

Pr. ct: 8-8  
Docket: 70-36

MAR 20 1962

Donald A. Buschman, Chief  
Source & Special Nuclear Materials Br.

Charles D. Luke, Chief  
Criticality Evaluation Br.

UNITED NUCLEAR CORPORATION, SHIPPING CONTAINER APPLICATION  
DATED FEBRUARY 27, 1962 (DOCKET 70-36)

Ref: DLR:FCO

Please refer to your memorandum of March 8, 1962, forwarding the subject application for review and comments.

Insofar as the uranium compounds are concerned, at an H/U-235 ratio of 0.32 for a 1% water content of fully-enriched  $UO_2$  with a maximum density of 6 g/cc, the applicant has determined the safe mass to be 12.8 kg U-235. We have confirmed this determination for the dry oxide but since the possibility of water leaking into the container cannot be neglected, we went a step further and calculated safe mass limits for water saturated oxide at a density of 6 g/cc and 3.2 g/cc, respectively. For the heavy oxide at H/X = 2.41, a safe mass of approximately 6.25 kg  $U_{25}$  was computed. For the low density compounds with 3.2 g  $UO_2$ /cc, a safe mass of approximately 7 kg  $U_{25}$  was computed at a H/X ratio of 7.07. These assumptions of limited moderation are permissible with the Schedule 40 steel pipe inner containers. Since the applicant states that no more than 5.8 kg U-235 ( $UO_2$  basis) will be packaged in each container, we recommend approval of the package based upon mass control.

As regards the uranium metal to be shipped in the form of whole biscuits, we recommend approval for a maximum of 4 whole biscuits (10 kg U-235) per container. We have determined that 5 biscuits would not incorporate the requisite safety factor.

In the case of broken biscuits, we require information concerning the H/X ratio when flooded before we can complete our evaluation of this aspect of the shipment to ensure safety from accidental criticality.

We see no objection to the proposed containers. However, we would recommend that the proposed package be referred to Chris Beck for analysis of its structural integrity and support mechanism for positioning the inner container within the 15-gallon drum.

B-92

Insofar as the array is concerned, with five layers of 19 drums each, the applicant calculated a total solid angle of 3.3 steradians. However, with mass control as the basis, a  $k_{app} = 0.65$  for each drum is assumed yielding a total allowable solid angle of 2.5 steradians. Therefore, we request that the applicant revise the arrangement of drums so that a total solid angle of 2.5 steradians is not exceeded. In addition, it should be pointed out that the solid angle computations submitted were not proper in that the hypothetical planar surface seen by the central container is somewhat larger than the 6" diameter.

We recommend disapproval of shipping via LTL, LCL, air, or railways express. Possibility of comingling cannot be neglected.

Attachment:  
Ltr dtd 2/27/62

8/4/90%  
450 @ 42.20%  
4.5-kg U  
15%  
10%

DL&R:FL:CEB DL&R:FL:CEB

F.K.Durkan/vj C.D.Luke

3/19/62

3/19/62