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February 19, 1981
LLC-81-0040

TMI Program Office
Attn: Dr. Bernard J. Snyder
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Revision of Orders re Solidification of EPICOR-II Resins

Based on the Commission's Order and Memorandum of October 16, 1979, the Director, Office of Nuclear Reactor Regulation, issued on October 18, 1979, to Metropolitan Edison Company an Order for Modification of License for Three Mile Island Unit 2. As part of this Order under subpart (iv), it was ordered that:

"The licensee shall not ship resins offsite unless they have been solidified. . . ." and "The licensee shall expeditiously construct a facility for solidification of the spent resins. . . ."

Subsequent to that order, the NRC staff in a letter of January 29, 1980 notified all power reactor licensees that effective July 1, 1981, ". . . spent resins and filter media with radioactivity levels above 1 μ Ci/cc of isotopes must be stabilized by solidification." However, that letter also provided that "in lieu of solidification, other methods such as packaging dewatered resins in a high integrity container (e.g., reinforced concrete) may be proposed to the NRC and the states licensing the burial sites." For the higher level EPICOR-II liners, the NRC and DOE staffs have suggested evaluation of such high integrity containers as well as other alternatives such as the possibility of vitrification. On January 12, 1981, Chairman Ahearne wrote Mr. Dieckamp and said, in part:

". . . there should be no further delay in the development either of definitive plans to solidify the EPICOR-II spent resins or of proposals for alternative plans to stabilize these wastes. This could include a request to be relieved of the requirement for solidification."

The purpose of this letter is to set forth our plans for the EPICOR-II liners, and to request revision of the requirement to solidify the EPICOR-II resins in conjunction with those plans.

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Specifically, it is requested that paragraph 3 on page 14 of the Commission's Order of October 16, 1979 and paragraph (iv) on page 3 of Order for Modification of License of October 18, 1979 be deleted from these Orders and that, in their place, the following be substituted:

"The licensee shall ship spent ion exchange media offsite only in such physical form and in such containers as are in compliance with applicable regulations and the requirements of the receiving organization."

Also, it is requested that, while the change to the Orders requested above is under consideration, the licensee be given immediate permission to ship up to 25 liners containing dewatered spent resin which meet current burial site requirements, but are not solidified. None of these liners contain in excess of 160 curies (excluding daughter radionuclides) of radioactivity (which, as discussed subsequently, is well within activity levels of dewatered resins routinely shipped by other licensees.)

On January 15, 1981, via our LL2-81-0005, we submitted to the NRC staff our schedule for disposal of EPICOR-II liners. This schedule identified our proposed actions within the constraints concerning solidification of the above-referenced Orders. As noted in that schedule, there are significant decision points reflecting uncertainties or the assumption of satisfactory information resulting from preceding activities. In view of these many uncertainties, coupled with the identification of possibly available alternatives since the issuance of the Orders, we propose to follow a plan for disposal of the EPICOR-II liners which would take advantage, as appropriate, of these alternatives. However, to do so requires modification of the October, 1979 Orders.

There are four significant reasons which we believe justify modification of the Orders:

- o To solidify the resins could rule out alternative options which may ultimately be selected by NRC and the receiving organization as the preferable (or required) form for safe disposal.
- o We believe that the operation of a solidification facility would inherently subject employees to radiation exposure which would likely be greater than from other alternatives. This would be contrary to the principle of ALARA.
- o The degree of confinement provided the spent ion exchange media in storage at TMI-2 is adequate to protect the health and safety of the public, making expeditious solidification unnecessary.
- o Up to 25 lower-activity liners could be shipped in the immediate future to a shallow burial site, dewatered (not solidified) in accord with current NRC and burial site requirements in the same manner as other licensees are permitted. This would be in accord-

ance with the sentiments of the Advisory Panel for the Decontamination of Three Mile Island Unit 2 as expressed at their February 11, 1981 meeting.

Work done toward solidifying resins

In order to comply with the Commission's direction to effect EPICOR-II solidification capability expeditiously, and to ensure that the solidification facilities and systems installed would be workable and safe, we considered it essential that such facilities and systems be patterned as closely as possible to existing, demonstrated technology. Our survey of binders that could potentially be used to immobilize the EPICOR-II resins revealed that cement was the only binder that then appeared to be adaptable to a solidification system that could reasonably be expected to be in operation in an appropriate time frame. Further, cement was currently being used as a binder for organic resins in some U. S. nuclear power plants, although the experience was confined to a few plants, since almost all plants still ship resins for burial in the "dewatered" state without further immobilization.

