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CL-FD-46

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By Date 8/25/71

October 20, 1947

Dr. C. Rogers McCullough Power Pile

Farrington Daniels Power Pile

CLINTON LABORATORIES

CENTRAL FILES NUMBER

27-10 279

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Suggested Research Programs for Power Pile

I believe that it would be worthwhile for the Power Pile Division to carry out calculations on the economics in U^{235} holdup which can be effected by remote control impregnation of graphite with uranium and with thorium.

It was brought out at the pile meeting of October 17, 1947, that one of the large cost items in atomic power is the capital investment in the holdup of fissionable fuel while it undergoes cooling and reprocessing. A considerable part of the time required for reprocessing is due to the need for radioactive cooling of uranium isotopes so that the metals can be fabricated by hand. A similar hold up applies to the thorium but it is less expensive.

A study should be made and a report issued showing the cost of reprocessing of impregnated uranium in which the leaching, burning, purification and impregnation are done by remote control. Under these conditions it would probably be satisfactory to use a less elaborate decontamination process - perhaps reducing the number of solvent extraction operations.

Experimental studies should be started on impregnated thorium oxide (and carbide) to determine the best conditions for impregnating graphite with the maximum amount of thorium oxide (or carbide) and the optimum conditions for leaching out or otherwise recovering the thorium. Hot-pressed thoria will probably have very bad thermal properties (much more susceptible to thermal cracking than BeO). Enormous quantities of thorium must be processed (at least 500 kilograms) to recover 1 kilogram of U^{233}. Thorium oxide, particularly the hot-pressed oxide, is difficult to dissolve. Perhaps it can be dissolved out from the impregnated graphite more easily.

Quick return of this thorium to the breeding blanket with the minimum of operations would effect a considerable saving. Perhaps the protoactinium can be removed chemically from the thorium and allowed to decay to U^{233} outside the pile. It is possible that impregnation and leaching can be done quickly in large vats by remote control, particularly with the thin-walled, 7-hexagonal fuel tubes. The costs in operation and in holdup investment with impregnated graphite should be compared in tabular form with the costs for using metals, hot-pressed oxides, extruded oxides, and solutions. One of the advantages of homogeneous solution piles is the simplicity of chemical processing. It would be well to see how closely the cost of chemical processing of impregnated graphite can approach the cost of processing in a homogeneous pile.

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FD:se

CLASSIFICATION CANCELLED

JG Morgan 1-18-95

ADD signature Date

Single rereview of CCRP-declass[redacted]

documents was authorized by DOE Office of [redacted]

Declassification memo of Augu[redacted]