SECRET

Metallurgical Laboratory

September 22, 1943

Col. K. D. Nichols

Arthur H. Compton

The attached memorandum is based upon the assumption that it is the intention of General Groves and the Policy Committee not to authorize construction of a P-9 plant for producing 49 until serious troubles have been encountered with the present graphite plant. If, on the contrary, it is the intention to authorize construction of such a plant more promptly independently of finding any new difficulties with the graphite plant, a different directive will be written that will authorize the formation of a separate laboratory for P-9 studies.

KT

cc: S. K. Allison
H. D. Smyth
A. V. Peterson (3) ✓
W. C. Münnicke

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Metallurgical Laboratory

September 22, 1943

S. K. Allison
H. D. Smyth

Director of Laboratory
Assoc. Director of Laboratory in Charge of P-9

Arthur H. Compton

Director of Project "49"

P-9 Program

In accord with instructions received from General Groves, may I ask you to proceed with the following program of work related to the use of P-9.

1. Perform experiments of the "exponential" type with both heterogeneous and homogeneous intermediate piles. These experiments are expected to give more precise data with regard to the critical sizes of the corresponding operating piles. You will presumably want to have them done under Mr. Fermi's supervision at the Argonne Laboratory.

2. Design, Build, and operate an experimental heterogeneous P-9 pile at Argonne Forest which will use no more P-9 than necessary (less than 10 tons) and will develop a maximum of not less than 100 nor more than 1000 kilowatts. This pile will:

a. Afford a means of performing experiments designed to test aspects of the W pile at relatively high levels of gamma and neutron radiation.

b. Supply reliable data regarding the size and other operating conditions of the chosen type of structure.

It is not necessary that the unit shall be so designed as to make possible the removal of the metal employed. The P-9 shall, however, be recoverable.

Since the experiments with this unit are necessary to test aspects of the W plant, its completion is urgent, and should be given a high priority in the work of the laboratory.

The buildings, instruments and other equipment required for constructing and operating this pile are authorized, subject to the approval of the Area Engineer in accord with the contract under which you operate. The work under items 1 and 2 is included in the request for authorization MUC-AC-313, submitted to the Area Engineer on August 3, 1943.

3. Prepare the process design of a P-9 plant for producing 49 to operate at not less than 250,000 kw nor over 600,000 kw. The design is to be ready by July 1, 1944, for submission for detailing and construction.

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All practicable experiments required to test the various features of this design shall be performed, and unit parts whose successful performance or maintenance is questionable shall be suitably tested. It is expected that this will require subcontracts with manufacturers and others to cover the cost of design and construction of these special parts. The type of design should be such as will have a good chance of success in case of trouble with the W plant.

The only occasion for building a plant during the present war following this design will presumably be in case of failure of the W plant to give satisfactory results. The P-9 development accordingly is not to be allowed to interfere with the studies required for the successful completion of the W plant. Preparation of the plans is nevertheless important as insurance that even in case of serious trouble with the graphite plant the 49 will become available without unnecessary delay.

It is expected that during the period of intensive effort on the W plant, a staff of some 40 technical men will be employed specifically for securing the required data and carrying through this P-9 design. A part of the experimental work may also be allocated to other groups within the project to be fitted into their regular schedule of project research. On occasion, some of the men assigned normally to the design of the P-9 plant may be required temporarily for other duties, as for example reviewing blueprints of the W plant or aiding with the design of the Argonne P-9 pile. On the other hand, as the work on the problems associated with the W pile slackens, considerably increased effort may be devoted to the completion of this P-9 design.

It will be noted that the number of men employed on the P-9 task is thus only a fraction of those that would be used were immediate construction of the P-9 plant contemplated. In view of the much smaller staff and the flexibility required to accomplish both the P-9 plant design shall be an integral part of the duties of the Metallurgical Laboratory and shall not be the occasion for setting up a separate organization.

It is anticipated that additional space of some 10,000 square feet, will be required together with suitable equipment and facilities.

In selecting the design to be developed, the various possibilities should first be carefully reconsidered, having in mind the fact that more time for preparation of the design is now available than had once been assumed. This preliminary study will presumably include a continuation of the investigation of the properties of slurries.

4. Investigate the possibilities of improvements in the pile design, considering especially what can be done to utilize the tube-alloy more efficiently in producing 49, the use of impoverished materials, and the possibility of producing 23 or 49 at the expense of 25 if this is found to be advantageous. In this study, not only the possibilities of the use of P-9 should be considered, but also those of Be, C, Bi and water. Likewise the use of metal enriched in 25 or 49, and the use of heat should be investigated.

It is hoped that the present war will be over before this investigation can lead to important practical results. It may well have a great effect, however, on the post-war military position of the nation. It is thus to be considered as an essential part of the laboratory's task, but not now of high priority. It is suggested that the time of from 2 to 5 technical men be assigned at present to this work, and that the effort be considerably expanded after some six months as other more expedite tasks are completed.

5. The Canadians are also working on the development of P-9 piles. You will interchange information freely with them on the scientific and technical aspects of the P-9 work. This includes particularly,

a. Interchange of all available technical data including calculations that may be useful in developing P-9 plants.

b. Showing and explaining instruments needed for investigating or constructing such plants. This includes the experimental pile (or piles) at Argonne, but not the production piles at X and W.

c. Performing for each other experiments related to the P-9 studies for which the facilities of one of the groups may be especially suitable, when this can be done without undue interference with your own program.

The cooperation does <u>not</u> include discussing with the Canadians:

a. The progress, plans, time schedules, production capacities and technical aspects of the graphite plants for producing 49, or of plants for producing P-9, except as the technical aspects may bear upon the technical problems of the P-9 piles under consideration.

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b. Plans for P-9 piles that have not been developed to the stage of active investigation, either by ourselves or the Canadians.

Transfer of materials or instruments which are government property is permissable only with specific authorization from the Area Engineer.

Visits to the Montreal Laboratory by members of the Metallurgical Project are authorized for interchange of information. The following persons may visit the Montreal Laboratory upon securing authorization and necessary credentials in advance from the office of the Project Director, Messrs. H. D. Smyth, C. J. Thomas, E. P. Wigner. Others may be included on this list upon approval by the Manhattan District Office.

Authorization for occasional visits by the other members of the Metallurgical Project may be secured from the Project Director's office upon approval of the special trip by the Manhattan District Office.

A mechanism for interchange of certain reports and secret letters will be worked out in cooperation with the Manhattan District Office.

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