Therefore our efforts have been concentrated on trying to develop a satisfactory system for immobilizing the EPICOR-II resins with cement.

When the Orders directing us to solidify the resins were issued, it was the consensus that solidification in concrete was a well-understood and mature technology. However, we soon became aware that the task would be much more difficult than originally expected. Mr. Dieckamp notified Chairman Ahearne in a March 4, 1980 letter that: "Some technical difficulties and uncertainties exist."

Subsequent to that letter, we kept the NRC apprised of our efforts to put a solidification capability into place. The numerous exchanges of information between the NRC and ourselves concerning the problems we have encountered in attempting to comply with the October, 1979 Orders to solidify EPICOR-II resins before shipment are tabulated in Exhibit A and summarized in the following paragraphs.

Work done four years ago by the Hanford Engineering Development Laboratory for the Department of Energy showed that some combinations of cement, water, and resins could lead to failure of the cement due to subsequent swelling of the resins. Further, discussions with Brookhaven National Laboratory personnel led us to the conclusion that other problems could develop depending on specific chemical and physical parameters. Therefore, it became clear that an extensive test program was required to qualify cement as a binder for the specific resins used in the EPICOR-II system. We contracted with the Hittman Nuclear Development Corporation in conjunction with EPICOR to conduct these tests. The purpose of the tests was to establish the range of parameters (for example, water, cement, and resin fractions) which would result in a monolithic structure. Arrangements were made for representatives of NRC and the Brookhaven National Laboratory (BNL) to observe the testing. The test program is now complete and a report of the results is in preparation.

As a consequence of the above test program, we concluded that we then had an adequate technical basis to proceed with the qualification of a specific process to solidify at least the lower activity level resins. There are 25 liners in this category, each of which contain about 0.7 to less than 160 curies (excluding daughter radionuclides). Accordingly, we prepared detailed specifications for a temporary cement solidification system for these low-activity resins. These were transmitted to likely bidders and we received last month a number of proposals to provide the service according to the specifications. These bids are now being evaluated for acceptability.

Should we determine that one or more of the vendor proposals for solidification of the 25 liners with relatively low level activity is acceptable, additional full scale demonstration and qualification testing would still be required.

If the present requirement to solidify the EPICOR-II resins remains in force, the radioactive resins will have to be transferred from their containers by converting them to a slurry and mixing them with cement in other containers designed for that purpose. Higher level liners would require construction of a major facility expressly designed for remote handling of the higher activity resins. Sluicing and processing of these resins would involve substantial radiation dose to workers and possibility of on-site leaks or spills.

Alternatives to Solidification

As you know, the Department of Energy is, on a best-efforts basis, in the process of developing designs for high integrity burial containers for resins as an alternative to solidification. Also, several industrial concerns are developing high integrity containers to meet burial ground requirements and draft criteria prepared by the NRC staff. We are following the progress of the DOE work as well as the parallel work going on in the several industrial development programs.

There are 47 EPICOR-II liners with activity levels (excluding daughter radionuclides) ranging from 470 to 1300 curies. From work done to date, it appears to us that it should be practicable to develop a suitable high integrity container acceptable to the NRC and a burial facility which could be used for these liners in lieu of solidification. This alternative should reduce the employee exposure to radiation involved in handling the liners, since the need to sluice and process the resins would be eliminated. Further, the elimination of sluicing and processing would reduce the possibility of accidental spills of resins.

The ultimate form of the EPICOR-II resins will depend on mutual agreement of the NRC and the receiving organization. For example, we note that the DOE, in response to a request from the NRC staff, is considering various additional alternatives including the possibility of vitrification of the higher level EPICOR-II resins. Until such time as a receiving organization is identified and the requirements are established as to an acceptable container or physical

form for disposing of these resins, we consider it would be a mistake to preclude any alternative by solidifying the resins.

We propose that planning for disposal of the 47 higher activity EPICOR-II liners be based at this time on future use of a high integrity container in lieu of solidification, while preserving the option to utilize another alternative such as vitrification should that ultimately prove to be the better course. These plans will not preclude solidification by other media if that course of action turns out to be the optimum approach.

