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July 8, 1980

Mr. Darrell G. Eisenhut
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

SUBJECT: Additional TMI-2 Related Requirements
(NUREG 0660, II K.3.46)
Oyster Creek Nuclear Generating Station
Docket No. 50-21_

Reference: (a) D. G. Eisenhut's (NRC) letter of May 7, 1980 to all operating reactors
(b) General Electric's (R. H. Buchholz) letter of February 21, 1980 to D. F. Ross, USNRC

Reference (a) requested that each operating boiling water reactor assess the applicability and adequacy of General Electric's response (reference (b)) to a general list of concerns expressed by a consultant to the ACRS. Enclosure 1 provides the results of the assessment as applied to Oyster Creek, a BWR-2 design.

In general we agree with General Electric's generic BWR responses. In the cases of questions 3 and 7 however, we do not have sufficient supporting documentation at this time to conclude that the concern is not a problem for Oyster Creek. We are currently investigating these concerns and will respond to the NRC in the near future.

Very truly yours,

Ivan R. Finfrock

Ivan R. Finfrock, Jr.
Vice President-Generation

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ENCLOSURE 1
JULY 8, 1980

OYSTER CREEK NUCLEAR GENERATING STATION
RESPONSE TO QUESTIONS POSED BY C. MICHELSON, AN ACRS CONSULTANT
(NUREG 0660, II K.3.46)

1. **QUESTION** Pressurizer level is an incorrect measure of primary coolant inventory.

RESPONSE A BWR does not have a pressurizer. Primary coolant inventory is measured directly using differential pressure level sensors attached to the reactor vessel. T[illegible], this concern does not apply to Oyster Creek.

2. **QUESTION** The isolation of small breaks (e.g., letdown line; PORV) not addressed or analyzed.

RESPONSE Automatic isolation only occurs for breaks outside the containment. Such breaks are addressed in Section 3.1.1.1.2 of NEDO-24708. At Oyster Creek, the operator must manually depressurize to allow the low pressure systems to inject and maintain vessel water level (Section 3.5.2.1, NEDO 24708). Analyses submitted for demonstration of adequate core cooling show that the operator has sufficient information and time to perform these manual actions. The necessary manual actions have been included in the operator guidelines for small break accidents.

3. **QUESTION** Pressure boundary damage due to loadings from 1) bubble collapsein subcooled liquid and, 2) injection of ECC water in steam-filled pipes.

RESPONSE The BWR has no geometry equivalent to that identified in Michelson's report on B&W reactors relative to bubble collapse (steam bubbling upward through the pressurizer surge line and pressurizer). Thus the first concern is not applicable to Oyster Creek.

The injection of ECC water into the core spray sparger and supply piping which could potentially contain steam is not felt to be a problem. However since this condition was not considered in the original design of the system we intend to investigate this matter further.

4. **QUESTION** In determining need for steam generators to remove decay heat consider that break flow enthalpy is not core exit enthalpy.

RESPONSE BWRS do not use steam generators to remove decay heat, so this concern does not apply to Oyster Creek. The GE modelling of break flow is discussed in NEDO-20566.

5. **QUESTION** Are sources of auxiliary feedwater adequate in the event of a delay in cooldown subsequent to a small LOCA?

RESPONSE BWRs do not need feedwater to remove heat from the reactor following a LOCA, whether the subsquent cooldown is delayed or not. Therefore this concern is not applicable to Oyster Creek. BWRs have a closed cooling system in which vessel water flows out the postulated break to the suppression pool. The suppression pool is cooled and water is pumped back to the vessel with ECCS pumps.

6. **QUESTION** Is the recirculation mode of operation of the HPCI pumps at high pressure an established design requirement?

RESPONSE Oyster Creek, a BWR 2, is not equipped with a HPCI system, therefore this concern does not apply.

7. **QUESTION** Are the HPCI pumps and RHR pumps run simultaneously? Do they share common piping/suction? If so, is the system properly designed to accommodate this mode of operation (i.e., are any NPSH requirements violated, etc....?)

RESPONSE At Oyster Creek the containment spray (CS) and Low pressure core spray (LPCS) pumps take suction through a common header from the suppression pool. Although we feel that the suction header has been properly sized, we have been unable to locate the original design calculations. We are in the process of redoing the analysis and will report the results at a later date.

8. **QUESTION** Mechanical effects of slug flow on steam generator tubes needs to be addressed (transitioning from solid natural circulation to reflux boiling and back to solid natural circulation may cause slug flow in the hot leg pipes.)

RESPONSE BWRS do not have steam generators so this concern does not apply to Oyster Creek. BWR post-LOCA cooling modes are addressed in NEDO-24708.

9. **QUESTION** Is there minimum flow protection for the HPCI pumps during the reciculation mode of operation?

RESPONSE Oyster Creek does not have a high pressure injection system. The low pressure core spray system does have minimum flow protections while the pumps are running prior to injecting water into the core.

10. **QUESTION** The effect of the accumulators dumping during small break LOCAs is not taken into account.

