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Docket No. 50-320

JUL 13 1982

Mr. John J. Barton
Acting Director of TMI-2
GPU Nuclear Corporation
P.O. Box 480
Middletown, PA 17057

Dear Mr. Barton:

This letter is in response to your letter, 4400-82-L-0110, dated July 6, 1982, in which you forwarded the safety evaluation report (SER) to support the Control Rod Drive Mechanism (CRDM) "Quick Look" camera inspection. The "Quick Look" camera inspection involves the venting of the noncondensible gases in the pressure vessel and RCS gas spaces, the reduction of reactor coolant system (RCS) pressure to atmospheric, the lowering of the RCS water level, the disconnection of a CRDM lead-screw and insertion of the camera. Accordingly, we have reviewed the following safety-related issues associated with the Quick Look Program: (1) the potential releases of radioactive material to the reactor building atmosphere and to the offsite environs, (2) the potential for a criticality within the RCS pressure boundary, (3) the effects of RCS draindown on the decay heat removal from the pressure vessel, (4) the potential for a boron dilution incident, (5) the potential for a combustible gas burn in the reactor building, (6) the expected occupational exposure, and (7) the effect on RCS chemistry of exposing reactor coolant to the atmosphere. Our review included the Quick Look SER as well as the detailed operating procedures which will be utilized to implement the Quick Look program. It is our understanding that additional camera insertions may be conducted in the future, based on the results of this program, and our review would apply to those future efforts.

Releases of Radioactive Material

You have conservatively estimated that the total quantity of Kr-85 in the RCS available for release is 30 Ci, based on a Kr-85 concentration of 0.07 uCi/cc in the RCS and an RCS vapor space of 190 ft^3. Based on the pressure response to makeup to the RCS, the best estimate of the vapor space in the RCS is approximately 50 ft^3 and the latest measurements of Kr-85 in the RCS are below detectable levels (i.e., less than 1.7×10^{-3} uCi/cc). Thus, the actual concentration of Kr-85 in the RCS is at least an order of magnitude below that assumed in your analysis and the assumed inventory of 30 Ci of Kr-85 adequately bounds the potential releases to the reactor building atmosphere. We understand that the vented gas will be transported in the building, via installed tubing, to a location in one of the "D" rings for discharge in an area which is away from the workforce.

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Further, the discharge from the vent line will be into a larger line, equipped with a blower, for rapid dilution and dispersion of the vented gas. The diluted gas from the larger line will discharge into the space which is exhausted by the reactor building purge system. The reactor building purge system exhaust will be filtered and monitored prior to release to the environment via the plant stack. In view of the capability of the purge system (i.e., 20,000 cfm) to replace the building atmosphere approximately once every hour, there is little risk to the workers in building from vented Kr-85 and the estimated offsite release of Kr-85 is well within technical specification limits.

Recriticality Within the RCS

We have reviewed the criticality analysis provided in the Quick Look SER and find that the results are consistent with the findings of previous studies of the potential for TMI-2 recriticality. These studies all conclude that there is a substantial margin of existing shutdown reactivity in the TMI-2 reactor coolant system which is more than adequate to mitigate the consequences of any credible core fuel configuration, including that which could result from disconnecting the CRDM leadscrew.

Decay Heat Removal Capability

The current decay heat in the TMI-2 core is approximately 45 kw and the average incore reactor coolant temperature is limited by operating procedures to 170 °F. Decay heat is removed by losses to ambient air. The partial draindown of the RCS will reduce the effective area for convective heat removal to the air circulating in the reactor building and the average reactor coolant temperature in the pressure vessel may rise a few degrees during the period of Quick Look activities. However, we expect this temperature rise to be minimal for several reasons. First, the Quick Look program will be conducted over a relatively short time period (approximately 1 week). Following completion of the Quick Look, the RCS will be pressurized and refilled to the water-solid condition. (Based on the results of this first visual examination, there may well be additional camera insertions in the future and the experience related to decay heat removal will be factored into these examinations.) Second, the average incore temperature is approximately 100 °F and, thus, a large margin exists between the actual temperature and the procedure limit. Lastly, the rate of temperature rise in the pressure vessel is dependent on the temperature of the reactor building atmosphere. The ambient temperature in the building is relatively cool, in the range of 70 to 75 °F, and the core heat-up rate is correspondingly low. A conservative interpretation of the decay heat analysis curves in your SER indicates that the average incore temperature would not rise more than 25 °F during the one week effort. Further, in the event of unexpected temperature increases, there is adequate backup decay heat removal capability by initiating feed and bleed to the RCS, refill of the RCS, or operation of the Mini Decay Heat Removal (MDHR) system.

