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MOUND LABORATORY-MONSANTO
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Dr. Joseph J. Burbage

September 24, 1951

A-Building

Trip Report, Argonne National
Laboratory, August 29, and
September 5, 6, and 7, 1951.

Dr. J. J. Burbage and I attended a meeting at Argonne National Laboratory on August 29, 1951, as auditors for Mound Laboratory, Monsanto Chemical Company. The meeting was concerned with the practicality of converting a CP-5 pile to the production of polonium-210. In attendance were: Sapirie and Woodruff of the Oak Ridge Atomic Energy Commission; Center, Larsen, Weinberg and Layne of Carbide and Carbon; Tammaro, Hagemann, and Saxe of the Chicago Atomic Energy Commission; Hilberry, Untermyer, West, and Weills of Argonne National Laboratory; and Belcher of the Dayton Atomic Energy Commission.

Salient features of the meeting follow:

Sapirie prefers Mound, Oak Ridge, Savanna, Hanford, and Arco in that order. He wants a feasibility report to reach him by September 15, this report to be prepared by Mr. Belcher with the assistance of Argonne National Laboratory on reactor design (modified CP-5); by Argonne and Mound on building design; by Mound on benefits of location at Miamisburg and physical nature of the site and surrounding area; and by Mound and the Oak Ridge Atomic Energy Commission on the meteorology of this area.

Mr. Center of Carbide and Carbon stated that Carbide and Carbon would prefer to see the pile at Mound as they were very busy with expansions at Oak Ridge and Paducah. On the other hand, Dr. Hilberry stated that Argonne would prefer to see an MTR-type reactor erected at Oak Ridge and gave Mound as their last choice. Argonne's attitude was based on the fact that they did not wish to be responsible for designing the pile and knew that Oak Ridge was capable of designing a suitable pile modeled after the MTR.

Mr. Sapirie stated that the pile should be capable of producing 25,000 C./month and that he would be interested in 75,000 C./month if that figure could be achieved with little extra cost. A great deal of the subsequent conversation centered around various modifications of the dimensions of the CP-5.

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CP-5
75,000 C./mo.

<u>Radius</u> <u>cm.</u>	<u>Power</u> <u>Megawatts</u>	<u>C/lb.</u>	<u>D₂O</u> <u>tons</u>	<u>D₂O</u> <u>\$</u>
100	13.0	17	5.6	560,000
120	9.4	10	9.8	980,000
140	7.2	6	15.0	1,500,000

MTR (guesses)

75,000 C./mo.

50,000 C./mo.

<u>C/lb.</u>	<u>Megawatts</u>	<u>C/lb.</u>	<u>Megawatts</u>
10	9.5	10	8
5	4.7	5	4

Heavy water for the CP-5 costs \$50 per pound and will be in short supply until around the summer of 1952 because of the high demand at Savanna River. When this demand ceases the price may fall to something like \$25 per pound. The MTR does not use heavy water.

Hilberry stated that the Reactor Safe-Guard Committee would be most favorably impressed by:

1. A gas-tight building for the pile.
2. Underground location.
3. Operation at as low a power level as possible which requires a large radius and large amount of heavy water and results in a lower value of curies per pound.

Hilberry further stated that there is no fixed modification at present; and that if a pile is to be designed, he would want Mound to send several men, including a production man, to consult and to aid in the preparation of operations manuals. A revision of the CP-5 specifications suitable for a report could be made by September 15, 1951, simply by varying the various factors in proportion to the power level. A redesign suitable for construction purposes would probably take until January 1, 1952. The CP-5 should be finished by January 1, 1953, and Hilberry suggested that the Modified CP-5 should lag the CP-5 by 2 - 3 months to benefit by experience.

Mr. Sapirie was of the opinion that the Modified CP-5 should be available in the summer of 1952.

Hilberry suggested that the firm of Shaw, Metz and Dolio be considered as architect-engineers and that they should be capable of putting about twenty-five men on the problem.

Attention was called to the fact that the Reactor Safe-Guard Committee has never made any rulings on the hazards of polonium in a pile.

The September 5, 6, and 7 trip was made by Mr. Wiesler, Mr. Scott and Mr. Halbach. Mr. Wiesler and Mr. Halbach were concerned primarily with building costs and plans and spent some time at the Du Page site and some time at Shaw, Metz and Dolio. It was pointed out that class C-1 blast-proof construction of a gas-tight building located underground would exceed the CP-5 in ability to contain an explosion. Pressures of 1000 lbs/ft.² must be withstood in the blast-proof C-1 construction as compared to 140 lbs/ft.² in the CP-5 building design.

Mr. Scott and I spent the time at the Du Page site in the company of Mr. West and Mr. Weills to be available for consultation. The conversations were concerned primarily with variations of tank radius and power level while holding to an average concentration of 5 C/lb. for a six months in-time with 10% down-time and discharge every month. Variation of slug size was discussed with the Argonne favoring large sizes such as 6" x 6" x 6". Mound Laboratory made extensive queries concerning the practicality of various methods of using smaller slugs. Alternate methods usually had two defects: smaller amounts of material with reduced production and difficulties in cooling (removing the heat from gamma rays).

There was some discussion of possible designs for the top plug, rod-storage facilities, lead coffins and cranes for handling hot slugs, and intercommunication facilities with the T-Building.

When we left, Mr. Weills' and Mr. West's calculations seemed to be pointing towards operation at a 6 megawatt power level with a tank of 120 cm. radius. Dr. Hilberry suggested that the terminology "Modified CP-5" be dropped as the CP-5 construction was allowed at 1 megawatt after being turned down at 2 megawatts. Thus it was felt that a request for 6 megawatts should not be conspicuously associated with the CP-5 design.

September 24, 1951

On our last day, it became apparent that the Argonne Laboratory would not supply their design modification for a report by September 13, 1951. Dr. Zinn's return from Arco was delayed and by his orders their report could not be issued without his criticism and approval. Hilberry guessed September 18 as a date for word from them.

Probably the most important points are these: All designs were made for 50,000 C. / month in order to guarantee 25,000 C. / month. All designs were made for a 5 C/lb. average production for 6 months irradiation with 10% down-time. All slugs were large size. Thus they did not propose a possible lower power level in terms of lower fluxes, larger tank size, and lower curies per pound. They were not at all firm in their thinking and the power level seemed to jump up and down by factors of two or three overnight.

It was stated frequently that the Reactor Safe-Guard Committee can only say "yes" or "no" on a design and cannot suggest changes in design to get approval. Approval for original operation at a lower power level might be possible, since the full 25,000 C. / month might not be initially needed. Operation at a lower power level would create problems in lower concentration which might be offset by a longer in-time. The Committee might subsequently permit raising the power level.

In general, it was believed that the Reactor Safe-Guard Committee would refuse approval on the grounds of too high a power level too near a city.

J. F. Eichelberger

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