Met-Ed / GPU

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March 23, 1981
LL2-81-0078

TMI Program Office
Attn: Lake Barrett, Deputy Director
U.S. Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, Pennsylvania 17057

RECEIVED MAR 27 1981 U.S. NUCLEAR REGULATORY COMMISSION

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Submerged Demineralizer System

This letter provides our response to your letter NRC/TMI-80-145, dated November 7, 1980, and supplements our previous response TLL632, dated December 4, 1980.

In our previous letter, we transmitted current SDS drawings to you in response to your request #1. This letter provides our response to the remainder of your comments and requests for additional information.

Additionally, we have provided a copy of our recent Technical Evaluation Report for SDS. This was submitted to you on March 11, 1981 under cover of our letter LL2-81-0070.

In our opinion, the submittal of this letter and our TER for SDS provides adequate information to enable your prompt review of this proposed processing scenario. Your expeditious approval of this request to process containment sump water and RCS water with SDS, polished by EPICOR-II, is requested.

Sincerely,

G. K. Hovey

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

GKH:lh

cc: Bernard J. Snyder, Program Director - TMI Office

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U.S. NUCLEAR REGULATORY COMMISSION

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Comment #1

Letter TLL 283 provided a list of piping and instrument drawings and general arrangement drawings. An up-to-date listing of these drawings are requested along with the latest revision of the drawing if the drawing has a later revision date than the one provided in TLL 283. Most of the drawings provided were "Issued for Approval". "Approved for Fabrication" drawings should now be available and we request that these drawings be provided.

Response

We have provided up-to-date drawings as requested by you under cover of our letter TLL 632 dated December 4, 1980.

Comment #2

Conflicting data is available concerning the estimated amount of water to be processed, the estimated activity in the water, the total activity to be retained in each bed and the total number of each type of bed required. For example: . . .

Some of the discrepancies are undoubtedly due to changing conditions and better information obtained at later dates. However, the effect of this variation in data is that the authors of the documents have come to differing conclusions concerning the amount of activity contained in each bed and total beds required. An up to date estimate of the activity to be retained in each bed (zeolite, cation, polisher, and any other bed proposed to be used) and the total number of columns of each type of bed is requested. Data that is used to develop this estimate should be clearly stated and justified, including bed size, throughput and techniques to be used to determine bed loading where throughput is limited by bed loading.

Response

Two sources of contaminated water can provide input to the Submerged Demineralizer System: (1) water contained in the Reactor Coolant System and (2) water that presently is in the Reactor Containment Building Sump.

With regard to the Reactor Coolant System:

1. The RCS cold volume is approximately 11,800 cu. ft.
2. The RCS is full.
3. Water volume in the RCS is, therefore, approximately 88,000 gallons.

4. RCS sample results, for a sample taken in February, 1981, are given in Table 1.1 of our revised TER.

Those results are given below:

ANALYSIS PERFORMED	ANALYSIS RESULTS	TOTAL RADIOACTIVITY
pH	\7.6	N/A
Boron	3800 ppm	N/A
Sodium	1240 ppm	N/A
H-3	0.066 uCi/ml	22 Ci
Cs-134	3.4 uCi/ml	1132 Ci
Cs-137	25 uCi/ml	8347 Ci
Sr-89	0.25 uCi/ml	83.27 Ci
Sr-90	23 uCi/ml	7661 Ci
Sb-125	1.6×10^{-3} uCi/ml	0.53 Ci

With regard to the containment sump:

1. The volume of water in the containment sump is given in Table 1.1 of our TER.
2. As specified in the TER, the containment sump water volume is increasing at the rate of approximately 150 gallons/day. This volume increase tends to provide for slight dilution of the sump water radionuclide concentration, except for Sr-90. This slight dilution, however, is not significant.
3. The containment sump water radionuclide concentrations given in Table 1.1 are from sample results taken in August, 1979. The results presented

have been adjusted for decay to October, 1980. These results are tabulated below:

ANALYSIS PERFORMED	ANALYSIS RESULTS (Decayed to 10-80)	TOTAL RADIOACTIVITY (based on 625,000 gal.)
H-3	0.97 uCi/ml	2295 Ci
Sr-89	0.018 uCi/ml	42.6 Ci
Sr-90	2.64 uCi/ml	6245 Ci
Sb-125	9.1×10^{-3} uCi/ml	21.5 Ci
Cs-134	27.2 uCi/ml	64,345 Ci
Cs-137	172 uCi/ml	406,890 Ci

As specified in our TER, our plans are to use a process flow stream as depicted in Figure 1.1. Utilization of this flow stream will permit effective removal of the radionuclides. Specifically, EPICOR-II expected effluents from processing containment sump water (that source of water with the higher radionuclide concentrations) is given in Table 3.1 of the TER. Furthermore, Table 3.1 provides the expected effluent concentrations from each bed while processing sump water and is based on information presented in ORNL/TM-7448. The table does not depict the use of a strontium-specific media in the cation exchanger.

