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February 24, 1960

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ATOMIC ENERGY COMMISSION

CENTRIFUGE PROCESS FOR URANIUM ENRICHMENT

Note by the Secretary

The attached Memorandum of Conversation from the Department of State is circulated for the information of the Commission.

Department of Energy Document Review	
1 st Review Date: <u>10/12/17</u> <u>G.N. Brown</u> HS-60 Reviewer	Determination: (Circle Number(s))
Authority DC: <u>DD</u> Derived From: _____ Declassify On: _____	1. Classification Retained
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W. B. McCool
Secretary

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DEPARTMENT OF STATE

Memorandum of Conversation

February 6, 1960

SUBJECT: Centrifuge Process for Uranium Enrichment

PARTICIPANTS:		<u>Dept. of State</u>	<u>A.E.C.</u>
		Secretary Herter	Mr. Floberg
		Mr. Merchant - M	Gen. Starbird
		Mr. Bohlen - S/B	Dr. English
		Mr. Eaton	Dr. Beams
		Mr. Smith - S/P	Dr. McDaniel
		Mr. Farley - S/AE	Dr. Kolstad
		Mr. Sullivan - S/AE	
		Mr. Spiers - S/AE	
		<u>White House</u>	<u>C.I.A.</u>
		Dr. Kistiakowsky	Mr. Dulles
		Mr. Keeny	Dr. Scoville
			<u>Dept. of Defense</u>
			Mr. Irvin
			Adm. Dudley
			Gen. Dabney
			Gen. Fox
			Mr. Knight

Mr. Floberg explained that the present briefing had been set up at Mr. McCone's suggestion to bring to the attention of the attendees the recent work which had been done on the centrifuge process for uranium enrichment. Although this process is not a new one, there were recent developments which give it a new relevance in connection with disarmament negotiations and the general problem of Nth country development. He stated that Drs. McDaniel, Kolstad and Beams (of the University of Virginia who is in charge of the AEC contract work on this subject) would present the technical briefing.

Dr. McDaniel explained that during World War II a great deal of work had been done in the U.S. on the gaseous centrifuge process. At that time it was decided that this process was not competitive and the U.S. therefore selected the gaseous diffusion process in preference. In 1953 the work on this subject was reinstated on a small scale at the University of Virginia. Soon after the War it came to our attention that the Soviet Union had started a two-pronged effort in this same field, one using German scientists which they had recruited and one conducted on their own hook. In 1958 the work was speeded up in the U.S. and similar efforts were undertaken in the Netherlands and West Germany. The tentative conclusions which we have arrived

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at are as follows: On the basis of present technology a facility producing 500 kilograms a year of weapons-grade U-235 could be constructed at a cost of \$100 million. A plant with a capacity of 50 kilograms a year would cost \$37 million. If a three-year development program were undertaken (at an estimated cost of \$6 million) a plant constructed in an additional two years would cost \$17 million for a capacity of 500 kilograms per year of 95 per cent U-235. The annual operating cost would be \$3 million and the power requirement would be 1,000 kilowatts. The plant would consist of 10,000 centrifuge units costing \$1,110 each. The plant would require an area of approximately three acres, and 375 tons of uranium oxide feed would be required annually.

Dr. Kolstad reviewed a series of charts dealing with the technological capabilities required, which included sources of UF₆, drive motors, pumps, high-speed bearings, rotors, and mechanical engineering capability. He then reviewed the work which was being done abroad in the USSR, West Germany, the Netherlands, the U.K., and Brazil on this subject and listed the domestic U.S. firms which had demonstrated an interest in the process. The problems presented for the U.S. arising from the work which had been done were: (1) whether we should make an expanded effort in this field; (2) whether we should attempt to collaborate with the U.K., West Germany, and the Netherlands; and (3) whether the process should be classified. Dr. McDaniel noted that we had decided six weeks ago to classify the work being done. Mr. Floberg said that if we were going to expand our U-235 production we would give serious consideration to using this process, particularly in view of its low-power requirements relative to gaseous diffusion requirements. He said that the high-stress materials developed as part of our space program had been responsible for the new outlook for this process and noted that new materials would continue to come along which would make possible higher peripheral centrifuge speeds. We have no plan to build a plant using this process but intend to continue our research and development effort. However, he estimated that some twenty countries would now have the capabilities for building a centrifuge enrichment plant and we can no longer assume that future reactors will not require highly enriched fuel. Thus, production of material of this grade may not necessarily in the future be a cause for suspicion that a producing country intends to use the output for weapons purposes. He said that within the next year or so the AEC may establish a civil reactor using fully enriched material.

In response to a query by the Secretary, Mr. Dulles said that there was no evidence that the Soviets were using this process. Dr. Scoville said that the evidence available to us is that the Soviets are expanding their gaseous diffusion plant capacity.

Mr. Floberg said that we were investigating the possibility of classified collaboration in this field with the Dutch and the Germans. The Secretary emphasized the need to keep the work on a classified basis. Mr. Smith suggested examining the value of a cooperative program with the Soviets in this field. Dr. McDaniel said that this might have some merit. Mr. Dulles said that CIA would conduct an intelligence review of what other countries might be doing on this process.

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