RESPONSE BWRs do not use accumulators to mitigate LOCAs. Therefore this concern does not apply to Oyster Creek

11. **QUESTION** What is the impact of continued running of the RC pumps during a small LOCA?

RESPONSE The impact of continued running of the recirculation pumps has been addressed in Sections 3.3.2.2, 3.3.2.3, and Section 3.5 .2.1.5 .1 of NEDO-24708. The conclusions were that continued running of the recirculation pumps results in little change in the time available for operator actions and does not significantly change the overall system response.

12. **QUESTION** During a small break LOCA in which offsite power is lost, the possibility and impact of pump seal damage and leakage has not been evaluated or analyzed.

RESPONSE The containment spray and low pressure core spray pumps are provided with mechanical seals. These seals are cooled by the pump primary process water. No external cooling from auxiliary support systems, such as service water or room air coolers, is required for pump seals. These types of seals have demonstrated (in nuclear and other applications) their capability to operate for extended periods of time at temperatures in excess of those expected following a LOCA.

Should seal failure occur it can be detected by room sump high level alarms. Individual containment spray & low pressure core spray pumps are arranged, and motor operated valves provided, so that a pump with a failed seal can be shutdown and isolated without affecting the proper operation of the other redundant pumps/systems.

Considering the low probability of seal failure during a LOCA, the fact that a pump with a failed seal can be isolated without affecting other redundance equipment, and the substantial redundancy provided in the BWR emergency cooling systems, pump seal faiure is not considered a significant concern for Oyster Creek.

13. **QUESTION** During transitioning from solid natural circulation to reflux boiling and back again, the vessel level will be unknown to the operators, and emergency procedures and operator training may be inadequate. This needs to be addressed and evaluated.

RESPONSE There is no similar transition in the BWR case. In addition, the BWR has water level measurement within the vessel and the indication of the water level is incorporated into the operator guidelines. Consequently this concern does not apply to Oyster Creek.

14. **QUESTION** The effect of non-condensible gas accumulation in the steam generators and its possible disruption of decay heat removal by natural circulation needs to be addressed.

RESPONSE The effect of non-condensible gas accumulation is addressed in Section 3.3.1.8.2 of NEDO-24708. For a BWR, vapor is present in the core during both normal operation and natural circulation conditions. Non-condensibles may change the composition of the vapor but would have an insignificant effect on the natural or forced circulation itself, since the non-condensibles would rise with the steam to the top of the vessel after leaving the steam separators.

An accumulation of non-condensible gas in the isolation condenser tubes can be vented if a degradation of heat transfer is detected by the operator. At present the vents are routed to the main steam lines outside containment. In addition a modification is in progress which would permit the isolation condensers to be vented to the suppression pool.

15. **QUESTION** Delayed cooldown following a small break LOCA could raise the containment pressure and activate the containment spray system. Impact and consequences need addressing.

RESPONSE Oyster Creek has been designed with an automatically initiated containment spray system. Although some non-essential equipment in the drywell (e.g. recirculation pump motors) could be adversely affected by sprays all essential equipment has been qualified for the effects of containment sprays.

Similarly there is no equipment in the suppression pools which would be affected by sprays.

16. **QUESTION** This concern relates to the possibility that an operator may be inclined and perhaps event trained to isolate, where possible, a pipe break LOCA without realizing that it might be an unsafe action leading to high pressure, and short-term core bakeout. For example, if a BWR should experience a LOCA from a pressure boundary failure somewhere between the pump suction and discharge valve for either reactor recirculation pump, it would be possible for the operator to close these valves following the reactor blowdown to low pressure and thereby isolate the break, stop the blowdown, and repressurize the reactor coolant system. Before such isolation should be permitted, it is first necessary to show by an appropriate analysis that the high pressure ECCS is adequate to reflood the uncovered core without assistance from the low pressure ECCS which can no longer deliver flow because of the repressurization. Otherwise, such isolation action should be explicitly forbidden in the emergency operating instructions.

RESPONSE If Oyster Creek should experience a LOCA from a pressure boundary failure somewhere between the recirulation pump suction and discharge valves, it is possible for the operator to close these valves following the reactor blowdown to low pressure and thereby isolate the break. Whether the reactor repressurizes or not depends upon the minimum level to which the water level drops. If level gets below the low-low set point (7.2 ft. above the core), the isolation condensers will go into operation and thereby prevent pressure from increasing. If level does not go below the low-low setpoint, reactor vessel pressure would increase to the 1050 psi setpoint of two electromatic relief valves which would cycle the pressure between 1050 psi and 1000 psi. Eventually this would cause level to drop below the low-low setpoint of the isolation condensers which would then reduce pressure with no loss of vessel inventory. Ultimately pressure would decrease to the point whereby the low pressure core spray system could inject water into the reactor vessel.

This discussion does not take into consideration the availability of the feedwater or CRD systems which are high pressure but non-ECCS systems. It also does not consider manual operator actions, eg, initiation of isolation condensers or manual ADS either of which would improve the plant's response.

This concern is therefore not a problem for Oyster Creek.