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NATIONAL INTELLIGENCE ESTIMATE #57

SUMMARY
THE SOVIET ATOMIC ENERGY PROGRAM TO MID-1957

NIE 11-3A-54
16 February 1954

The Intelligence Advisory Committee concurred in this estimate on 16 February 1954. The FBI abstained, the subject being outside of its jurisdiction.

The following member organizations of the Intelligence Advisory Committee participated with the Central Intelligence Agency in the preparation of this estimate: The intelligence organizations of the Departments of State, the Army, the Navy, the Air Force, the Joint Staff, and the Atomic Energy Commission.

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NATIONAL INTELLIGENCE ESTIMATE

JOINT ATOMIC ENERGY INTELLIGENCE COMMITTEE

SUMMARY

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NIE 11-3A-54

16 February 1954

This is a summary of National Intelligence Estimate, NIE 11-3-54, dated 16 February 1954, prepared and agreed upon by the Joint Atomic Energy Intelligence Committee which is composed of representatives of the Departments of State, Army, Navy, Air Force, the Atomic Energy Commission, the Joint Staff and the Central Intelligence Agency. The FBI abstained, the subject being outside of its jurisdiction.

A group of expert consultants working with the Joint Atomic Energy Intelligence Committee concurred in the conclusions given in this estimate. The estimate was approved by the Intelligence Advisory Committee as of 16 February 1954.

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SUMMARY
THE SOVIET ATOMIC ENERGY PROGRAM
TO MID-1957

THE PROBLEM

To estimate the current status and future course of the Soviet atomic energy program on the basis of information available from all sources.

SUMMARY

1. While the exact extent of the Soviet capability for quantity production of nuclear weapons remains uncertain in some of its aspects, the available evidence establishes the existence in the USSR of (a) a high-priority, extensive atomic energy program; (b) a substantial stockpile of nuclear weapons; and (c) the capability of producing explosions in a range from the equivalent of a few thousand to at least a million tons of TNT.

2. In November 1945 the "First Chief Directorate attached to the Council of Ministers" was organized to plan and carry out the Soviet atomic energy program.

3. The first Soviet reactor capable of quantity production of plutonium probably went into operation during 1948 and by the spring and summer of 1949 the level of total reactor power became significant, thus marking the date of the start of production scale operations for the manufacture of plutonium.

4. The production of uranium-235 apparently lagged behind the plutonium program. Whether this was planned or the result of technical difficulties is not known, as only meager evidence is available that is relevant to the isotope separation phase of the program.

5. The Soviets have demonstrated a capability to accomplish independent research essential to their atomic energy program. While it is no doubt true that espionage activities, German technical assistance, and unclassified scientific and technical literature available in Western countries made substantial contributions to Soviet progress, independent research by the Soviets, required to adapt to their needs the information obtained through such sources, was apparently carried out with a high degree of competence. The evidence is now clear that in a number of instances Soviet atomic energy practices do not follow those of the U.S., the U.K. or Canada.

6. It is estimated that the total cumulative production of uranium metal available to the Soviet Union from East German production alone up to the end of 1953 was between 10 and 15 thousand tons. It is possible that an equal amount could have been produced from internal and other Satellite sources.

7. The Soviets are depending, for the most part, on very low-grade deposits of uranium. In the Satellites the major portion of the uranium recovered is derived from ores which probably average between 0.03% and 0.3% U_3O_8. Only a vast amount of hand sorting can account for the large output. Comparable grades of ore are probably being extensively worked inside the USSR.

8. It is estimated that the probable total reactor power levels were in the neighborhood of 900 - 1200 megawatts during the period from early 1952 to the end of 1953. Further, it is estimated the total effective reactor power levels will increase during the period of this estimate, reaching a level of approximately 2100 to 2400 megawatts in 1957. It should be noted that this increase is not intended to define the maximum capability for expansion of Soviet plutonium manufacturing facilities.

9. The absence of sufficient evidence from which to estimate installed or planned isotope separation capacity continues to be one of the most serious gaps in intelligence information on the Soviet atomic energy program. It is believed that there are several possible courses of action the Soviets may have taken with respect to uranium-235 production which are consistent with available evidence and which yield general guide lines for the Soviet uranium-235 stockpile. An average value has been taken for the purpose of calculating the weapons stockpile.

