February 11, 1982

Docket No. 50-255
LS05-82-02-060

Mr. David P. Hoffman
Nuclear Licensing Administrator
Consumers Power Company
1945 W Parnall Road
Jackson, Michigan 49201

Dear Mr. Hoffman:

SUBJECT: FORWARDING DRAFT EVALUATION REPORT OF SEP TOPIC IX-5 VENTILATION SYSTEMS FOR THE PALISADES NUCLEAR POWER PLANT

Enclosed is a copy of our final evaluation of Systematic Evaluation Program Topic IX-5, Ventilation Systems.

This assessment compares your facility, as described in Docket No. 50-255, with the criteria currently used by the regulatory staff for licensing new facilities.

Your comments on our draft evaluation have been considered and are reflected in this report. Of the systems reviewed only two were found not to be in compliance with current criteria; the turbine area ventilation system and the ventilation system which services the viewing gallery, switchgear and cable spreading rooms.

This evaluation will be a basic input to the integrated safety assessment for your facility. With respect to the potential modifications outlined in the conclusion of this report, a determination of the need to actually implement these changes will be made during the same integrated assessment. This topic assessment may be revised in the future if your facility design is changed or if NRC criteria relating to this topic are modified before the integrated assessment is completed.

Sincerely,

SE04 Add: Gary Staley
S.1/1 Ted Michaels

DSU USE EX (04)

Thomas V. Wambach, Project Manager
Operating Reactors Branch No. 5
Division of Licensing

Enclosure: As stated

cc w/enclosure: See next page

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I. INTRODUCTION

To assure that the ventilation systems have the capability to provide a safe environment for plant personnel and for engineered safety features, it is necessary to review the design and operation of these systems. For example, the function of the spent fuel pool area ventilation system is to provide ventilation in the spent fuel pool equipment areas, to permit personnel access, and to control airborne radioactivity in the area during normal operation, anticipated operational transients, and following postulated fuel handling accidents. The function of the engineered safety feature ventilation system is to provide a suitable and controlled environment for engineered safety feature components following certain anticipated transients and design basis accidents.

II. REVIEW CRITERIA

The current criteria and guidelines used to determine if the plant systems meet the topic safety objective are those provided in Standard Review Plan (SRP) Sections 9.4.1, "Control Room Area Ventilation System", 9.4.2, "Spent Fuel Pool Area Ventilation System", 9.4.3, "Auxiliary And Radwaste Area Ventilation System", 9.4.4, "Turbine Area Ventilation System" and 9.4.5, "Engineered Safety Feature Ventilation System". In determining if plant design conforms to a safety objective, use is made, where possible, of applicable portions of previous staff reviews.

III. RELATED SAFETY TOPICS AND INTERFACES

The scope of review for this topic was limited to avoid duplication of effort since some aspects of the review were performed under related topics. The related topics and the subject matter are identified below. Each of the related topic reports contains the acceptance criteria and review guidance for its subject matter.

II-2.A	Severe Weather Phenomena
III-1	Classification of Structures, Components and Systems (Seismic and Quality)
III-6	Seismic Design Considerations
III-12	Environmental Qualification of Safety Related Equipment
VI-4	Containment Isolation System
VI-7.C.1	Independence of Onsite Power
VI-8	Control Room Habitability
VI-3	Systems Required for Safe Shutdown
IX-3	Station Service and Cooling Water Systems
IX-6	Fire Protection
XV-20	Radiological Consequences of Fuel Damaging Accidents (Inside and Outside Containment)

TMI III.D.3.4 Control Room Habitability

IV. REVIEW GUIDELINES

In determining which systems to evaluate under this topic, the staff used the definition of "systems important to safety" provided in Reference 1. The definition states systems important to safety are those necessary to ensure (1) the integrity of the reactor coolant pressure boundary,[1] (2) the capability to shutdown the reactor and maintain it in a safe condition, or (3) the capability to prevent, or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines of 10 CFR Part 100, "Reactor Site Criteria". This definition was used to determine which systems or portions of systems were "essential". Systems or portions of systems which perform functions important to safety were considered to be essential.

V. EVALUATION

The systems reviewed under the topic are The Control Room Area Ventilation System, Spent Fuel Pool Area Ventilation System, Auxiliary and Radwaste Area Ventilation System, Turbine Area Ventilation System, and Engineered Safety Feature Ventilation System.

A. Control Room Area Ventilation System

The function of the Control Room Area Ventilation System (CRAVS) is to provide a controlled environment for the comfort and safety of control room personnel and to assure the operability of control room components during normal operating, anticipated operational transient and design basis accident conditions.

