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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON D.C. 20555

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MEMORANDUM FOR: Thomas A. Ippolito, Chief, ORB #3, DOR

FROM: Vernon L. Rooney, Project Manager, ORB #3, DOR

SUBJECT: SUMMARY OF MEETING HELD ON FEBRUARY 14, 1979 TO DISCUSS THE PROPOSED ACAD SYSTEM FOR COOPER

On February 14, 1979, representatives of Nebraska Public Power District (NPPD) and their consultants, Energy Incorporated, met with the NRC staff. Attachment A lists attendees.

The meeting was for the purpose of discussing questions that had arisen in the course of the review of the proposed Atmospheric Containment Atmosphere Dilution System (ACAD) for the Cooper Nuclear Station. Preliminary responses provided by NPPD are given in attachment B. More complete responses, modified as discussed in the meeting will be provided by NPPD. It is expected that the complete responses will be submitted within 30 days.

V L Rooney

Vernon L. Rooney, Project Manager
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:
As stated

7903140419

Attachment A

LIST OF ATTENDEES

NEBRASKA PUBLIC POWER DISTRICT

J. Pilant
J. Weaver
C. Mosev

ENERGY INCORPORATED

R. Breeding
R. Griebe

NRC

Y. Huang
G. Cwalina
J. Burdoin
B. Buckley
V. Rooney

DRAFT

NRC MEETING FEBRUARY 14, 1979
FIRST DRAFT RESPONSES FOR NRC'S
REQUEST FOR ADDITIONAL INFORMATION
ACAD SYSTEM
COOPER NUCLEAR STATION

1. Question
The licensee has calculated the potential consequences from ACAD system operation for a period of 720 hours after the accident. Address the need for continued operation of the ACAD system after the initial 720 hours of operation. If it will be needed, calculate the additional incremental dose from ACAD system operation for the time period after the initial 720 hours.

Response
- How long after 720 hours?
- CNS could vent after 720 hours and only double dose offsite. This is still less than 10 CFR 100 limits.

2. Question
In Section III.3 of the Combustible Gas Control System Design Report for the Cooper Nuclear Station, the licensee states that an alarm will be annunciated by the CAM system once the high hydrogen set point is reached and that the "ACAD system is initiated manually from the main control room" when the hydrogen concentration in the containment (drywell or wetwell) exceeds 3.5% (volume). Describe the alarm (audible, visual, etc.) which will be initiated by the CAM system signal and the safety criteria to which it will be designed.

Response
The description of the alarm is as follows:

Each hydrogen monitor provides audible and visual alarms in the control room on panels VBD-P1 and VBD-P2. These alarms are actuated by either, 1) directly from the monitor, or 2) from the recorder used for control room indication. In addition to the high hydrogen alarms the systems also each include "system malfunction" alarms and "analyzer failure" alarms. These alarms are actuated by supervisory circuits in the monitors and will alarm if any malfunction develops which could prevent the analyzer from functioning properly.

Alarms and Trips

A. Alarm Annunciators

1. hydrogen level high - activated if hydrogen concentration is greater than 3.5% by volume.
2. hydrogen system malfunction - activated by a low sample flow rate.
3. hydrogen analyzer failure - activated by a failure of the analyzer detector cell.

4. drywell high pressure isolation - activated by the drywell pressure reaching 28.3 psig.
5. suppression chamber high pressure isolation - activated by the torus pressure reaching 28.3 psig.
6. ACAD compressor trip - activated by low oil pressure, high current flow or a normal shutdown of the compressor.
7. Hydrogen level low - activated if H_2 concentration is less than 3.3% by volume.

B. Horns

1. d-c failure - activated if there is a loss of d-c power for the alarm circuits.
2. alarm - audible signal in conjunction with a flashing window light.
3. ring back alarm - is an audible signal of a different pitch or warble activated when an abnormal condition clears. This will occur in conjunction with a slow flashing window light.