Lack of need for expeditious solidification

There does not now appear to be a need for urgency to solidify the spent EPICOR-II resins to protect the health and safety of the public. The resins are packaged in heavy carbon steel liners. A second barrier against release is provided by the massive reinforced concrete structure in which they are housed. This structure is provided with drains leading to a monitored sump which provides positive containment of any leakage. While some very low levels of contamination (below 10 CFR Part 20 limits for release to unrestricted areas) have been found, we have not been able to ascribe this to liner leakage. (Details of this are contained in our LL2-81-0020 of February 2, 1981).

Even so, we have prepared a very conservative (assuming corrosion rates we believe to be higher than will be found) metallurgical evaluation which showed the possibility of early pin-hole leakage from eight of the liners (as reported in our TLL 634 of December 4, 1980). We plan to add to these eight liners a third barrier to release of their contents in the form of stainless steel pans under them to catch and hold leakage, if any.

Prompt shipment of remaining 25 liners

Although we are now evaluating bids for installation and operation of a temporary solidification system for the remaining 25 EPICOR-II liners which contain from about 0.7 to less than 160 curies (excluding daughter radio-nuclides) per liner, we believe it is desirable and appropriate to proceed with shipment of these liners now. Operators of shallow land burial sites often receive shipments of dewatered resins with much higher activity levels than these 25 liners. For example, Exhibit B is a listing of dewatered resins over 100 curies transported by one company in 1979. As can be seen, total contents of large containers were as high as 895 curies. Specific activities were as high as 17.86 curies per cubic foot, which compares to less than 6 curies per cubic foot contained in these 25 EPICOR-II liners. Therefore, we request that we be permitted to ship these 25 liners dewatered in accord with current requirements for other reactor licensees.

We think this request is consistent with the desires of the majority of those concerned about the on-going efforts to clean up TMI-2. In this regard, we note that sentiments expressed by many of the Citizen's Advisory Panel for Decontamination of Three Mile Island Unit 2 on February 11, 1981 favored NRC

waiver of the requirement for solidification of low level EPICOR-II liners to facilitate prompt shipment to a burial site provided that the liners are shipped in accordance with the applicable regulations. An essential element of that sentiment seemed to be that such action would reassure the public that the NRC was doing everything they could to avoid long term storage of the waste at the site.

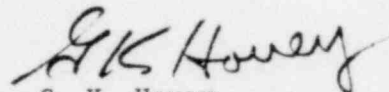
In hope that the NRC will act favorably and promptly on this request, we are investigating the availability of casks to make shipment at the earliest possible time. After July 1, 1981, or as required of other licensees, we would expect the high integrity container option for shipping and disposal to be preferred in lieu of solidification.

Conclusion

Taking into consideration the events which have transpired since the Commission's Order of October 16, 1979, it appears to us that the Commission's objective would be better served by modifying the requirement to solidify the EPICOR-II resins, thereby permitting efforts to be concentrated on development of alternatives which appear to be preferable. In order to achieve the earliest safe removal of waste from the island, we emphasize the need for expeditious action on our request to ship up to 25 liners each with less than 160 curies (excluding daughter radionuclides) in the dewatered state without solidification.

If you would like to discuss any aspect of the above, please call me.

