1958.

Burckhardt, Jacob, Dr., Delegate for Atomic Energy Questions. Member, Steering Committee for Nuclear Energy, European Nuclear Energy Agency. Deputy Delegate for Atomic Energy Questions. 1956-1958, and delegate to the Second United Nations Conference on Atomic Energy.

Clusius, Klaus, Prof. Dr. Ing. Physical chemist. Clusius is regarded as one of the leading physical and organic chemists in Western Europe and has been Director, Institute of Organic Chemistry, University of Zürich since 1947. He was formerly Director, Physical Chemistry Institute, University of Munich (West Germany). The inventor of "Clusius Tube." His chief research is connected with the separation of isotopes, but he is also doing work on low temperature research and reaction kinetics. Born 19 March 1903.

Fritzche, Andreas. Mechanical Engineer, Chief Design Engineer, Reaktor AG. 1957. Research Engineer, Sulzer Brothers Corporation, Winterthur, 1949-1956. Fritzche works on reactor design and reactor control apparatus. He was one of the top three men in the first

ISNSE class at Argonne National Laboratory 1955. Born 20 August 1920.

Haenny, Charles, Prof. Dr., Physical chemist. Director of Institute for Nuclear Research and Physical Chemistry, Polytechnic School of the University of Lausanne, and member of the Swiss National Fund for Scientific Research. Born 1906.

Houtermans, Freidrich Georg, Dr. rer. nat. Physicist. Professor for Experimental Physics and Director, Physics Institute, University of Bern, and member of Swiss National Committee for International Geophysical Year. Houtermans was educated at the University of Göttingen and the Technische Hochschule, Berlin, and worked in the USSR and England before World War II. He was imprisoned by the Soviets and the Nazis and left Germany in 1953, although he still retains his German citizenship. Houtermans has attended numerous international meetings and has published widely. His main interest is in classical radioactivity measurements. Other interests are cosmic radiations, mass spectrography, radioactivity, and nuclear reactions. He has achieved considerable success in the investigation of cosmic radiation with the aid of photographic emulsion layers. Born 22 January 1903.

Huber, Paul, Dr., Rector Physicist, Ordinary Professor of Physics

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and Director, Institute of Physics, University of Basel; Member, Federal Commission for Atomic Energy; President, Federal Commission for Surveillance of Radioactivity. Huber has attended many international conferences in recent years and was an official delegate to both United Nations "Atoms for Peace" Conferences. Huber's main interests are in low energy neutron physics, accelerators, scattered radiation of neutrons in nuclei, thermodynamics and gas scintillation neutron counters. Born 21 April 1889.

Huber, Otto. Prof., Physicist, Professor of experimental physics and Chairman, Physics Institute, University of Fribourg. Huber came from the ETH in Zürich in 1953 and built up the Physics Institute.

Marmier, Pierre, Prof., Nuclear Physicist. Professor of nuclear physics at the ETH, Zürich. Taught at the ETH 1946-51 and was a Senior Research Fellow at the California Institute of Technology 1952-1955. Returned to the ETH in 1955. Marmier's main interest and research are in the field of nuclear reactions and spectroscopy. Born 1922.

Rossel, Jean. Prof. Dr., Physicist. Director, Physics Institute, University of Neuchâtel; Member of the Board of Directors, Reaktor AG, and the Federal Commission for Atomic Energy. Rossel was educated at

the ETH and taught in the physics department from 1944-47. His research has included work on neutron physics, low temperatures, solid state physics (electronic properties of crystals) and atomic chronometry. Born 1918.

Scherrer, Paul. Prof. Dr., Nuclear physicist. Scherrer who is probably Switzerlands outstanding nuclear physicist is Professor and Director of the Institute of Physics of the Federal Institute of Technology (ETH). He plans to retire at the end of the 1959-60 academic year. He is also a member of the Federal Commission for Atomic Energy and a member of the Board of Directors, Reaktor AG,. Scherrer, who was chairman of the SKA from 1945 to 1958, was the leading proponent for many years in creating interest in the development of atomic energy in Switzerland.

Sontheim, Rudolf, Dr. Sc. Technical. Engineer. General Manager, Reaktor AG. Sontheim spent four years as a development engineer for General Electric Co. in Lynn, Mass., 1947-1950, and was Project Engineer for Albiswerk AG., Zürich, 1950-1955. In 1955 he became General Manager of the Reaktor AG. Born 1916.

Staub, Hans Prof., Physicist. Director, Nuclear Physics Institute, University of Zürich. Staub spent some years in the United States at

Los Alamos and at Stanford University. He returned to Switzerland in 1949 but still retains his U.S. citizenship. The two activities at the Physics Institute in which Staub is primarily interested are the Van de Graaff program and nuclear magnetic resonance. The Van de Graaff at the Institute is a 1.6 Mev machine built by Staub.

H. COMMENTS ON PRINCIPAL SOURCES

Information on the Swiss Nuclear Energy Program has been obtained from open literature, [redacted] the U.S. Department of State, visitors to Switzerland and intelligence sources. In general the information contained in this section is available from several sources. There are no outstanding gaps in intelligence coverage of this subject.