Comment #3

The system design objectives in the TER include reducing concentrations in the processed water to levels that meet existing regulatory requirements for release to the environment. The preliminary projected stream analysis for intermediate streams and product water provided in TLL 283 showed that the proposed system will not meet its design objectives. ORNL/TM-7448 indicates even more pessimistic projections in Table 17 and provides proposed modifications to improved system performance even though these modifications will not be enough to meet the system design objective. In view of the above, indicate your plans to improve system performance. Any proposal which does not meet the system design objectives should be thoroughly justified.

Response

The overall objective of decontaminating water at TMI-2 involves the utilization or radwaste processing systems best suited for that purpose. As identified, both TLL-283 and ORNL/TM-7448 indicate that the SDS should be enhanced for effective decontamination of specific radioisotopes and their related species. We have enhanced SDS to include EPICOR-II polishing of SDS effluent. It is expected that this type of system enhancement will be an ongoing work effort. Furthermore, as more is learned about the reactor building sump water, its contaminants and the materials selected to remove the contaminants. To this end, a program is in progress designed to optimize the resin selection so as to remove various contaminants from the water as these contaminants are identified. However, it is incorrect to assume that the overall objective of water decontamination cannot be accomplished. The EPICOR II Radwaste System has demonstrated the ability to decontaminate the various radioisotopes and their species. Although EPICOR II has not processed reactor building sump water, a careful review of the EPICOR II experience indicates direct comparison of DF capability for antimony, ruthenium, niobium and the cesium and strontium species labeled as being "recalcitrant."

Therefore, EPICOR II is planned to be operated in series with the SDS. Following passage through the SDS, the water will be pumped through the EPICOR II system for final polishing. The present demand on EPICOR II is very slight. It is expected water collected in the auxiliary building will be stored until an SDS outage occurs or the requirement to process auxiliary building water approaches due to a decrease in the available storage capacity.

Table 3.1 of our TER provides the expected performance of this combined SDS/ EPICOR II system operation. It should be noted the expected SDS operational capability is based on data from Table 17 of ORNL/TM-7448 report. The Met Ed TLL-283 submittal was taken from preliminary Oak Ridge National Laboratory (ORNL) results and, therefore, the final ORNL report is considered the preferred reference. The operation of EPICOR-II is not detailed herein as this information has previously been supplied the NRC. With this combination, the objective of water decontamination will be achieved.

The SDS is undergoing optimization and will continue to be optimized even after system startup. It is the objective of this program to make SDS fully independent of EPICOR II while achieving necessary system DF.

Comment #4

The TER, TLL-283 [in response to question 2(a)], and ORNL/TM-7448 do not all agree in the expected system DF's, in some cases differing by a factor of 100. An updated process flow diagram of the same format as Table 4 in the response to question 2(a) in TLL-283 is requested along with justification of values used.

Response

Our letter, TLL-283, was based on preliminary information received from ORNL. ORNL/TM-7448 is the final report and should be considered the reference document. An updated process flow diagram is incorporated in our TER, Table 3.1. This updated flow diagram incorporates the final values as depicted in ORNL/ TM-7448.

Comment #5

The TER indicates that filtration is necessary to achieve designed decontamioation factors. ORNL/TM-7448 states that because of flocculent in the containment sump water, the filters proposed for SDS might be inadequate. Provide plans to ensure adequate filtering of the process water and the expected radioactivity loading of the prefilter and the final filter based on this updated information. Based on this loading provide an estimate of the total number of prefilters and final filters needed to process the water.

Response

The SDS TER, Sections 3.1 and 5.1.1 discuss the requirement to provide for SDS influent water filtration. As stated in the TER, the prefilter will provide filtration for particles of 125 micron (nominal) size and the final filter will remove particles down to 10 microns (nominal). This filtration scheme is deemed to be adequate to perform its intended function: provide hydraulic protection to avoid plugging the zeolite beds.

In our response to your original comments (NRC/TMI-80-89, dated May 16, 1980) we provided estimates of filter radioactivity loadings. These estimates were based on the use of the WG-P-1 pump with flow through the decay heat drop line. If this flowpath is used, these estimates remain valid. However, if containment sump water is removed using the surface suction scheme, fewer solids will be deposited in the filters because of a lower concentration of solids in the influent to the filter. The same amount of solids would remain ultimately to be disposed of from the sump, of course, if the surface suction scheme is used. It is believed that once the bulk of the water is removed from the containment building sump, the problem of handling such residual solids will be eased considerably.

