TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
830 Power Building

MAR 29 1978

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 1217
230 Peachtree Street, NW.
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

OFFICE OF INSPECTION AND ENFORCEMENT BULLETIN 78-03 - RII:JPO 50-259, -260, -296 - BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3

In response to your February 10, 1978, letter which transmitted IE Bulletin 78-03, we are enclosing the results of our investigations at Browns Ferry.

Very truly yours,

J. E. Gilleland
Assistant Manager of Power

Enclosure
cc (Enclosure):
Office of Inspection and Enforcement
Division of Reactor Operations Inspection
U.S. Nuclear Regulatory Commission
Washington, DC 20555

ENCLOSURE

RESPONSE TO IE BULLETIN 78-03
POTENTIAL EXPLOSIVE GAS MIXTURE ACCUMULATIONS ASSOCIATED
WITH BWR OFFGAS SYSTEM OPERATIONS

This is in response to your letter to Godwin Williams, Jr., dated February 10, 1978, on the subject bulletin. Our response corresponds to the related item numbers in the subject bulletin.

Item 1

System Operating Instruction No. 66 ensures that operations are performed in accordance with design parameters.

Administrative procedures BFS27 and BFM8 describe maintenance procedures to prevent fire or explosion in the offgas system.

Items 2 and 3

A. Influent to Recombiner

1. Condenser to Steam Jet Air Ejector (SJAE)

Offgas piping originates from the back of each condenser and enters a large pipe chase before branching into rooms housing an individual SJAE. During operation of the unit, this piping as well as the condenser is under negative pressure. Small breaches in system integrity would cause building air to leak into the offgas system increasing the dilution of detonable mixtures.

2. SJAE

Each SJAE is located in a room connected to the turbine building ventilation system. Room air is pulled from an outside corridor

through the room and into a branch ventilation system exhaust duct. A leak on the discharge side of the SJAE would release noncondensibles plus dilution steam. The noncondensibles would be diluted further by room air and then by other exhaust streams entering the ventilation system. Significant leaks would produce and be detected by increased activity in the turbin building exhaust duct. A sample from this duct is monitored continuously by a radiation monitor. There are no rupture disks associated with the Browns Ferry Nuclear Plant SJAE's.

B. Recombiners

Both of a unit's recombiners and a common offgas condenser are located in a single room in the turbine building adjacent to the SJAE's. Ventilation and leak detection are identical to that of the SJAE's described above.

C. Effluent from the Recombiner

The offgas recombiners catalytically recombine the explosive mixture of hydrogen and oxygen in the offgas stream. The construction of the offgas system precludes bypassing of the recombiners. The recombiner effluent is thus comprised principally of fission gases and condenser air inleakage. This effluent is monitored to ensure that detonable mixtures are not present. Additionally, recombiner performance is monitored by periodic observation of the recombiner ΔT. If dilution steam is lost to the SJAE's, a high temperature alarm on each recombiner will provide control room awareness. Therefore, it is highly unlikely that detonable mixtures will exist downstream of the recombiners. In all cases, if high airborne activity is detected in an area, no danger of detonation exists if checks indicate proper recombiner operation and no downstream hydrogen concentration. The following evaluation of the system has been performed.

1. Recombiner Effluent to Underground Holdup Volume

The effluent from the recombiner is routed through a pipe chase and vault room before exiting the turbine building to connect with an underground holdup pipe. Significant leakage in either location would by diffusion be transported to the building ventilation system. Once in the ventilation system it would be diluted by other exhaust streams. An increase in activity on the turbine building continuous air monitor would alert operating employees to the presence of a significant leak. Depending on the actual location and size of the leak, earlier detection might be provided by the area radiation monitors located throughout the turbine building.

2. Pretreatment Sampling and Monitoring System

This system consists of piping and valves necessary to route a representative sample of the offgas stream to a process radiation monitor and grab sample station. The process radiation monitor is located in a room on the ground floor of the turbine building. The two pretreatment process radiation detectors are located inside the room external to a cylindrical metal sample chamber. Significant leakage inside the room would therefore be readily sensed when the detectors monitored the presence of unshielded offgas activity. Additional sample piping and a sample station are located in a generally open area of the turbine building. Leakage originating in this area would be transported to and diluted by the turbine building ventilation system. An area radiation monitor is located near the sample station and could lead to earlier detection of a significant leak. Each unit has two offline process hydrogen analyzers to continuously monitor the concentration of hydrogen in the recombiner

effluent. A separate building ventilation exhaust duct is provided for each monitor in the event of leakage associated with the instrument. The monitor's sample stream is returned to the condenser; therefore, offgas could only escape on the suction side of the sample pumps. Significant leakage from this line would disrupt normal sample flow to the monitors and would initiate a control room annunciation.