Figure 73-1. MEMBERS OF THE FEDERAL COMMISSION FOR ATOMIC ENERGY

C. Aeschimann

Prof. B. Bauer

E. Binkert

W. Boveri

E. Choisy

L. Derron

Prof. Ch. Granacher

A. Heil

E. Hess

H. Homberger

Prof. P. Huber

E. Kronauer

U. Meyer-Boller

C. Meylan

O. Muller

Prof. A. von Muralt

Prof. H. Pallmann

E. Primault

R. Reichling

Prof. J. Rossel

A. Schaefer

Prof. P. Scherrer

E. Steiner

A. Winiger

H. Wolfer

E. Wuttrich

H. P. Zschokke

Figure 73-3. SWISS REACTOR SPECIFICATIONS

	SAPHIR	DIORIT
Type	Swimming Pool	Thermal Heterogeneous
Fuel	MTR-type fuel elements 20% enriched 3.5 kg of U^{235}	Natural Uranium
Moderator	Ordinary water	Heavy Water
Reflector	Ordinary water	Ordinary water and graphite
Max. Thermal Power	1 MW	12.5 MW
Primary Coolant	Demineralized water	Heavy water
Secondary Coolant	None	———
Max. Thermal Flux	6.10^{12} n/cm²/sec	$2.2\ 10^{13}$ n/cm²/sec
Thermal shield	Ordinary water	Cast iron with cooling coils and concrete
Biological shield	None	Baryte concrete

Figure 73-2. APPROPRIATIONS FOR THE DEVELOPMENT OF ATOMIC ENERGY IN SWITZERLAND

Year	Federal Government (Swiss Francs*)	Industry and Cantons (Swiss Francs)	Use
1946	500,000		Research
1947-1951	18,500,000		Research, Training
1954-1957	11,800,000	15,000,000 6,000,000 500,000	Construction and Operation of Reaktor AG. Original capital Suisatom AG. Original capital Energie Nucleaire SA.
1958	10,500,000 4,500,000		Research and Training Operation of Reaktor AG.
1959-1962	40,000,000 30,000,000		Research and Training Operation of Reaktor AG.

*4.29 Swiss Francs = $1.00

#1 USSR-11-2-60

S/AE FILE DRAFT

S-E-C-R-E-T

DRAFT TERMS OF REFERENCE - NIE 11-2-60, The Soviet Atomic Energy Program

THE PROBLEM

To review significant recent developments in the USSR's atomic energy program and to estimate the probable future course of that program to mid-1965.

SCOPE

This paper will consist of an updating of these subjects in NIE 11-2-59 about which significant new information has become available and which merit a restatement. It will endeavor to provide answers to the questions listed under the topic headings below.

DISCUSSION

The Soviet Nuclear Power Program

What changes are noted in the Soviet plans for the development of nuclear power? What is its current status or time schedule?

What are the effects of the revised program on the consumption and production of fissionable materials?

Propulsion

What new developments have been noted in propulsion reactors for naval and marine use; for aircraft and rockets, and land vehicles?

The Soviet Nuclear Materials Program

What significant changes have taken place in availability of essential ores; the production of uranium metal; the procurement and processing of lithium, U-233, and tritium.

What is now believed to be the current and future volume of U-235 production?

What is now believed to be the current and future volume of plutonium production?

The Soviet Nuclear Weapons Program

What is the final analysis of the nuclear devices tested by the Soviets? What is the Soviet nuclear weapon development potentiality under a continued moratorium on testing? If testing is resumed?

Possible Soviet Allocations of Fissionable Materials to Weapons Stockpiles

What is the most probable allocation of fissionable material to various weapon types? What is the probable Soviet military doctrine on weapon employment?

METHOD

Two procedures will be employed in preparing this estimate. For all topics except Possible Soviet Allocations of Materials to Weapon Stockpiles, the usual method of drawing upon JAEIC member agencies for drafts to be submitted for JAEIC approval will be employed.

For Possible Soviet Allocations of Material to Weapon Stockpiles, it is proposed that a joint working group consisting of USIB member

representatives and JAEIC members prepare the draft under the chairmanship of a representative of the Board of National Estimates. This draft will be submitted through the JAEIC mechanism along with the remainder of the estimate to USIB for approval.

#10

SECRET

Section 17 - Annual (Rumania)

Atomic energy, physics, and mathematics

In July 1955 a Nuclear Energy Commission of the Rumanian Council of Ministers was created to foster nuclear physics research and its application in the fields of science and technology, to create the organizational basis for training specialized cadres, and to be responsible for construction and operation of installations using nuclear energy for peaceful purposes. On 10 August 1957, the ARPR Nuclear Physics Institute in Bucharest placed into operation a 2,000 kilowatt research reactor furnished by the Soviet Union, under its program of aid to the Satellites. A Soviet-furnished 12.5 MEV cyclotron reportedly went into operation 17 January 1958. Within the next 1-2 years Rumania plans to meet domestic requirements with radioisotopes produced in the reactor and the cyclotron. No nuclear power reactors are contemplated in Rumania prior to 1970. Rumania is a member of the Joint Institute for Nuclear Research in Dubna, USSR, and its scientists have access to the nuclear research facilities of this institute. Rumania is also a member of the International Atomic Energy Agency (IAEA). Rumania's mines produced approximately 700 tons of recoverable uranium metal in 1958, all of which was shipped to the USSR.

NND