10. No evidence is available on Soviet efforts with respect to power applications of atomic energy other than possible implications from Soviet interest in thorium and the high irradiation level of the plutonium utilized in the 3 September 1953 explosion. However, together with continuing research on methods of plutonium and uranium-233 production, some effort will undoubtedly be placed on power applications.

11. It is concluded that the USSR is capable of producing nuclear weapons with explosive powers in the range of the equivalent of a few thousand tons of TNT to approximately one million tons of TNT. Throughout this range thermonuclear reactions were apparently used to increase (i.e. boost) the energy yield from the fissionable materials present without themselves directly contributing substantially to the total energy yield. It is apparent that by the end of 1953 the Soviets had reached a point in weapon technology at which they were capable of producing stockpile weapon types dictated by military requirements.

12. While there is no clear evidence which can serve as a guide to an estimate of the specific types and numbers of each type that the Soviets will actually stockpile, it is considered probable that for the immediate future the specific weapons stockpiled will have the general characteristics and explosive powers of models tested. However, as estimates are projected further into the future, uncertainty is increased by the possible advent of new principles of weapon design or the development of new methods for the production of fissionable or thermonuclear materials.

13. In order to illustrate how estimated Soviet stockpiles of fissionable materials may be utilized, the table below has been based upon two examples of the many courses which are within Soviet capabilities: (a) the continued stockpiling of composite and pure plutonium weapons using principles tested in 1951 and yielding approximately the equivalent of 40,000 tons of TNT each, or (b) the stockpiling of nuclear weapons using the boosting principles tested in 1953, i.e. utilization of plutonium components for medium yield (60,000 tons of TNT) and small yield (5,000 tons of TNT) weapons, and all uranium-235 weapons yielding one million tons of TNT.

Stockpile Examples	End 1953	Mid-1954	Mid-1955	Mid-1956	Mid-1957
(a) Unboosted composite and plutonium weapons 40 KT each	180	240	390	575	800
Total yield (million tons TNT)	7.2	9.6	15.6	23	32
or					
(b) Boosted uranium or plutonium weapons 1000 KT	12	18	34	54	80
60 KT	60	85	125	175	235
5 KT	190	250	375	525	700
Total yield (million tons TNT)	16.5	24.3	43.4	65.6	97.5

14. For comparison with the above, the following table sets forth the stockpile figures which would be applicable if the Soviets fabricated all fissionable material into either large-yield boosted weapons (e.g. uranium-235 weapons yielding 1000 kilotons each, and pure plutonium weapons yielding 60 kilotons each) or small-yield weapons (e.g. composite and pure plutonium weapons yielding 5 kilotons each).

Stockpile Examples	End 1953	Mid-1954	Mid-1955	Mid-1956	Mid-1957
(a) Boosted uranium-235 weapons 1000 KT each	12	18	34	54	80
Boosted plutonium weapons 60 KT each	120	170	250	350	470
Total yield (million tons TNT)	19	28	49	75	108
or					
(b) Boosted composite and pure plutonium weapons 5 KT each	550	725	1175	1725	2400
Total yield (million tons TNT)	2.8	3.6	5.9	8.6	12.0

15. While the figures given in paragraphs 13 and 14 are considered to be the most probable for the examples stated, in view of the degree of precision applicable to the estimates of fissionable material production, the actual figures for the weapons stockpile examples given above for the end of 1953 (as well as other choices the Soviets can make) may be as much as one-third lower or higher. The uncertainty increases as estimates are projected into the future, and the actual figures for mid-1957 may be as low as one-half or as high as twice the figures given in the tables.

16. The Soviets will probably continue work on small-yield and small-dimension weapons and further developments along these lines could be tested during 1954. In view of this, the possibility cannot be excluded that the Soviets will develop during the period of this estimate nuclear warheads for weapons other than bombs.

17. The Soviets will probably also continue work on the development of weapons with energy yields well in excess of a million tons of TNT. This program could possibly result in a test in 1954. If the Soviets develop weapons in which thermonuclear reactions contribute directly a major portion of the energy yield, the energy yield of a portion of the Soviet weapon stockpile could be considerably increased without any increase in fissionable material production or in numbers of weapons.