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UNITED NUCLEAR CORPORATION
HEMATITE, MISSOURI

DOCKET NO. 70-53

SCRAP RECOVERY OPERATIONS

I. General

United Nuclear has submitted a license renewal application which requests scrap recovery operations in three separate areas. In the Red Room, used exclusively for up to full enrichment, all vessels and equipment are safe geometry. In the Green Room (for operations with material up to 6.5% enrichment) and in the Blue Room (for any enrichment) nuclear safety of each operation is based upon safe mass.

Safe geometry dimensions are based on minimum critical parameters reduced by standard safety factors. Optimum moderation and full water reflection are assumed except for certain specific operations where administrative controls and environmental factors assure other than the most conservative assumptions of moderation and reflection.

Mass control is based on 43.5% of the minimum critical mass, for the enrichment of concern, based upon optimum moderation and full water reflection, except for the assumption of limited moderation in certain specified storage and shipment procedures.

Grouping of equipment (arrays) is judged to be nuclearly safe in accordance with accepted interaction principles.

II. Red Room (301.3)

The nuclear safety of these operations is based on fully enriched uranium with the density not to exceed 3.2 g U/cc.

A. "U" Leg Dissolver

The calcining and ball milling of the material before it is charged to the dissolver is optional. The dissolver consists of two cadmium wrapped columns connected at top and bottom by pipes. The nuclear safety of the dissolver is based on nominal reflection. The solution is first transferred to an assay tank where an accountability sample is taken and then to the extraction feed equipment. The mixer-settlers are geometrically safe assuming minimal reflection. All associated vessels are geometrically safe including the raffinate and product hold tanks.

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The uranium is precipitated in separate columns as ADU and the slurry drained to a Buechner funnel for filtration. The filtrate is collected in a bottle placed beneath the funnel. The ADU is dryed while remaining in the Buechner filter funnels.

B. Recovery Hood (240-2-24)

Solids are dissolved in a small safe geometry container and solutions precipitated in columns. The slurry and filtrate is drained into a small safe geometry container or Buechner funnel with the filtrate collected in a vessel, placed beneath the funnel.

C. Recovery Hood (240-2-25)

Solids are dissolved and precipitated in safe geometry containers. The slurry and filtrate is drained into a Buechner funnel with the filtrate collected in a vessel placed beneath the funnel.

D. Recovery Hood (240-2-26)

Solids are introduced into one of two column dissolvers. Reagents are introduced through piping from outside of the building with an air break to prevent a backflow of uranium-bearing solutions to the 55-gallon drum. The slurry is pumped through a filter and the filtrate is collected outside the building in a bottle. The filtrate is sampled and assayed; if the uranium content is less than 0.1 g/l it is poured into a 55-gallon drum for neutralization and disposal.

Concerning the above operations, we have raised three questions pertaining to nuclear safety with the applicant:

1. Identification and justification of all operations involving material containing more than 3.2 g U/cc.

2. Modification of the Mixer-Settlers, with nuclear safety based on nominal reflection.

3. Description and safety analyses of all procedures for transferring material from safe geometry to unsafe geometry.

III. Green Room

This operation is limited to dissolving and precipitating as ADU a single safe wet batch of uranium enriched in the U^{235} up to 6.5 w/o. The equipment is of unsafe geometry. The precipitated solution passed through a

filter press. The filtrate is recycled until it is clear of solids and color, after which it goes to a filtrate hold tank. The filtrate is sampled and analyzed for uranium prior to discarding. The ADU is removed from the filter by hand and collected in trays and processed according to procedures described for UO_2 production. These subsequent operations are judged to be nuclearly safe on the basis of mass control.

We have raised a question concerning the possibility of particle buildup in the filtrate collection tank.

IV. Blue Room

The equipment used in this area is of unsafe geometry. For low enriched uranium, the operation is the same as for the Green Room. For high enriched uranium solutions (pickle liquor) each batch will be limited to a safe mass of 350 g U^{235}. The uranium is extracted from the pickle liquor by TBP. The stripped product is precipitated as ADU and collected in a filter press. All solutions are sampled and analyzed for uranium content prior to starting the next batch through. The batch size is reduced to account for any uranium hold up in each process equipment. The ADU is removed from the filters and processed through the remaining steps, with nuclear safety based upon mass control.

V. Status

The applicant has described certain operations as typical, implying he may alter his basic nuclear safety criteria without obtaining a license amendment. It is our intent to condition the license to require a prior license amendment for all significant changes. Also, the applicant has been requested to confirm that he will take a representative sample from each incoming container of scrap and analyze it for uranium content and U^{235} content (unless it is handled and processed as fully enriched uranium).

The applicant has stated there will be no unsafe geometry containers in any area containing more than 500 grams U^{235}, except for those process vessels described in the application and which are nuclearly safe because of mass control.