VIRGINIA ELECTRIC AND POWER COMPANY

RICHMOND, VIRGINIA 23261

March 7, 1978

Mr. Edson G. Case, Director
Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Serial No. 059/012478
PO&M/TAP:dgt
Docket Nos. 50-280
50-281

Attention: Mr. Albert Schwencer, Chief
Operating Reactors Branch No. 1

License Nos. DPR-32
DPR-37

Dear Mr. Case:

This letter is in response to your letter of January 24, 1978, regarding your continuing review of the consequences of a fuel handling accident inside the containment. (FHAIC)

We desire to be in compliance with your guidelines in that any systems required to keep the results of an accident within the guidelines of 10CFR100 should be Engineered Safeguards Features (ESF). We discussed with your staff that the electrical portion of the purge isolation circuit meets most of the current ESF design criteria, and that efforts have been made to upgrade it to full compliance. However, we find this is not a beneficial venture in that any further modification to the electrical system will not significantly enhance its reliability, but further modification would be required to fully comply. We have decided not to pursue this modification any further.

Our efforts will be directed toward upgrading the auxiliary building ventilation system and its associated filters, dampers and ducting. This will be of benefit to the station.

Our letter of July 5, 1977, shows that with the filters and not the purge isolation circuit, the consequences of the postulated Fuel Handling Accident in Containment is much less than 10CFR100. A preliminary system description and analysis of the modified ventilation system is attached and further information will be made available as it is developed by our architect engineer.

Very truly yours,

C. M. Stallings

C. M. Stallings
Vice President-Power Supply
and Production Operations

Attachment

PRELIMINARY
CONTAINMENT PURGE AND FILTER SYSTEM
SURRY POWER STATION - UNITS 1 & 2
VIRGINIA ELECTRIC AND POWER COMPANY

DESCRIPTION

The System

The containment purge and filter subsystem, which is a part of the total auxiliary ventilation system, consists of a supply circuit and an exhaust circuit.

The supply circuit consists of two 50 percent capacity supply fans (F-4A and B), powered off the normal station bus, which draw outdoor air through low efficiency roughing filters and a heating coil, if required, and deliver the air to the containment through ductwork and two isolation butterfly valves. The valves are seismic and powered off the normal station bus. The valves are normally kept closed except during unit shutdown when they are opened for ventilation, heating, and purging.

The exhaust circuit consists of ductwork and two containment isolation butterfly valves connecting to the ESF filter trains through two isolation trip dampers in series. The butterfly valves are seismic and powered off the normal station bus. The manipulator crane monitor and the containment gas and particulate monitor are wired to close the butterfly valves on a high radiation signal.

The ESF filter train system to which the purge exhaust circuit connects, consists of two 36,000 cfm trains, each train consisting of roughing filters, HEPA filters, charcoal adsorbors, and a fan (F-58) which discharges through a stack in the wake of Unit 2 containment. The design flow condition for the filter trains is a LOCA when the exhaust from the safeguards building of the unit with the LOCA and the exhaust from the cubicles of three charging pumps are drawn through the filter for treatment of ECCS leakage. The fans, filters, ducts, and isolation dampers are seismic. The fans are powered off the emergency buses; one fan off Unit 1 orange bus, the other fan off Unit 2 orange bus. (orange = H Bus/purple - J Bus)

The two isolation trip dampers in series connecting the purge exhaust circuit to the ESF filter inlet header are air operated (AOD), designed to fail in the closed position on loss of air.

Compressed air is supplied to the AOD's either from the station compressed air system (QA Category II) or through redundant QA Category I compressed air accumulators sized to store sufficient air to keep the dampers open for two hours.

Compressed air is supplied to each AOD through two 3-way solenoid-operated valves (SOV) piped in series. The power supplies to the two SOV's of the orange AOD are from Unit 1 orange and Unit 2 orange buses. The power supplies to the two SOV's of the purple AOD are from Unit 1 purple and Unit 2 purple buses. De-energized SOV's direct compressed air to the AOD to open. Energized SOV's vent compressed air from the AOD to close.

