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July 24, 1980

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. MacDonald:

This letter is in response to your April 3, 1980 letter requesting additional information on our request for amendments to the Certificates of Compliance 9044 and 9081, on the Model GE-1600 and Model CNS-1600 packages, respectively. We have discussed this subject with Dick Odegaarden and Bill Lake of your staff. The time required in responding has been spent compiling data for our response; it is not indicative of a lack of interest or priority. These casks are our first line of back-up to be leased in the event of a problem with the casks presently in use and/or difficulties at the waste burial site such as inclimate weather which would increase the turnaround time. A delicate balance exists between the continued supply of medical radioisotopes produced by our facility, the only domestic commercial reactor supplying bulk medical radiochemicals, and the shipment of wastes necessarily generated in the production process.

Our approach in responding to your questions on containment of the package has been to empirically show that our form of wastes can withstand normal and accident conditions without undue risk to the health and safety of the general public regardless of the containment provided by the shipping cask. While there is an ongoing concern between the NRC and the owner of the cask as to the leak tightness during accident conditions, there appears to be no question of the cask containing the inner specification 17H steel drum in a relatively undeformed condition. The form of material we request to ship in these casks (reference specifica- tions UCC-9044, Rev. 1, and UCC-9081, Rev. 0 of our January 16, 1980 letters) is restricted to solid material by a license condition. As such, the material will be contained in the cask during both normal and accident conditions.

Over the past months, measurements have been made of each shipment we presently make. After placing a drum of waste in our Model B3-1 shipping containers, an air sample is drawn from the air space between the drum and the inner cask cavity walls. Results have shown that the only isotope found in measurable quantities is a small amount of I-131 which

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is adsorbed to the outer surface of the drum in the hot cell as the waste is packaged. Measurements of twelve drums show a range of I-131 concentrations from 2.82×10^{-8} uCi/cc to 5.66×10^{-7} uCi/cc, the average being 1.24×10^{-7} uCi/cc. This concentration times the 2.77×10^{5} cc volume of the air space in the GE-1600 or CNS-1600 cask is the amount available for release in either normal or accident conditions, assuming no credit for containment by the cask. This quantity of I-131 is 0.0343 uCi.

We propose to apply containment criteria of Regulatory Guide 7.4 and ANS N14.5-1977. For I-131 having an A_2 of 10 Ci the normal and accident allowable leak rates are:

$$R_N = A_2 \times (2.78 \times 10^{-10}/\text{sec})$$
$$= 0.00278 \text{ uCi/sec}$$

$$R_A = A_2 \times (1.65 \times 10^{-9}/\text{sec})$$
$$= 0.0165 \text{ uCi/sec}$$

For demonstration purposes it is assumed that in the hypothetical accident the entire inventory of I-131 is vented in the 30-minute fire. The resulting leak rate would be 0.0343 uCi in 30 minutes or 0.00002 uCi/sec, or approximately 0.1% of the limit for accident conditions. During normal conditions, any leakage would be expected to occur over a substantially greater time resulting in a lower leak rate; however, even for the 30 minute release assumed above, the leak rate is only approximately 1% of the limit for normal conditions.

To provide a conservative outer-bound case, another measurement was taken. Sampling taps were installed in a lid of a waste drum. Immediately after filling the drum with fresh waste material, a sample was drawn from the drum; normally drums are stored in the hot cell to allow for greater than 4 weeks of radioactive decay. The concentration was again primarily I-131 at a level of 1.52×10^{-2} uCi/cc. During accident conditions, a breach of containment was assumed along with expulsion of the gas due to the hypothetical fire. The ambient temperature will increase approximately 500°F from its initial temperature of approximately 500° absolute, causing the gas to double in volume. That is, a volume of gas equal to the original volume would be released. With the drum filled to 90% of theoretical volume, a resultant free air space of 0.75 ft^3 exists in the drum. Loss of the 0.75 ft^3 of gas having 1.52×10^{-2} uCi/cc during the 30 minute time interval would result in a hypothetical release of 0.18 uCi/sec for fresh wastes. To reach the allowable limit for accident conditions would require radioactive decay of the 8 day half-life material for 28 days. Since the present practice is to allow a minimum of 4 weeks decay, the proposed leak rate criteria would be fulfilled even in this situation.

In conclusion, the simplistic and overly conservative model which in effect assumes no containment at all substantiates the fact that in no event would the limit be exceeded. More realistic modeling shows that the leak rate may be on the order of 1% of the limit or less.

A final question in your April 3, 1980 letter concerned the maintenance program. The analysis takes no credit for containment and therefore imposes no specific maintenance requirements. However, as a matter of normal good packaging procedures in our facility, all shipping casks are visually inspected prior to each use, including close inspection of the mating surfaces and gasket material, replacing the gaskets when necessary. In addition, large quantity waste drums are routinely packaged in accordance with the same procedures used to package those containers on which measurements were made for this analysis. Each drum is new and comes complete with a gasketed tight-fitting lid.

We trust that the above information will provide the required support for issuance of the amendment as requested. If you have any questions, please feel free to call.

Yours very truly,

Marcus H. Voth

Marcus H. Voth
Manager of Nuclear Operations

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c.c.: Mr. Stuart Corbett
Chem Nuclear Systems, Inc.