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July 26, 1983
4410-83-L-0115

TMI Program Office
Attn: Mr. L. H. Barrett
Deputy Program Director
US Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, PA 17057-0191

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Reactor Building Basement Reflood

The purpose of this letter is to discuss further GPUNC review of the reactor building basement reflood issue.

The attachment to this letter is a summary of the factors we have taken into account in evaluating the advisability of reflooding the reactor building basement for dose reduction purposes. We have considered the full range of options, from no reflooding (that is, continuing in the present mode of operation, permitting decon water to accumulate to a few inches prior to removal and processing) to a "full" reflood (that is, adding 9 to 10 feet of shield water in order to shield the bathtub ring located 6 to 8 feet above the reactor building basement floor). We conclude at this point that the disadvantages of a full or partial reflood far outweigh the benefits and, therefore, we intend to continue in the present mode. This conclusion does not preclude reflooding the basement for decontamination purposes, i.e. leaching of activity out of unpainted surfaces; however, a decision in this regard will not be made until GPUNC finalizes its plans for decontaminating the reactor building basement.

GPUNC letter 4410-83-L-0079 dated April 14, 1983, referred to plans to utilize a water-shielded TLD device to determine the shielding effectiveness of a partial (2 or 3 feet of water) reflood of the reactor building basement. In light of the conclusions outlined in the attachment and the relatively high man-rem expenditure which would be involved, we have decided to cancel the experiment because it will not provide significant additional data concerning reflood for dose reduction purposes.

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If you have any questions on this subject, please feel free to contact Mr. J. J. Byrne of my staff.

Sincerely,

B. K. Kanga

B. K. Kanga
Director, TMI-2

BKK/JJB/jep

Attachments

CC: Dr. B. J. Snyder, Program Director - TMI Program Office

EVALUATION OF REACTOR BUILDING REFLOOD OPTIONS

The primary incentive for basement reflood is that it would provide an additional measure of shielding of radiation sources in the basement, thus reducing exposures to personnel working on the building's upper levels. In this respect, it must be noted that:

1) Specific data regarding basement radiation sources is limited and the building geometry is complex; it is therefore, difficult to predict accurately the effect of any one dose reduction action such as placement of shielding. Based on available data on present conditions, however, the shielding value of 2 to 3 feet of water, over the basement floor, is estimated to be slight, probably 0 - 5 percent on the building's upper elevations. In fact, recent radiation data indicated that dose rates in many locations on elevation 305' increase with height above the floor which strongly suggests that the major dose contributors at these locations are from sources other than the basement.

2) It is known that the sources in the basement are widely distributed in plan and elevation. One known major source (and very likely the predominant one) is the "bathtub ring" at 6 to 8 feet above the floor. Other expected significant sources are the cable trays and piping 18 to 20 feet above the floor. Obviously, very large quantities of water would be required to provide effective water shielding of these sources.

3) Inherent shielding of basement sources is provided by the building structure (floor slabs, equipment, etc). This in-place shielding has been supplemented by placement of additional shielding (via the Dose Reduction Task Force effort) over penetrations, equipment hatch, annular gap, etc. Continued progress in this area is being made, and can be achieved without the disadvantages of basement reflood, as identified herein.

A second incentive for basement reflood is reduction and/or control of airborne contamination that otherwise could be emitted due to drying of contaminated surfaces in the basement. This is not a major consideration, since there is little traffic in the basement, airflow is minimal and generally segregated from the rest of the building, and based on a review of the data obtained to date, the presently dry surfaces in the basement do not appear to be contributing to general airborne contamination levels in the building.

In general, the disadvantages of basement reflood are considerable. They include:

1) Waste Management Implications

Because of existing high levels of radioactive contamination on basement surfaces, any water used to flood the basement will itself become contaminated and, therefore, require subsequent processing. For small amounts of water (such as the few inches in depth which routinely accumulates due to in-building decontamination work) this is not a problem.

For large quantities of water, however, (such as the million gallons of water which would be needed to shield the "bathtub ring") this contamination problem represents a severe disadvantage in that it would produce large quantities of lower activity water by remobilization and redistribution of fission product activity. The consequence of this would be extreme inefficiency and excessive (and unnecessary) processing costs.