The fuel building exhaust circuit is connected to the ESF filter inlet header through two isolation trip dampers in a manner identical to the purge.

Operation

1. Normal Power Generation and Clean Fuel Building During Normal Station Operation

   The containment purge system (RC) is not in operation, and the fuel building (F) is exhausted at 35,000 cfm by the normal exhaust fans (F-7A and B) bypassing the filters. The isolation trip dampers of both the RC and F streams are kept closed by energized SOVs.

2. Normal Power Generation and Contaminated Fuel Building

   If radioactivity levels within the fuel building require the filtration of the F stream, the SOVs of the isolation trip dampers of the F stream are de-energized by a hand selector switch (HSS). This supplies compressed air to the AODs which open. The F stream is drawn through the filters by the filtered exhaust fans.

   A LOCA signal in Unit 1 (or Unit 2) will override the HSS and energize the SOVs which vent the compressed air from the AODs. The AODs fail closed and allow the filters to treat the air exhausted from ECCS equipment areas. If one AOD does not close, the other one in series will. If a Unit 1 (or Unit 2) orange SOV does not vent the orange AOD, the Unit 1 (or Unit 2) purple SOV will vent and close the purple AOD.

3. Unit 1 Purging Prior to Refueling - Unit 2 On-Line

   During the shutdown of Unit 1 and prior to refueling, the purge air exhaust stream (RC) is routed through the filters. The SOVs of the isolation trip dampers of the RC stream are de-energized by an HSS. This supplies compressed air to the AODs which open. The RC stream is drawn at 30,000 cfm through the filters by the filtered exhaust fans.

   A LOCA signal in Unit 2 will override the HSS and energize the SOVs which vent the compressed air from the AODs. The AODs fail closed and allow the filters to treat the air exhausted from ECCS equipment areas.

   If one AOD does not close, the other one in series will. If the Unit 2 orange SOV does not vent the orange AOD, then Unit 2 purple SOV will vent and close the purple AOD.

4. Unit 1 Refueling - Unit 2 On-Line

Before starting Unit 1 refueling, both the RC and F streams are aligned through the two filters. The SOVs of the isolation trip dampers of both the RC and F streams are de-energized by HSSs. Then, power to the SOVs is removed from the control room. The de-energized SOVs supply compressed air to the AODs which open. Both the RC and F streams are drawn through both filters by the two filtered exhaust fans. The capacity of the filtered exhaust fans 1-VS-F-58A and B is automatically controlled by pneumatically operated inlet vanes to draw the design flow rates. The fan inlet vanes are arranged to fail in the wide open position on loss of compressed air.

A refueling accident inside the containment or the fuel building will leave the system alignment unchanged, allowing filtration of the exhaust of both buildings through the two filter trains. Loss of station compressed air will not terminate filtration of the refueling accident puff release, since the compressed air accumulators are sized to keep the isolation trip dampers open for two hours. Loss of station compressed air will result in loss of fan capacity control. With inlet vanes wide open, the fans will draw the F and RC streams at a higher rate than their respective design rates but no higher than filter design capacity.

No single active failure can close the isolation trip dampers since there is no required mechanical movement of a component.

No passive failure in the short term (two hours) is postulated to close the isolation trip dampers.

No spurious signal can close the isolation trip dampers since the SOVs are de-energized and electrically disconnected from the control room.

Failure of an emergency bus cannot close the isolation trip dampers since the SOVs are already de-energized.

Loss of a filter train (whether due to loss of an emergency bus, fan, or fan back-draft damper) will trip the fans (F-4, F-6, and F-39) of the ventilation supply air systems of both the containment and the fuel building. This will leave one filter train to exhaust and treat the air from both buildings at a lower rate than design. It will also prevent overpressurization of the two buildings.

