Question 8: Mechanical effects of slug flow on steam generator tubes needs to be addressed.

Response: Since BWRs do not have steam generators, this concern does not apply to BWRs.

Question 9 : Is there minimum flow protection for the HPCI pumps during the recirculation mode of operation?

Response: BWR/1 and BWR/2 units do not have special purpose HPCS or HPCI systems. For BWR/3-6, the RCIC, HPCI, HPCS, RHR and CS/LPCS pumps all contain valves, piping and automatic logic that bypasses flow to the suppression pool as required to provide minimum flow protection.

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

Response: Since BWRs do not use accumulators to mitigate LOCAs, this concern does not apply.

Question 11: What is the impact of continued running of the RC pumps during a small LOCA?

Response: Analyses in NEDO-24708 show 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.

Question 12: 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 RCIC, HPCI, HPCS, RHR, CS/LPCS pumps are provided with mechanical seals which are cooled by the pump primary process water. No external cooling from auxiliary support systems is required for ECC pump seals. Should seal failure occur,

it can be detected by room sump high level alarms. The RCIC, HPCI, HPCS, LPCS and RHR individual pumps are arranged, and motor operated valves provided, so that a pump with a failed seal can be shutdown and isolated without affecting other redundant equipment. The recirculation pump seals are cooled by service water and control rod drive flow. On most BWRs, at least one of these sources of cooling water is powered by emergency power; either source is capable of preventing damage to the pump seals. While pump seal damage would be expected if both sources of cooling water are lost, leakage past the failed seals is calculated by GE to be less than 50 GPM, a value within the normal makeup capability.

Question 13: When 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, since the BWR has water level measurement within the vessel and the indication of the water level is incorporated into the operator guidelines, this concern does not apply to BWRS.

Question 14: 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: 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. The natural circulation process would be expected to

continue since the upper vessel head area is well above the circulation paths through the jet pumps.

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

Response: A. Mark I and II Containments: Except for a few early plants, most plants with Mark I and Mark II containments do not have an automatically initiated drywell or wetwell spray. Only one of the newer plants has an automatic wetwell spray. All essential equipment in the drywell has been qualified for the steam and temperature environment that would exist following a LOCA. There is no equipment in the wetwell that is adversely affected by wetwell sprays.

B. Mark III Containments:

There is no drywell spray in a Mark III Containment. There is an automatic spray system in the wetwell. All essential components have been qualified for this condition.

Question 16 : An operator may be inclined and perhaps even 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. 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.

Response: In order for the reactor vessel to repressurize following isolation of a recirculation line break, the isolation would have to occur before initiation of ADS due to a high drywell pressure in concurrence with low water level 1 condition. Isolation of a recirculation

line break prior to obtaining a high drywell pressure signal might occur for very small breaks (area $<< 0.01 ft^2$) which may require several hundred seconds following the break to reach the high drywell pressure setpoint. In this case, it has been shown (NEDO-24708) that the high pressure systems are sufficient to maintain the water level above the top of the core. If isolation of the break were to occur prior to reaching level 1 but after the high drywell pressure setpoint, the vessel would pressurize to the SRV setpoint following isolation of the main steam lines. If no high pressure systems were available, the loss of mass through the SRVs would result in ADS acutation; this would allow the low pressure systems to begin injecting. No adverse consequences result from isolation of a break in the recirculation line.

In summary, we have reviewed the responses given to the 16 concerns expressed by Mr. Michelson and we find the responses acceptable.