MAR 2 1 1973

Mr. Charles M. Hardin, Director
Radiological Health Program
Kentucky State Department of Health
275 East Main Street
Frankfort, Kentucky 40601

Dear Chuck:

As discussed during our telecon today, I have attached AEC comments relating to the proposed settling/filtration/evaporation system from NECO's Kentucky burial site. Please keep us informed concerning the disposition of this application.

If you have any questions, please let me know.

Sincerely,

Paul H. Lohaus
Agreements and Exports Branch
Directorate of Licensing

H/53

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAR 21 1973

REVIEW OF PROPOSED EVAPORATOR FOR KENTUCKY BURIAL GROUND

Pursuant to your request, we have reviewed the proposed settling/filtration/evaporation system for the NECO burial ground at Morehead, Kentucky.

Settling/filtration/evaporation systems, in general, are effective. However, there are questions concerning the proposed system utilizing a submerged combustion evaporator. While it cannot be concluded that this evaporator will not work, there are some doubts concerning it.

Comments are listed below:

1. Submerged Combustion Evaporation

A submerged combustion evaporator is not commonly used in evaporation of low level waste; thus, we have no experience to draw upon. Pages 28 and 29 of the proposal are intended to provide technical justification (or experience) for the use of this type of equipment. The justification is very weak.

Of particular concern is the possibility that this type of evaporator could actually become a particulate generator. The following statements from the information submitted will provide illustration.

Kerr-McGee Facility at Sequoyah, Oklahoma "Although decontamination factors were not directly measured...."

"A simple demister pad installed directly in the evaporator exhaust stack did not appear to affect decontamination to any appreciable extent."

Oak Ridge National Laboratory "No information on performance is known."

Hanford Works "The amount of entrained water droplets of small size (less than 5 microns) was inferred to be relatively high. This was deduced from the observation that inertial type of entrainment separation should have accomplished adequate entrainment removal but did not."

British Windscale Facility "... reference is made to use of a submerged combustion evaporator at the British Windscale facility, but no data or performance is provided."

The entire "technical" backup as condensed above is of little value. Of concern is that a submerged combustion evaporator could become a particulate generator. It can come about as a result of either of two mechanisms. The first is that the burner represents a more concentrated source of heat; the boiling is, therefore, more violent and water droplets (5 microns or less) simply are blown free of the liquid surface. Secondly, the temperatures which the boiling liquid sees across a vapor interface is the flame temperature. The abstracted Hanford report (already mentioned) refers to exit temperatures of "from 200° to 1800°F." The high temperatures conceivably could breakdown salts which are stable in conventional evaporators and the "flash sintering" could produce particulates of either the metal portion of the dissolved salts or any of the remaining particles not removed in the settling/filtration steps.

Particulates are easy to generate but difficult to collect. A centrifugal, mist eliminator (ME-1) is suggested for installation if particulates are discovered after the plant is built and tested. Such a mist eliminator is of doubtful value. Further, the particulates will pass through the condensers and out of the vent, not to the second stage evaporator. A second stage evaporator is suggested as a backup in case a single stage doesn't work. Thus, in such a case, the second stage evaporator would be ineffective.

We suggest that a detailed search of the literature be made on the subject and, if possible, a demonstration using an innocuous chemical tracer be made.

2. Volatile Materials

There are several volatile materials either present, or possibly present. One of these volatiles, iodine, is mentioned in the analysis. At pH of 11, an iodine decontamination factor of only 100 may be obtained in conventional evaporators. At neutral pH's, where operations are planned, losses to the stack will be higher.

Ruthenium may also be present. Here again a high pH operation is desirable. This element might be a problem at a neutral pH in a submerged combustion operation.

The effect of this system on tritiated water will be essentially zero. It will go out the vent (whatever portion remains uncondensed), follow the route of the condensate, or remain in the water which wets the sludge. The sludge can be buried, but this small fraction is all the tritium that the system will dispose of.

3. Flame-Out

A single instrument to detect flame-out is provided. Collection of combustible mixtures and a possible explosion in the equipment is a possibility. It is conceivable that flame-out and a single instrument could fail at the same time. A backup instrument system completely independent of the indicated flame-out detector should be provided.

4. Sludges and Spills

The 10,000 gallon storage tank (TK 1) apparently has no way to remove settled sludges. Also no mention is made in the design for cleaning up spills where barrels are filled, filters dumped, etc. Such spills occur and provision should be made for cleanup at the time of a spill rather than at a later time after several spills may have occurred. In particular, a dry, dusty operation should be avoided.

Came from Chatwoods Branch