As a result of TMI this system is being reviewed generically (TMI Item III.D.3.4, Control Room Habitability) to assure compliance with Criterion 19, "Control Room" of Appendix A, "General Design Criteria for Nuclear Power Plants", to 10 CFR Part 50. Therefore the CRAVS was not reviewed under this topic.

B. Spent Fuel Pool Area Ventilation System

The function of the Spent Fuel Pool Area Ventilation System (SFPAVS) is to maintain ventilation in the spent fuel pool equipment areas, to permit personnel access, and to control airborne radioactivity in the area during normal operation, anticipated operational transients, and following postulated fuel handling accidents.

Based on our review of the SFPAVS and the licensee's fuel handling accident analysis, we determined that the system is non essential as defined in Section IV.

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[1] Reactor Coolant Pressure Boundary is defined in 10 CFR Part 50 & 50.2 (v).

C. Auxiliary And Radwaste Area Ventilation System

The Auxiliary and Radwaste Area Ventilation System (ARAVS) services most areas within the Auxiliary Building during normal operation, including the engineered safeguard equipment rooms (East and West), the charging pump room, the primary drain tank pump room and the boric acid control area. These areas house equipment (ECC sysems and the Chemical and Volume Control System) which operates either post-accident or for the safe shutdown of the plant. Therefore the service conditions within these areas and the equipment that maintains those conditions are considered essential.

The ARAVS consists of a supply damper PO-3010 and fan V-10, two exhaust fans in parallel V-14 A & B, their associated dampers PO-1839 & PO-1840, plus various other dampers, filters, heaters, and chiller and associated ducts.

The normal operation of the ARAVS is with all dampers open, supply fan V-10 running, one or both exhaust fans V-14 A & V-14 B running and the exhaust dampers PO-1839 and PO-1840 controlled by filter intake pressure to maintain balanced airflow from all areas. Airflow controllers are used to maintain negative differential pressure in equipment compartments and between controlled and non-controlled spaces. This negative pressure is used to induce infiltration into compartments, thus producing a predictable direction of airflow towards areas of increasing radiation hazard. Final exhaust from these potentially contaminated compartments is discharged to the outside atmosphere through the ventilation stack after filtering out radioactive particulate matter in a high efficiency filter. If loss of instrument air were to occur, the radwaste area supply damper PO-3010, the two exhaust dampers PO-1839 and PO-1840 and safeguard rooms supply and exhaust dampers would fail closed (safeguard room cooling is addressed in Section V.E.). This would result in a loss of ventilation for the Chemical and Volume Control System. In addition, if normal station power is lost, the ARAVS would fail.

This event actually occurred during a plant trip which occurred on September 24, 1977 when the switchyard "R" Bus was automatically deenergized during an electrical storm. The CVCS was required to operate 4 hours and 34 minutes on diesel power with the ARAVS deenergized. No temperature-related equipment failures occurred in the auxiliary and radwaste areas. This demonstrates that ample time exists for operator action. The probability of a sustained loss of instrument air is not credible since station demand is less than 400 cfm and the original plant is equipped with three 200 cfm compressors, 2 of which can be powered from emergency diesel 1-1, and the other from 1-2. In addition, the Feedwater Purity Building houses two 500 cfm compressors, which can be paralleled into the original plant instrument air system by opening a single control room activated control valve . These two compressors do require offsite electrical power.

The loss of offsite power does have a higher probability of occurrence than loss of instrument air, but loss of offsite power also trips the reactor and only activates the engineered safeguard equipment. Thus, there is a minimum of operating equipment to add heat. A simplified analysis was performed, by the licensee, on the charging pump room assuming the three pump motors provide the heat input. The only other heat input would be that radiated from the insulated process lines carrying 120°F water. Since the normal design ambient for the pump and motor is also 120°F the terminal temperature from this source is equal to the design temperature. This demonstrates less than an 11°F rise in 6 hours and a temperature rise of only 0.4°F during the fifth hour. Thus, assuming an initial temperature of 80°F it would take on the order of 83 hours to reach the design temperature of 120°F. This would allow ample time to restore normal power via back feed through the main transformer or to install temporary air movers.

Although the Chemical and Volume Control System, a system required for plant safe shutdown, relies on the ARAVS for maintaining it's operational service conditions, the licensee has demonstrated that a short loss of the ARAVS has no adverse effect on the chemical and volume control system and that adequate time exist for corrective action. Although the present ARAVS is susceptible to single disabling failures, it's the staff's judgment that a safety grade ventilation system is not required for this area based on the long time available for operator corrective action.