Compliance with FSAR Criteria for Engineered Safety Features

The engineered safety features of the ventilation system, modified as described above, for mitigating the consequences of a refueling accident meet and exceed all the safety criteria established in the FSAR.

Compliance with NUREG-75/087 Criteria for Engineered Safety Features

The engineered safety features of the ventilation system, modified as described above, for mitigating the consequences of a refueling accident meet all the safety criteria of the NRC Standard Review Plan NUREG-75/087, except Regulatory Guide 1.52, referenced in Standard Review Plan 6.5.1 as listed below.

LIST OF NONCONFORMANCES TO THE POSITIONS OF REGULATORY GUIDE 1.52, REVISION 1

1. C.2.a - The filter trains do not include (a) demisters, (b) HEPA filters after-absorber banks, and (c) heaters.

2. C.2.b - The filter trains are not protected from missiles generated by natural phenomenon (tornado).

3. C.2.f - Each filter train is 36,000 cfm. However, the filter banks are 3 HEPA filters high.

4. C.2.i - The filter trains are not designed for replacement as an intact unit or in a minimum number of segmented sections without removal of individual components.

5. C.2.k - Filter ductwork was designed to exhibit on test a leakage rate of approximately one percent of system flow.

6. C.3.c - Prefilters neither meet the UL Class 1 requirements nor have a minimum efficiency of 40 percent dust spot.

7. C.4.c - No space is provided between upstream HEPA filter and adsorber mounting frames for personnel access.

8. C.5.c - The station technical specifications require in-place DOP tests on HEPA filter banks to have 99.0 percent efficiency.

9. C.5.d - The station technical specifications require in-place halogen tests on adsorber banks to have a 99.0 percent efficiency.

10. C.6.a.3 - The station technical specifications require laboratory testing of samples of used activated carbon to have methyl iodide removal efficiency of 95.0 percent at 25 C and 85 percent relative humidity.

REASONS WHY IT IS NOT NECESSARY TO RECTIFY NONCONFORMANCES LISTED ABOVE

Item 1(a) - There is no potential for entrained water droplet in exhaust air streams during a refueling accident.

Item 1(b) - The release of radioactively contaminated carbon fines from the adsorbers to the environment is not a station design assumption. Omission of downstream HEPA filters is, therefore, not an unreviewed safety question.

Item 1(c) - Control of relative humidity is not required for the low (less than 70 percent) methly iodide removal efficiencies used in the refueling accident analysis.

Item 2 - The filters and ventilation system mitigate the consequences of refueling accidents in two hours before long-term natural phenomenon, such as tornadoes, could take place.

Item 3 - This nonconformance does not affect system safety function.

Item 4 - Cutting the ESF filter system into segments without removal of individual components exposes the local environment and the personnel working in it to unnecessary contamination. When components are individually removed for packaging, shielding, and shipment, operator exposure is minimized. After all components are removed and the housing has been washed down, it is then determined whether the housing has been satisfactorily decontaminated for reuse or whether cutting for shipment and burial off site is required.

Item 5 - Since leakage is into ductwork, contamination of personnel is not a problem.

Item 6 - The combustible material contained in the prefilters is insignificant (less than 10 percent) in comparison with the charcoal in the adsorbers. The low efficiency prefilters merely shorten the life of the HEPA filters; they do not affect system safety function.

Item 7 - The lack of access space between the HEPA filter and adsorber-mounting frames makes in-place testing less convenient. It does not affect the system safety function.

Item 8 - Since dose calculations take credit for 70 percent in particulate removal efficiency, in-place DOP testing to 99.0 percent represents a factor of safety of 30.

Items 9 and 10 - The in-place halogen test of 99 percent efficiency combined with the laboratory analysis of charcoal samples at 95 percent methyl iodide removal efficiency, at 85 percent relative humidity, provides sufficient conservatism in fuel-handling accident dose calculation which takes credit for 70 percent methyl iodide removal efficiency with no restrictions on relative humidity.