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This document consists of
3 pages, No. _____

To W. R. McSpadden

Dist.: #1 DA Dingee
#2 WR McSpadden

From D. A. Dingee *MD*

Subject Proposal for 2020 Program

Project Title: Analysis of The Use of LWRs in Weapons Material Production

Objective: The objective of this study is to examine the major issues associated with using a Light Water Reactor (LWR) to produce weapons materials.

Scope: The central focus of the study will be on the design and safety issues relating to tritium production in LWRs using uranium fuel with both low and high enrichment. This study will identify the problems and propose solutions.

Study Approach: This study will analyze the technology of tritium production in an LWR. The first step will identify and quantify the major problems and the worst credible accident condition. The next step will consist of identifying and evaluating engineering changes to the LWR design.

Specific areas to be reviewed include:

- Materials and Geometries for Producing Weapons Material.
This activity will provide a preliminary core and assembly design to serve as a reference for other parts of the study. The materials and geometries will be a result of material and thermohydraulic safety considerations. The starting point for this activity will be the RPR study as reported in UNC-2000.
- Reactivity Properties and Control Requirements for the LWR.
Particular attention will be paid to determining the Doppler and moderator temperature coefficients and the shutdown margin requirements during an over-cooling event.
- Worst Credible Reactivity Transient During Production in an LWR.
Transients considered in this activity will be loss-of-poison accidents as opposed to the over-cooling accident studied in the previous activity.

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By J E Savely 10-17-94

Verified By J E Savely 10-19-94

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- Thermal Hydraulic Parameters.

Attention will be paid to normal operating conditions and the most limiting credible accident conditions in a production LWR.

- Material Behavior.

Material behavior during normal and transient conditions will be analyzed.

- Water-Metal Reactions.

Reactions during the worst credible accident in a production LWR will be studied. This task will also recommend solutions to reduce the severity of the resulting hydrogen buildup, including possible changes in containment.

- Potential Hazards During Refueling.

This activity will analyze refueling hazards and identify solutions.

- Economics.

The impact of proposed technical changes on the cost of producing weapon material in an LWR will be estimated.

Project Management: This study will be managed by (to be determined), who will also serve as a systems integrator of the project. John Barner of PNL will serve as Materials Behavior Consultant in a production LWR. Cal Heeb of PNL will provide the economic estimates for the production LWR. Andrew Prichard of PNL will provide the core neutronics analysis for the production LWR. Duane Faletti of PNL will provide the thermohydraulic analysis of the production LWR. Don Rasmussen of PNL will provide engineering and fuel handling support. Assistance from Westinghouse Pittsburgh Advanced Reactor Division will be required to conduct reactor transient analysis and this proposal is contingent upon their support.

Estimated Cost: This study will require about 10 man-months of time and \$10,000 of computer time, for a total estimated PNL cost of \$100,000. Costs for ARD support services must be added to this.

Schedule: The first milestone for this study will be to identify the key problems and set of design-basis accidents. This will be completed by April 15. The second milestone for this study will be to evaluate the key problems and quantify the design-basis accidents. This will be completed by May 30. A parallel activity will be to recommend

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and perform preliminary analyses of engineering changes to mitigate the problems and accident conditions. This study will be completed by June 15 and summarized in a letter report.

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