D. Turbine Area Ventilation System

The Turbine Area Ventilation System (TAVS) services all of the components contained within the Turbine Building. The TAVS takes suction from outside air through four unit 9 supply fans or two unit 21 supply fans. The only area which is considered to be essential to safety is the Auxiliary Feed Pump Room. It is located in the lower level of the Turbine Building. During normal operation, air is supplied to the Auxiliary Feed Pump Room by unit 9 of the TAVS and exhausted back to the main Turbine Building space via an exhaust duct located in the ceiling of the Auxiliary Feed Pump Room. A single duct failure or loss of normal station power would result in the loss of ventilation of this room which could potentially cause the failure of both auxiliary feed pumps to perform when required.

Since the auxiliary feed system is required for plant safe shutdown and is susceptible to several other common mode failures, the licensee has committed to provide an additional auxiliary feed pump. This third pump is to be located in the west engineered safeguard room. The conceptual design for the proposed modification will be reviewed as a part of the integrated assessment.

E. Engineered Safety Features Ventilation System

The engineered Safety Features Ventilation System (ESFVS) is comprised of several systems or subsystems which either service equipment required to function after an accident or is needed to safely shutdown the plant. Areas serviced by the ESFVS are:

Engineered Safeguard Equipment Rooms (East & West)
View Gallery, Switch Gear and Cable Spreading Rooms
Emergency Diesel Generator Rooms
Intake Structure
Penetration and Fan Rooms

1. Engineered Safeguard Equipment Rooms (East & West)

The Engineered Safeguard Equipment Rooms (ESER) are located in the Auxiliary Building. Equipment located in these rooms are:

HPSI Pumps
Containment Spray Pumps
LPSI Pumps
Shutdown Cooling Heat Exchangers
High Pressure Control Air Equipment
Related Piping, Valves, Controls, etc.

These rooms are normally serviced by the ARAVS. However, when required these rooms are isolated from the ARAVS by non-safety grade isolation dampers in order to preclude release of higher than normal activity to the Auxiliary Building. The possibility of a single failure of non-safety grade isolation dampers could allow radiation to escape into the Auxiliary Building, and even possibly the environment. The radiological consequences of this event have been evaluated, see SEP Topic XV-19. In addition, effects of the event have been minimized as a result of the TMI Action Plan Item III.D.1.1* which required the immediate leakage reduction from the type systems located in those rooms.

Each room has redundant fan coolers to maintain suitable service conditions for the equipment located in these rooms. The water source for each of the coolers is the Service Water System. Emergency power is supplied upon loss of normal station power. Fan coolers VHY-27C and VHX-27D, which service the west room, receive power from buses M.C.C. No. 1 (B01) and M.C.C. No. 2 (B02) respectively. Fan coolers VHX-27A and VHX-27B which service east room are similarly powered from diverse sources.

*Integrity of Systems Outside Containment Likely to Contain Radioactive Material for Pressurized Water Reactors and Boiling Water Reactors.

2. Viewing Gallery, Switchgear and Cable Spreading Rooms

The viewing gallery, switchgear and cable spreading rooms ventilation system services the following areas:

Offices and Viewing Gallery
Cable Spreading Room
Switchgear Room
2.4KV Switchgear
Toilet
Battery Room

The cable spreading room, switchgear room and battery room are considered essential because they house the reactor protection and control system, the instrumentation for shutdown and cooldown, the emergency power (AC and DC), and control power for safe shutdown systems all of which are considered important to safety.

The ventilation system that services these areas is composed of V-33 and V-43 with supplemental ventilation supplied by V-47 none of which are safety grade nor supplied by emergency power. Supply fan V-33 provides 20,000 scfm of air to the areas identified. Makeup air to V-33 is a blend of outside air and recirculated air from V-43. This blend is controlled by temperature of 72°F. When outside air temperature increases, the amount of recirculation is decreased, and the amount of makeup and exhaust increases up to the full 20,000 scfm.

Separate from this 2 fan ventilation system is a 30,000 scfm exhaust fan that takes suction on the cable spreading, switchgear and 2.4 kV switchgear rooms only. When air temperature in the upper region of the rooms increases above 104°F, temperature switches 1824, 1825 and 1826 will initiate a control room annunciator all of which are not safety grade. The operator manually starts the supplemental exhaust fan V-47. Normally, the temperature will drop below the 104°F set point within 10 minutes and the operator will stop V-47.