Sincerely,



G. K. Hovey
Vice-President and
Director, TMI-2

GKH:RIN:djb

Enclosures

cc: L. Barrett, Deputy Program Director

EPICOR-II Liner Solidification
Communications Between Met. Ed and NRC

| <u>Date</u> | <u>Type</u> | <u>Organization</u> | <u>Parties</u> | <u>Letter No.</u> | <u>Subject</u> |
|-------------|-------------|---------------------|--|-------------------|--|
| 03/04/80 | letter | GPU/NRC | Dieckamp to Ahearne | NA | Difficulties in solidification & reconsider decision solidify prior to shipment. |
| 03/27/80 | meeting | NRC/GPU | | | Solidification policy. |
| 04/11/80 | meeting | GPU/NRC BNL | | | TMI waste processing and disposal plans |
| 05/05/80 | letter | BNL/NRC | | | Status report on leachability of cement solidification |
| 05/28/80 | letter | GPU/NRC | Hovey to Collins | TLL-252 | EPICOR-II Solidification test program |
| 06/05/80 | letter | GPU/NRC | Hovey to Collins | TLL-241 | EPICOR-II Solidification Status |
| 06/22/80 | meeting | GPU/NRC BNL | | | Meeting at HNDC re screening tests |
| 08/13/80 | meeting | GPU/NRC | Negin, Wadsworth, Browning, Lowenberg | | EPICOR-II liner shipping |
| 08/20/80 | meeting | NRC/GPU | | | Solidification status & problems |
| 09/15/80 | letter | BNL/NRC | Davis to Browning | | Report on immersion tests |
| 09/29/80 | letter | GPU/NRC | Hovey to Browning | TMI-II- R-4806 | Amend meeting report |
| 10/03/80 | letter | GPU/NRC | Hovey Collins | TLL-502 | Response to NRC commitments RE EPICOR II solidification |
| 10/06/80 | letter | GPU/NRC | Hovey to Collins | TLL-503 | Transmit logic decision diagram re EPICOR-II |
| 10/13/80 | meeting | BNL/GPU | | | Re: Resin solidification report/ radiation damage |
| 11/12/80 | test | GPU/NRC | | | At Hittman--full scale solidification test |
| 11/17/80 | letter | GPU/NRC | Hovey to Collins | TLL-545 | Forwarded copies of specifications for solidification bids |
| 11/21/80 | letter | GPU/NRC | Hovey to Collins | TLL-604 | Disposal of EPICOR-II Low Activity Ion Exchange Media |
| 12/18/80 | meeting | GPU/NRC | | | Schedule discussion for decision logic diagram |

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| <u>Date</u> | <u>Type</u> | <u>Organi- zation</u> | <u>Parties</u> | <u>Letter No.</u> | <u>Subject</u> |
|-------------|-------------|---------------------------|---------------------|-------------------|---|
| 12/18/80 | meeting | GPU/NRC et/al. | | | Bidders meeting--EPICOR-II Solidification |
| 12/19/80 | letter | GPU/NRC | Hovey to Barrett | TLL-683 | Resin Solidification Requirements |
| 01/13/80 | meeting | GPU/NRC | | | Schedule and logic for EPICOR-II solidification |
| 01/15/80 | letter | GPU/NRC | Hovey to Barrett | IL2-81- 0005 | Transmit schedule per 12/18/80 meeting |
| 01/21/80 | meeting | GPU/NRC BNL | | | At Hittman--review test program |
| | | | | + | GPU weekly status reports during August to December 1980-- Copies to NRC. |

One Contractor's Shipment of Dewatered Resins Greater than 100 Curies
 Calendar Year - 1979

| <u>Dates</u> | <u>Container</u> | <u>Volume</u> <u>(CF)</u> | <u>Activity</u> <u>(Curies)</u> | <u>Specific Activity</u> | |
|--------------|------------------|------------------------------|------------------------------------|--------------------------|-------------------|
| | | | | <u>Ci per CF</u> | <u>µCi per ml</u> |
| 10/15 | Liner | 70 | 580 | 8.28 | 293 |
| 09/07 | Drums | 21 | 333 | 15.86 | 560 |
| 09/10 | " | " | 172 | 8.19 | 289 |
| 09/12 | " | " | 260 | 12.38 | 437 |
| 09/14 | " | " | 309 | 14.67 | 518 |
| 11/03 | " | " | 375 | 17.86 | 631 |
| 11/06 | " | " | 304 | 14.48 | 511 |
| 11/08 | " | " | 226 | 10.76 | 380 |
| 11/10 | " | " | 226 | 10.76 | 380 |
| 11/13 | " | " | 375 | 17.85 | 631 |
| 11/15 | " | " | 311 | 14.81 | 523 |
| 06/06 | Liner | 75 | 127 | 1.69 | 60 |
| 01/12 | Liner | 70 | 166 | 2.37 | 84 |
| 08/23 | " | " | 129 | 1.84 | 65 |
| 05/16 | Liner | 80 | 895 | 12.79 | 451 |
| 06/14 | " | 70 | 727 | 10.39 | 367 |
| 10/26 | Liner | 63 | 146 | 2.32 | 82 |