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GE Nuclear Energy

G-EH-92-052  
December 23, 1992

General Electric Company  
P.O. Box 910 1 Prestige Drive, Meriden, CT 06450

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PROJECT SERVICES DEPARTMENT  
H.P. RISLEY

Mr. S.E. Scace  
Vice President - Millstone Station  
Millstone Nuclear Power Station  
Northeast Utility Service Co.  
P.O. Box 128  
Waterford, CT. 06385

Subject: Postulated Hydrogen Explosion in a Non - United States  
Reactor Turbine Building Mezzanine

Dear Mr. Scace:

A BWR/3 utility located outside of the U. S., recently informed GE that a postulated hydrogen gas line break in the plant's Turbine Building mezzanine could result in a hydrogen detonation. U. S. BWR utilities may have similar turbine building configuration/equipment arrangements which could result in a similar condition. However, this portion of the plant is in the utility's Architect Engineer's scope of supply and therefore cannot be evaluated by GE within the context of the U.S. Code of Federal Regulations 10 CFR Part 21. GE is, therefore, obligated, under the requirements of 10 CFR Part 21, to pass this information on to the potentially affected BWR utilities so that they can review the following information for applicability to their unique plant design.

At the subject plant, the pipe lines which carry hydrogen gas to cool the generator are routed from the hydrogen bottles outside the turbine building to the hydrogen controls in the turbine building mezzanine area and up to the generator. It was postulated that if a break occurred in one of these lines, up to 16,000 cubic feet (459 cubic meters) of hydrogen gas would rapidly blow down into the mezzanine (a semi-enclosed area). This room has a volume about 56,000 cubic feet (1,600 cubic meters) of oxygen so that even with uniform mixing, the average hydrogen concentration could easily exceed 25% by volume, which is well above the lower limit of a detonatable mixture (13% by volume).

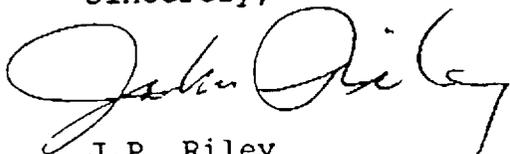
A scoping calculation indicated that hydrogen gas could enter the room from a major pipe break at an initial rate of about 10,000 cubic feet per minute (cfm), and release all 16,000 cubic feet in about three minutes. If all of the hydrogen were retained in the room, a detonatable concentration would exist. However, the mezzanine at this plant is well ventilated with a ducted flow of 2,000 cfm of air and a total flow of about 30,000 cfm coming from other sources. Thus, a more realistic calculation yielded an average hydrogen concentration in the room of about 10%, which is equivalent to about 30 pounds of hydrogen. This 10% concentration can be ignited and result in an explosion.

At the subject plant, the room below the generator contains the hydrogen piping and generator output busses, their cooling and air conditioning systems, and the generator auxiliary equipment. This includes the piping containing hydrogen and oil mixtures. An opening in the structure supporting the generator indirectly exposes some of the plant's 1E and non-1E electrical busses to the effects of an explosion or a fire. Based on the above estimated average hydrogen gas concentration of 10% by volume in a part of the mezzanine, a conservatively estimated blast pressure of 40 psi would have to be contained at the opening to prevent blast waves from exiting this area and damaging the vital busses. To avoid the possibility of consequential damage, a recommendation will be made to the utility to provide a blast shield or ignitors to mitigate or prevent a potential blast.

GE recommends that all BWR utilities perform an evaluation to determine if a postulated generator coolant hydrogen explosion represents a substantial safety hazard at their facility.

Northeast Utilities should evaluate this information as it relates to existing or future plant equipment, conditions, procedures or plans. GE cannot determine if this information affects U. S. BWR utilities. GE is, therefore, notifying all U. S. BWR owners of this information. The owners of GE BWRs located outside the U. S. also will receive this information.

Sincerely,



J.P. Riley  
Nuclear Services Manager  
GE Nuclear Energy

cc: P.A. Blasioli  
L.D. Davison  
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R.T. Harris  
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#### Notice

This 10 CFR Part 21 information pertains only to GE BWRs. GE Nuclear Energy (GE-NE) has not considered or evaluated the applicability, if any, of this information to any plant or facility other than GE BWRs.