It should be noted that this water contamination problem could be viewed as an advantage in that it might serve as a mechanism for decontamination (via leaching) of walls and other surfaces. However, the preliminary view of this is that it constitutes an inefficient way of decontaminating surfaces because:

1) the volume of water which must be added to the building to provide contact with contaminated surfaces 6 to 8 feet above the floor is very large. In past decontamination efforts, GPUNC has continually tried to minimize water used for decontamination and the very unfavorable surface-to-volume ratio, in this case, provides a major disadvantage which significantly differs from the "wet floor approach" in which a relatively small volume of water contacts a large surface.

2) the efficiency of fission product removal is uncertain for this method, particularly in the absence of pressure, temperature, or other energetic application which have been found to be important factors in effective decontamination.

Nevertheless, the option of basement reflood for decontamination purposes is an open issue which will be addressed as part of the overall 282' decontamination planning.

A second factor related to the shield water contamination problem is that, once contaminated, the shield water itself becomes a radiation source. It is difficult to predict the equilibrium cesium concentration which would be reached in a large (one million gallon) pool of shield water. Nonetheless, this source would provide a contribution to dose rates on the 305' elevation, counteracting the intended dose reduction benefit of reflood.

2) <u>Reactor Building Leakage</u>

The reactor building was neither designed nor intended to be used as a large capacity tank. Its use for long term (several years) storage of contaminated water raises serious concerns about leakage to the environs.

This is not an abstract or trivial concern. In the first two years after the accident, the presence of radioactive water in the reactor building basement was a major and visible hazard. It was the source of much public anxiety, and caused the consumption of a great deal of time and resources to establish protective actions, including:

-- groundwater monitoring system installation, and years of operation, chemical analysis, results evaluating and reporting, etc.

-- water level monitoring system installation

-- extensive contingency plans and procedures, including the operational constraint of retaining available tankage in the plant, in the event of building leakage.

Reflood, in effect, would reinstitute an extremely undesirable situation, and one which was finally eliminated in 1982 after years of substantial effort and high cost.

3) Basement Access

Reflood of the basement effectively prohibits access to the basement by people or machines. Access to the basement is important now to permit the characterization work essential to planning its stabilization and decontamination. Thereafter, access will be required to execute those planned actions. Finally, access may be required at any time, for emergency reasons.

On this point, it is important to note that reflood is, at best, an interim action which delays and does not contribute to building cleanup.

Based on the above spectrum of incentives and disadvantages, several options have been considered. These range from no reflood (i.e., current mode of operation, with decontamination water being permitted to accumulate only to a depth of a few inches prior to removal and processing) to a "full" reflood, to a depth of 9 to 10 feet. These are summarized in the attached table. Based on these evaluations, GPUNC concludes that the balance of factors weighs heavily against reflood options for purposes of dose reduction.

OPTION	ADVANTAGES	DISADVANTAGES
I. No reflood (wet floor)	-- no leakage hazard -- full access for characterization and subsequent stabilization/decon -- maximum efficiency in waste management (relative to Options II and III) -- some airborne contamination protection ,(floor only)	-- no shielding of floors, walls, components
II. Partial reflood (2 to 3 feet of water)	-- effective shielding of floor, and low components (or portions) -- some airborne contamination protection (slightly better than Option I)	-- substantial waste management inefficiency (150 to 250 thousand gallons) -- some leakage hazard (water level in building above groundwater level) -- minimal shielding benefit on 305' and 347' elevations -- restricted access to basement
III. Full reflood (9 to 10 feet of water)	-- most effective shielding relative to Options I and II (estimated at 0 - 20 percent reduction on 305') -- additional increment of airborne control compared to Options I and II (However, a large fraction of contaminated surfaces in basement overheads would remain dry)	-- major leakage hazard (with attendant public anxiety and demands on program resources for leakage monitoring/protection) -- major waste management cost; inefficiency -- basement access prohibited -- no shielding benefit on 347' elevation