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Department of Nuclear Energy

April 4, 1980

Mr. Robert L. Ferguson
 Plant Systems Branch
 U.S. Nuclear Regulatory Commission
 Washington, D.C. 20555

RE: Duane Arnold, Fire Protection Review, Item 3.2.7

Dear Bob:

Attached is item 3.2.7, Turbine Building Fires, for the Duane Arnold Plant.

This review constitutes the first in Brookhaven National Laboratory's continuing supplement and design task since the completion of the backlog items, March 31, 1980.

Respectfully yours,



Robert E. Hall, Group Leader
 Reactor Engineering Analysis

REH:EAM:sd
 attachment

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DUANE ARNOLD

Fire Protection Review

Item 3.2.7 - Turbine Building Fires

Item 3.2.7 of the Duane Arnold SER requires the licensee to provide an analysis of the turbine building fires and their impact on the diesel generator units with consideration given to the lube oil lines routed near the diesel generator rooms and the combustibles in the turbine trackway and adjacent areas. Item 3.2.7 states:

"An analysis of turbine building fires and their impact on the diesel generator units will be provided. Consideration will be given to lube oil lines routed near the diesel generator rooms and combustibles in the turbine trackway and adjacent areas."

Fire Zone 8-D at elevation 757'-6" of the turbine building is adjacent to the emergency diesel generator rooms. The primary sources of combustibles in this area are the hydrogen seal oil unit, the lube oil lines routed near the diesel generator rooms, cable insulation, a diesel locomotive in the trackway, and drums of oil and resins in plastic containers in the trackway area. These combustibles present an unacceptable exposure hazard to the turbine building structure. A collapse of the turbine building due to a fire or an uncontrolled fire involving the lube oil piping outside the diesel generator rooms could compromise the availability of the emergency diesel generators for safe plant shutdown.

Section D.1(a) (1) of Appendix A to BTP 9.5-1 states that "Plant layouts should be arranged to isolate safety related systems from unacceptable fire hazards." In addition, Section F.8 of Appendix A states:

"A blank fire wall having a minimum resistance rating of three hours should separate all areas containing safety related systems and equipment from the turbine oil system. When a blank wall is not present, open head deluge protection should be provided for the turbine oil hazards and automatic open head water curtain protection should be provided for wall openings."

In their letter dated November 29, 1979, the licensee stated that they did not include lube oil in the combustible loading list because it is enclosed in piping and that the amount of turbine lube oil piping in Fire Zone 8D is "quite small compared to the H₂ seal unit." They add that they have not taken any credit for floor drains for mitigating the consequences of a fire following a lube oil line rupture and that "suppression in the area is neither practical nor necessary."

In their Fire Hazards Analysis, the licensee states on pages III-82 and 83 that structural damage, including possible collapse, could result from fires involving oil spills resulting from leakage in the lube oil piping if it exceeds the drainage capacity of the floor drains. On page III-84 they state that the floor drains will prevent excessive accumulations of lube oil, and proceed to conclude that no suppression system is necessary for Zone 8D.

Based on a review of the fire hazards in Zone 8D, the consequences of structural collapse, and the licensee's conclusions that automatic suppression is not necessary for Fire Zone 8D, we find the licensee's response to SER item 3.2.7 unacceptable. At no time in their Fire Hazards Analysis or in their response to staff concerns expressed in SER item 3.2.7 did the licensee indicate the total quantity of lube oil which could be introduced into Zone 8D if a leak or break in a line should develop. The only reference to quantity was that 68 gpm of lube oil could be expected from a leak in the 6 inch diameter pipe following the criteria of SRP 3.6.1 (BTP MEB 3-1 and APCS 3-1).

The licensee also considers that the floor drains will effectively drain the lube oil from the area if a leak develops. Reliance on floor drains for this purpose is unacceptable as these drains frequently become clogged with refuse or debris if they are not permanently sealed for other reasons.

The licensee has also failed to analyze the effects of a fire involving all combustibles in Fire Zone 8D and its effect on the diesel generator rooms. They have only analyzed the effects of fires involving each source of combustible separately.

In order for the licensee to adequately address the staff concerns regarding the turbine building fire exposure hazard to the emergency diesel generators, we recommend that an automatic sprinkler system be provided throughout Zone 8D. We recommend that the staff request that the licensee submit design criteria and drawings to NRC for approval prior to implementation.

DUANE ARNOLD
RESOLUTION OF INCOMPLETE ITEMS - STATUS

	Staff Evaluation	Licensee Response Due	Staff Action
3.1.5 Hose Care	Complete		
3.2.5 Radiological Consequences of Fire	Complete		
3.2.6 Diesel Generator Air Intakes	Complete		
3.2.9 Administrative Controls	Complete		
3.1.13 Portable Smoke Venting Equipment	Requirement		
3.2.4 Control Room Fire Hazards	Requirement		
3.2.7 Turbine Building Fires	Requirement		
3.2.2 Smoke Detection Ssystem Tests			
a) In-Situ			Acceptance
b) Bench Tests	Information		BNL (4/28/80)
3.1.7 Water Suppression System	Ongoing		
3.2.1 Shutdown Capability Analysis	Ongoing		
3.2.3 Cable Fire Barriers Penetration Test Data	Ongoing		
3.2.8 Fire Dampers	Ongoing		