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Potential For Boron Dilution

We have reviewed the measures that you describe for prevention and monitoring of boron dilution during Quick Look activities and the corrective actions you can take to assure subcriticality in the event of a dilution incident.

You will prevent boron dilution by leakage from the secondary system through the steam generator tubes to the primary system by requiring the secondary side water level to be lower than the primary side level to assure a preferential leakage pathway. You have taken measures to isolate those systems (e.g., demineralized water, makeup and purification) which interface the RCS by tagging isolation valves (shut) and pumps (off) and removing piping spool pieces where possible. The positions of all valves that provide isolation from the RCS will be confirmed every 24 hours. Storage tanks that provide a potential source of dilution water will be monitored every 24 hours to assure a constant water level in the tanks.

The water level in the RCS will be monitored with an installed level monitoring system during the Quick Look to provide early detection of any unplanned additions to (or losses from) the system and permit corrective action (e.g., termination of Quick Look activities, addition of borated water).

Potential For Combustible Gas Burn

The venting of the RCS prior to depressurization and lowering of the water level will result in the discharge of hydrogen to the reactor building atmosphere. We have reviewed your procedures for the prevention of a combustible gas burn in the building during the venting. As previously stated above in the discussion of Releases of Radioactive Material, the venting of hydrogen from the RCS will be into a dilution flow stream with a dilution factor of at least 25. The discharge will take place in an area away from working personnel (inside one of the "D" rings). There will be no sources of ignition near the area of hydrogen discharge as the discharge will effectively occur in a confined pipe duct.

Lastly, the reactor building purge system will be operating to prevent the buildup of any hydrogen gas inside the building.

Occupational Exposure

You have estimated that the occupational exposure resulting from the Quick Look will range from 50 to 150 man-rem, based on approximately 300 man-hours of in-containment work. Based on a recent evaluation by the TMIPO staff of the average exposure rates expected from performing work in the reactor building (200 mrem/hr.), we expect that the in-containment work will result in approximately 60 man-rem of occupational exposure.

RCS Chemistry

The RCS will be opened to the atmosphere during the Quick Look and there is the potential for some oxygen from the atmosphere to dissolve in the reactor coolant. Oxygen can aid in the corrosion of system surfaces. However, the actual surface area of reactor coolant which will be exposed to the atmosphere is very small as only that coolant in the one CRDM will be exposed. The diameter of the exposed opening is less than 2 inches. Thus, the rate of oxygen buildup in the RCS is expected to be minimal and we do not expect a significant increase in the dissolved oxygen in the coolant.

We conclude that the Quick Look can be conducted in a safe manner with the measures and precautions provided for each of the major activities (i.e., venting, depressurization, water level lowering, lead screw removal, and camera insertion) associated with the Quick Look and that there is little risk to the offsite public and the occupational workforce from the conduct of this program. All of the Quick Look activities are within the scope of those analyzed in the PEIS. The Quick Look will provide the first visual evidence of conditions inside the reactor vessel and will aid in the planning of core disassembly. The Quick Look can be performed following formal approval by NRC of the operating procedures currently under review.

Sincerely,

Bernard J. Snyder, Program Director
Three Mile Island Program Office
Office of Nuclear Reactor Regulation

cc: L. King
J. Larson
See attached list

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