



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

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October 9, 1979

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MEMORANDUM FOR: Chairman Hendrie  
Commissioner Gilinsky  
Commissioner Kennedy  
Commissioner Bradford  
Commissioner Ahearne

FROM: Bernard J. Snyder, Acting Director, OPE *BJS*

SUBJECT: OPERATION OF THE EPICOR-II SYSTEM AT TMI-2

The purpose of this memorandum is to provide views on the operation of the EPICOR-II System for processing approximately 400,000 gallons of contaminated water collected in auxiliary building tanks. This memorandum covers three technical and policy aspects: process adequacy, solidification of resins, and suggested questions for the staff along with the most significant public comments. I understand that OGC is providing a separate memorandum regarding the litigative aspects.

Recommendation

I recommend that the Commission approve operation of the EPICOR-II system as soon as the dewatering process for radioactive resins is demonstrated to meet the criteria of no free-standing water and subject to other conditions discussed below. I recommend that a minimum time period for beginning solidification of resins now be established by the staff with Commission concurrence, and subsequent shipments be made after that time only if resins are solidified. I suggest that you may want to obtain the staff's response to the questions and comments in Section III of this memorandum as part of your decision process.

Discussion

1. Adequacy of the EPICOR-II System

The basic goal of decontaminating the collected water is to fix the radioactive fission products in a less mobile form and reduce the risk of exposure for the public and on-site workers. Processing of radioactive water by the use of ion-exchange resin bed demineralizers, such as EPICOR-II, is a well-established practice. From the operation of the earliest water cooled reactors to the present, both central station power plants and Naval propulsion reactor plants have used resin bed demineralizers. The performance of such systems is predictable and the process can be considered reliable and effective.

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The only viable alternative\* to demineralization is to utilize an evaporative process. This alternative and some of its disadvantages were briefly discussed in the staff's Environmental Assessment (Section 6.0). However, the staff did not discuss a number of disadvantages that would result if an evaporator was used. An evaporative process would produce a very high activity sludge as the "bottoms" of the evaporator. Probably these bottoms would have a much higher specific activity than the hottest EPICOR-II resins. A frequently encountered problem is that evaporator bottoms containing chemical residues which are difficult to solidify. Considering both the higher specific activity and difficulty of solidification, a much higher man-rem exposure would probably result if an evaporator were used instead of EPICOR-II.

On balance, the EPICOR-II system, if properly operated, would be the best approach. The major, but I believe manageable, concern is the handling of radioactive resins. Remote handling is required, with dose rates expected to range from 1000 rem/hr. for the prefilter/demineral down to 3 rem/hr. for the post-filter. Since 50 change-outs of demineralizers are anticipated to be required to process this water, the possibility is fairly high that leakage could occur from improper connections. If leakage were to occur it would be in areas outside the shield walls which require manned access to make and break the quick-disconnect fittings. Clean-up of any spill could be a significant occupational dose contribution. For this reason, I suggest that the Commission require that a hydrostatic test of the system (with clean water) be conducted after each demineralizer unit replacement, before introducing further contaminated water for processing. Furthermore, the licensee should be required to process the lowest activity water first. (Some additional points are covered in the suggested questions, Section III of this memorandum).

## II. Solidification of EPICOR-II Resins

As discussed at the last Commission briefing, the question of solidification of the EPICOR-II resins has not been fully resolved. Prior to generating any radioactive resin, I believe resolution should be reached. In making a decision for TMI-2, it should be recognized that the hottest EPICOR-II resins will have a specific activity of about 10 curies/ft<sup>3</sup> (mostly Cs-137). This specific activity is roughly 5 to 10 times higher than the hottest resins encountered in normal operation of a nuclear power plant.

\*Leaving the water in the tanks at TMI indefinitely would not satisfy what I believe to be the basic goal of reducing the mobility of the radioactive contaminants, considering the 30 year half-life of Cs-137.



Although some reactor licensees have solidified resins in the past, there is currently no NRC requirement for solidification.\* Based on a staff survey, less than one-fourth of the currently operating reactors have solidified resins in the past. Of these, most have used UF (ureaformaldehyde) or cement solidification processes. The UF process has been the source of recent problems at the low level waste burial grounds (i.e., leakage resulting from incomplete solidification). Generally, it appears that cement systems have been more satisfactory. However, since some problems have been experienced with both types of systems, whether portable or permanent on-site, any solidification process proposed by Met. Ed. will require detailed review by NRC staff.

As presently designed, the EPICOR-II system does not have capability for solidification within the resin liners. Without changing the design of the liners, resins would have to be flushed out and processed through an add-on solidification system. This is not an insurmountable problem. However, some increased radiation exposure to workers would result with additional processing of the resins. Trade offs among the options of: solidification in an add-on system; solidification within redesigned resin liners; or dewatering resins within the liners appear to be necessary.

Requirements placed on the licensees of the three operating commercial disposal sites presently specify no free-standing liquids in low-level waste accepted for burial. In order to meet stricter enforcement of this requirement, tests are being conducted by Met. Ed. to ensure that the no free-standing water criteria can be met. Earlier tests involving a simple suction pumping technique yielded about a gallon of water when the bottom of a "dewatered" liner was punctured. Since this procedure did not result in an acceptable product, improved techniques including warm air drying are being tested. In addition, there is concern that an initially dewatered resin may yield further water after transportation. You should obtain from the staff the latest results from testing of the dewatering process before approving operation of EPICOR-II. Assuming improved dewatering techniques are successful in meeting the no free-standing water criteria, test results should be made available to the waste burial facility licensees, the appropriate states, and the public. Prior to any off-site shipment of EPICOR-II resins, the best possible dewatering process should be used (after conclusive demonstration with non-radioactive resins). In order to reduce exposures and possible risks due to accidents, handling of resin liners should be minimized at the TMI site.

\*Although NRR established a Branch Technical Position in 1975 that solidification of resins should be required, this has not yet been implemented.

The question of solidifying EPICOR-II resins before shipment has been considered by the NRR and NMSS staffs. As you were told at the last briefing, there is some disagreement between NRR and NMSS, but this disagreement appears to have been narrowed down only to the issue of when a fully operational solidification system can be available at the site. Based on the attached memorandum from William Dircks to Harold Denton, dated October 3, and further discussions with the staff, I understand that both agree that until a satisfactory solidification system is operating, dewatered resins should be shipped to burial sites. Although not explicitly stated in the attached memorandum, presumably these resins would have to meet the no free-standing water criteria. I suggest you obtain confirmation of this from the staff, in order to ensure meeting the requirements where LLW is buried. I also understand that NRR will provide you with their best estimate as to how soon a satisfactory solidification system can be available at TMI. Both NRR and NMSS apparently agree that solidification should be carried out as soon as possible, and that no long-term storage of resin liners should be considered at the TMI site.

Under the present circumstances, the best course appears to be to proceed with EPICOR-II processing and off-site shipment of resins as soon as the dewatering process is demonstrated to meet the no free-standing water criteria. A minimum time period for beginning solidification should be established now by the staff, with Commission concurrence and subsequent shipments should be made after that time only if they are solidified.

III. Suggested Questions for the Staff (including major issues raised in public comments)

The following are some questions which were identified in OPE's review which you may wish to address to the staff:

1. If there was any leakage along the transfer pipe between the Auxiliary Building and the EPICOR-II building how would it be detected and what corrective actions would be taken? Does the guard pipe surrounding the transfer pipe (which would contain any leakage) slope toward the EPICOR-II building sump for gravity drainage?

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