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Department of Nuclear Energy

February 20, 1980

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

Dear Bob:

Enclosed is Brookhaven National Laboratory's fire protection review of item 3.2.9, Effects of Fire on Radiation Monitors, for Calvert Cliffs nuclear power plant.

Respectfully yours,

*Robert E. Hall*  
Robert E. Hall, Group Leader  
Reactor Engineering Analysis

REH:EAM:sd  
enclosure

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## CALVERT CLIFFS

### Fire Protection Review

#### Item 3.2.9 - Effects of Fire on Radiation Monitors

The SER states that the licensee will provide the results of a study to demonstrate that the radiation monitors will remain operational when exposed to smoke and/or heat of a potential fire.

The licensee responded on December 21, 1979 and stated that:

- "The radiation monitoring system is not required to place the plant in a safe shutdown condition. As demonstrated in the results of a study for the radiological consequences of a fire, there exist only minimal areas where a postulated fire could cause the release of radioactive materials; it is also stated that these releases would not result in a condition which would exceed the requirements of 10CFR20.
- Four independent radiation area detectors located within the containment are provided and, upon coincident of two-out-of-four trip signals or manual initiation from the control room, actuation occurs to isolate and secure the containment purge system. These devices are designed to operate in a LOCA environment of 100 percent relative humidity at 273°F and will provide audible and visual alarms if the radiation levels exceed a pre-set value or if the detector malfunctions. Due to separation between locations for the area monitors and the containment volume available, a postulated fire that could conceivably effect all four system channels is not considered credible. The smoke resulting from a fire will not effect the system function. A device malfunction for any reason will provide a single input to the 2 out of 4 coincident logic, such that a second device malfunction will isolate and secure the containment purge system.
- The waste processing area ventilation exhaust fans discharge is provided with a continuous off-line gaseous radiation monitor system. This system extracts a sample from the ventilation system, analyzes the sample via a geiger-mueller tube and returns the sample to the ventilation system prior to the main exhaust plenum. A flow indicating switch is provided to indicate malfunction of the system. The system will operate normally under the following environment conditions: +40°F minimum to 120°F maximum, sample temperature 167°F maximum and smoke atmosphere.
- The plant vent is monitored for particulate, iodine, and gaseous activity. The equipment continuously withdraws a representative sample from the plant vent and passes the sample through a moving filter paper having a collection efficiency of 99 percent for particle sizes greater than 1.0 micron. The amount of deposited activity is continuously scanned by a lead-shielded detector. The remaining air is monitored by a separate gaseous monitor prior to returning to the plant vent. A flow indication switch is provided to indicate malfunction of the system. The gas monitoring portion of this system is identical to the previously described waste processing system. The particulate monitoring portion of this system will operate normally under the following environment conditions: +40°F minimum to 120°F maximum and a sample

temperature of 140°F maximum. This portion of the monitoring system is not expected to function properly with a smoke atmosphere from a fire. The particulate monitoring portion is provided with a normally closed bypass piping to the gas monitoring portion. Continuously on-line charcoal filters are provided in parallel with the particulate and gas analyzing system.

- Due to the significant volume of air flow associated with ventilation systems within the Auxiliary Building, dilution will reduce the resultant temperature rise caused by a fire. Further, since the majority of the plant areas served by the ventilation systems are provided with fire dampers to isolate the effects of a fire, temperatures are not anticipated to affect the gaseous monitoring portion of the main plant vent system. It should also be noted that the main plant system provides redundant monitoring for the waste processing plant areas.
- In the unlikely event that both of the described radiation monitoring systems simultaneously fail, qualified plant personnel with sufficient quantities of portable radiation monitoring equipments are available to monitor effluents from the plant."

The containment radiation monitors are considered satisfactory in that smoke would cause the system to fail safe. In the event of a fire the smoke would secure the containment purge system and the alarm would notify the control room personnel. We recommend that the staff accept this part of item 3.2.9.

The waste processing area gaseous radiation monitors are also considered satisfactory in that the licensee has stated that they will not be effected by smoke and that there is a backup system for radiation monitoring in the main plant system. We recommend that the staff accept this part of item 3.2.9.

The main plant vent system has a gaseous radiation monitoring system which is considered acceptable and we recommend that the staff accept it. However, the particulate radiation monitoring system could fail in the case of a smokey fire and the licensee has not as yet justified the loss of the ability to monitor particulate radiation which could result at the line of a fire. We recommend that the staff keep this part of item 3.2.9 open and request that the licensee develop an alternate particulate radiation monitoring system that will function in the event of a fire.