If the high-temperature alarm does not clear, other corrective measures available to the operator would be: check fan and damper operation, insure heating steam controller and cooling controllers are functioning, insure filter media is clear, block open doors, place fire protection smoke blowers in rooms as temporary air movers.

Because the equipment located in these areas are required to function after a postulated accident and the ventilation system components are neither safety grade nor powered from emergency power sources, the staff was unable to conclude that the equipment located in these areas would function under accident conditions. The licensee should demonstrate that the equipment serviced would not be adversely affected by lack of ventilation or provide proposed system modifications.

3. Emergency Diesel Generator Room (EDGR)

There are two emergency diesel generator rooms. Ventilation to maintain suitable operating temperatures for the diesel and its associated electric control equipment within each room is provided by two separate ventilation systems. The reliable operation of these ventilation systems is considered essential to plant safety.

The major components of these systems are the two diesel generators 1-1 and 1-2, and two cooling fans for each generator room, V-24A, V-24B, V-24C, and V-24D respectively. An intake plenum is installed between the two fans in each room.

On the basis of extensive experience with this system involving normal periods of diesel operation for test purposes, this ventilation system has been demonstrated to be of adequate design.

4. Intake Structure Ventilation System

The intake structure ventilation system is addressed in this evaluation because it services the area where the three service water pumps are located. These pumps are considered important to safety based on our findings presented in the SEP Topic IX-3 evaluation. The system consists of seven supply fans, five wall mounted units (V-21D-H) and two roof units (V-32A and B). These supply fans draw atmospheric air into the building. The air is then exhausted back outside through five roof mounted exhaust fans (V-30A-E).

The intake structure ventilation system was originally sized to cool circulating water pumps in addition to the service water pumps. The existing ventilation system is now oversized for normal operation since the circulating water pumps have been replaced by smaller cooling tower pumps.

In the event of a power failure, several mechanisms act to prevent any rapid heat buildup. All other head loads within the structure are secured as the plant is shutdown, service water pipes containing cool lake water act as heat sinks, and the room is not airtight allowing some limited convective cooling to take place. If a system failure should occur doors opening to the outside are available and should provide sufficient air flow even with multiple

fan failures. Inspection of the intake structure at eight hour intervals provides additional protection against excessive heat buildup. It's the staff's judgment that a safety grade ventilation system is not be required for this area based on heat load to volume and heat sinks.

5. Penetration and Fan Room Ventilation System (P&FR)

The penetration and fan room ventilation system provides cooling air to the feedwater pipe penetration room, the main steam pipe penetration room, and fan room. Although this ventilation system services the Main Steam System and Component Cooling Water System, both considered essential for a shutdown of the plant, it is not considered essential as defined in Section IV, because the essential equipment located in this area are being qualified to survive a main steam line break within this area.

VI. CONCLUSION

The staff has found that Palisades ventilation systems to be, with two exceptions, in conformance with the criteria as outlined in Section II, either explicitly or on other defined basis. These systems were the turbine area ventilation system and the ventilation system services the viewing gallery, switchgear and cable spreading rooms (for details see Section V). The suitability of the proposed corrective actions will be made as part of the integrated assessment.

REFERENCES

1. Regulatory Guide 1.105, System Setpoints

2. NUREG-0737, Clarification of TMI Action Plan Requirements

3. Final Safety Analysis Report for Palisades

4. SEP Review of Safe Shutdown Systems for the Palisades Plant (SEP Topics VII-3, V-11.A, V-11.B, and X)

5. Consumers Letter, R. Vincent to D. Crutchfield, dated June 22, 1981 Responses to NRC Question on Topic IX-5

6. Bechtel Letter, J. Dotson (Bechtel) to D. Markle (Consumers), dated January 26, 1981 Transmitting Preliminary Scope Document for HVAC Modifications

7. Consumers Letter, D. Hoffman to D. Crutchfield, dated December 19, 1980 Consumers Response to NUREG-0737

8. Drawing M-115 Rev. 6 - Heating and Ventilation, Auxiliary and Containment Elevation 570'-0", Drawing M-218 Rev. 14 - P&ID Heating, Ventilation and Air Conditioning, Drawing M-656 Rev. 9 - Heating & Ventilating Air Flow Diagram, Drawing E-1 Sheet 1 Rev. M - Plant Single Line Diagram, Drawing E-5 Sheets 1&4 Rev. 15 - Single Line Meter and Relay Diagram 480 volt M.C.C.

9. Consumers Letter, B. Johnson to D. Crutchfield, dated November 10, 1981 Comments on Draft Topic IX-5 Evaluation