D. Turbine Building General

Most of the drains associated with the offgas system in the turbine building discharge to the condenser. The exception is the offgas dehumidification coil which discharges into the turbine building equipment drain sump. In the unlikely event the automatic isolation logic fails and the loop seal is lost, offgas activity would escape the sump and be diluted by the turbine building's once-through ventilation system. Significant leakage would be detected by increased activity in the turbine building ventilation system or by annunciation of an area radiation monitor.

E. Underground Holdup Volume

The approximately 8,000 cubic feet of holdup volume is located entirely underground. It was designed for and used with the original offgas system. The loop seals associated with the drains from the holdup volumes are routed to a common sump located in the basement of the radwaste building. In the unlikely event the automatic isolation logic fails and a loop seal is lost, activity would exit the sump and be diluted by the radwaste building's once-through ventilation system. Increased airborne activity in the ventilation system and/or annunciation of an area radiation monitor would alert operations' employees of the problem.

F. Offgas Treatment Building

This building houses the offgas pretreatment HEPA filters and the charcoal adsorber beds associated with all three units. For shielding purposes, individual ventilated vaults house major system components. With the exception of the charcoal adsorber beds, air outside the vault is exhausted by a common exhaust system and discharged into the main stack. A significant leak in any one of these vaults would be diluted by the once-through ventilation system and could be detected by an unexplained charge in the post-treatment and/or stack gas activity. All six of a unit's charcoal adsorber beds are located in a large vault with a ventilation system independent of the offgas building. Vault air is recirculated through an external heating and cooling system. Each vault contains an area radiation monitor to detect any significant leakage. Small sample lines transport offgas from vault rooms to a common grab sample station and unitized process radiation monitors. Leakage from the sample station or radiation monitors would be diluted and exhausted by the building's once-through ventilation system. A continuous air monitor is located in the same room with the sample station and could provide early detection of system leakage. Experience has demonstrated that small offgas leaks originating near the process radiation monitors can be detected by significant increases above the monitor's normal readings. Loop seals on drains in the offgas treatment building empty into a common building sump. The sump is connected to the suction side of the building ventilation exhaust fans and kept under constant negative pressure. Should a loop seal be lost, offgas leakage would be diluted and removed by the ventilation system. Lost loop seals would increase the radiation levels associated with the ventilation system exhaust ducts. This would be detected during the performance of periodic health physics radiation surveys.

G. Stack

Underground piping transports the offgas from the treatment building to the base of the stack. There the offgas is routed through the post-treatment HEPA filters. These redundant HEPA filters are located in individual vaults or cubicles located in the basement of the stack. A filter cubicle exhaust system is used to pull air through these vaults and discharges it to mix with the stacks other inputs. A leak in one of these would be diluted by the exhaust inputs from other vaults. A large leak might be detected by a change in the stack gas activity. Once detected the spare filter could be placed in service to eliminate the source of the leak. The effluent from the filters is routed by way of a valve room and pipe chase to the third floor of the stack. Each unit's valve rooms open onto the stack's well-ventilated ground floor.

The offgas system ends with the effluent from the post-treatment filter being mixed into the discharge of redundant dilution air fans. At least one of these fans per unit is operated to provide dilution and upward momentum to the offgas. The dilution fans were designed for and used with the original offgas system. During operation of the system before the addition of the recombiners, these fans demonstrated their ability to maintain hydrogen in the stack effluent below detonable concentrations. Offgas loop seals in the stack discharge to a common sump located in the basement of the stack. In the unlikely event that automatic isolation logic associated with these drains fails and a loop seal is lost, offgas activity would be pulled from the sump and diluted by the same ventilation duct exhausting the HEPA filter cubicles. The offgas building and each turbine building have redundant ventilation system exhaust fans to minimize the potential for losing airflow through these buildings.

Based on the review performed under item 2 above, no area was discovered with a high probability of accumulating a large undiluted and/or undetected volume

of detonable gases originating from the Browns Ferry offgas system. Therefore no changes in plant design are being considered.

Item 4

Operating Instruction No. 66 ensures that all loop seals are established before the system is placed in operation. If a loop seal is lost while the system is operating, it will be detected by an increase in radiation or activity level on the nearest area radiation monitor or continuous air monitor. The area radiation monitors and continuous air monitors, located inside the plant, are recorded in the unit control room. An alarm is provided for high activity levels. Existing plant procedures require the operators and health physics technicians to locate the source of the activity and correct or isolate the problem.

Item 5

Operating Instruction No. 66 gives adequate guidelines to ensure that <4% H_2 mixtures are maintained in the offgas piping downstream of the recombiners or the unit will be shut down. If an explosion should occur that resulted in high pressure and/or temperature in the offgas system, the operators are instructed to manually scram the reactor. The plant emergency plans manual covers situations for fires or explosions external to the system piping and outlines operator response to fires and explosions. Fires in the charcoal adsorbers are also covered in the emergency plans manual.