Comment #6

TLL-283 (in the response to question 3) provided the radioactivity loading of the cation bed and the polishing unit for 15,000 gallons of water. Is the throughput of these columns to be limited to 15,000 gallons? If not, what is the criteria to be used for replacement of these columns? Include in the discussion the ORNL/TM-7448 finding that "very little decontamination, if any, will be obtained in either the organic resin column or in the polishing columns" and the TER statement that "the remaining strontium (after the zeolite beds) is effectively removed by the organic cation resin."

Response

Recognizing that the organic cation bed and the originally proposed polishing unit were not effective to accomplish their intended objectives, we have revised our processing plans. In particular, the processing plan revision was made in part, as a response to poor performance of these beds, as reported in the final report, ORNL/TM-7448.

As indicated in our TER, we plan to load the cation bed with a strontium-specific cationic exchange media. This media is expected to be selected in the near future. At that time we will advise the NRC of our criteria for replacement of the cation bed. Furthermore, we have eliminated the previously proposed polishing unit, based on the information provided in ORNL/TM-7448. Our revised plan identifies that we plan to use EPICOR-II as the polishing unit for SDS effluents for removal of recalcitrant species and residual radionucludes. Table 3.1 of the TER (which is based on results as presented in ORNL/TM-7448) provides information to enable your evaluation of expected system performance. Furthermore, our planned process flow stream is depicted in Figure 1.1 of the TER.

Comment #7

TLL-283 (in the response to question 6) indicated that the processing method for decontamination of the RCS water would be similar to the method planned for the containment sump water. ORNL/TM-7448 gave another recommendation concerning how to process the water in the RCS. In view of this recommendation, provide your plan for processing RCS water.

Response

RCS processing is planned to proceed by letting down to a Reactor Coolant Bleed Tank at a relatively low flowrate of 5-10 gpm. During the process of letting down, makeup will be provided at the same rate to maintain a constant inventory in the RCS. The makeup water would be of reactor coolant quality, appropriately borated to meet the required boron concentration as specified in the TMI-2 Recovery Technical Specifications. Processed water is the intended source of makeup water.

Our SDS TER includes RCS processing via SDS. We have previously requested that approval be granted to process RCS water via EPICOR-II since the present contamination levels of the RCS are within the range of radioactive influents for which EPICOR-II has been licensed to operate (1-100 uCi/ml).

On March 13, 1981 members of the GPU technical staff provided a presentation to NRC personnel concerning RCS processing plans utilizing EPICOR-II exclusively. Essentially, the mechanism of letdown from and makeup to the RCS remains the same irrespective of the processing system, SDS followed by EPICOR-II or EPICOR-II alone. As indicated to the NRC Staff, the option of processing the RCS using EPICOR-II would be utilized only if the SDS were unavailable for some reason for an extended period.

Comment #8

By mid-1981, burial grounds will require such wastes as the polishing unit resin to be solidified prior to disposal. Provide plans for meeting this projected requirement for the polishing unit resin.

Response

The polishing unit has been deleted from the SDS processing scheme.

Comment #9

Provide an accident analysis of dropping a cask containing a loaded zeolite resin liner from the maximum height of crane travel onto (a) the 305' level of the fuel handling building and (b) the SPC system and its supporting components (eg. N_2 system). Include in the response a summary of the health and environmental effects on the public and on operators in the area and the effect on the reactor coolant system.

Response

Section 7.5 of the SDS TER provides the summary requested concerning the drop of a shipping cask containing a loaded zeolite resin liner onto the 305' elevation.

The analysis of the cask drop showed the following:

1. The effect on plant operators and off-site is given in Section 7.5 and shows that the public health and safety are not comprised.
2. A detailed study of cask drops from the maximum height to el 305' between the TMI-1 and TMI-2 Fuel Handling buildings shows that by routing the lifted cask through the safety zones specified in the TMI-1 FSAR, no damage which could prevent safe Reactor shutdown/cooling will occur.
3. The cask drop onto the SPC system will not result in failure to maintain continuous R.C. pressure. Existing plant emergency procedures ensure maintainence of continuous R.C. pressure.
4. The cask drop on to the N_2 support system could conceivably result in the creation of missle hazard if the cask is dropped in a manner that causes the end of one of the N_2 bottles to be sheared off. The hazard is being studied further. The results of the analysis will be forwarded when available; the approximate date will be June 1, 1981.

Comment #10

Provide an accident analysis of lifting a loaded zeolite resin liner above the pool surface.

Response

Section 7.4 of the SDS TER provides this analysis. It should be noted, however, that this hypothetical occurrence is considered to be extremely unlikely. The lifting tool for the zeolite vessels has been designed such that, under normal circumstances, a zeolite vessel could be lifted no higher than about 8' below the surface of the water.