C. The sequence of operation is as follows:

Condition	Operator Action	Window Light	Audible Alarm	Audible Ring Back*
Normal	None	Off	Off	Off
Alert	None	Flashing	On	Off
Alert	Acknowledge	Steady On	Off	Off
Return to Normal	None	Slow Flash	Off	On
Reset to Normal	Reset	Off	Off	Off
Test**	Flashing	Flashing	On	Off

The test button is arranged such that no change of state takes place due to actuation of the test button. Any conditions existing prior to operation of the test button will be displayed after "test" in the same way as before "test."

The system was designed to the following safety criteria:

All electrical installation is in conformance to IEEE 384-1974 separation for Class IE equipment and circuits.

3. Question
The Acceptance Criteria II.3 of SRP Section 6.2.5 states that if the licensee proposes to rely on convective mixing in the containment to mix the combustible gases, an analysis of the effectiveness of the containment design features which promote the free circulation of the atmosphere should be presented. Further, this analysis should show that not only will the containment maintain a nonexplosive mixture but also that an explosive mixture would not accumulate within a compartment or cubicle of the containment.

The information presented in Section IV.5 of the Cooper Combustible Gas Control System Design Report that convective currents will cause sufficient mixing in the post-LOCA containment to prevent hydrogen pocketing is not sufficient to satisfy the acceptance criteria stated above. While references were given which contain information on convective mixing currents post-LOCA, no discussion of the applicability of this data to the Cooper Nuclear Station was presented. There is no discussion regarding the design features of the Cooper Station which control compartment or cubicle hydrogen pocketing to noncombustible levels or which promote or enhance the circulation of air in the containment atmosphere.

Therefore, discuss in additional detail how the referenced information is directly applicable to the Cooper Nuclear Station design and how the referenced information satisfies the SRP acceptance criteria items identified above.

<u>Response</u>

- Reference Amendment 19, Question 5.23 on the use of fan coils for circulation.
- Fan coils 1. start on scram
  2. receive power from critical buses
  3. are qualified for post-LOCA operation.

4. <u>Question</u>

While reviewing the submittal for the ACAD combustible gas control systems for the Cooper Nuclear Station, we found that the Combustible Gas Control System Design Report for the Cooper Nuclear Station did not address the expected radiological consequences from the ACAD system operation to the control room operators. Therefore, provide the radiation doses to the control room operators following a postulated LOCA (i.e., Regulatory Guide 1.3) and estimate the incremental doses received by the control room operators due to the operation of the ACAD system. Your response should identify all assumptions used in the analysis including, as appropriate:

a. Assumed credit for engineered safety features, such as iodine removal by containment filters.

b. Assumed atmospheric dispersion (χ/Q) factors for the control room air intake vents, the data source (e.g., meteorological records, literary references, etc.) for these χ/Q's and other assumptions made in reaching the χ/Q values used in your analysis (e.g., release height, distance and direction to receptor, building wake factor, wind direction changes, etc.).

c. Assumed duration of control room isolation following the initial isolation of the control room air intakes.

d. Assumed iodine removal efficiency of the charcoal filters in the control room ventilation system.

e. Assumed rate of unfiltered air inleakage, including such leak paths as control room doors, ducts, penetrations, outside air isolation dampers and contaminated air from rooms adjacent to those served by the control room HVAC.

f. Assumed frequency of operating crew changes after the LOCA.

g. Assumed credit for any other dose mitigating equipment, such as respiratory protection devices.

For your reference in this dose analysis, see the following:

a. U.S. NRC Standard Review Plan Section 6.4, "Habitability Systems," (NUREG-75/087, Section 6.4).

b. Murphy, K. G. and K. H. Campe, "Nuclear Power Plant Control Room Ventilation System Design for Meeting General Design Criterion 19," Proceedings of the Thirteenth AEC Air Cleaning Conference, August 1974.

c. U.S. NRC Standard Review Plan Section 15.6.5, Appendix A, "Radiological Consequences of a Design Basis Loss-of-Coolant Accident: Containment Leakage Contribution," and Appendix B, ". . . Leakage from Engineered Safety Features Components Outside Containment."

Response

- Reference SAR description of control room doses from a LOCA (SAR Pages XIV-10-7 through XIV-10-10).
- Show direct radiation to operators small by referencing floor plans and equipment arrangement. Reference Amendment 11, Question 5.9 for direct dose from 1/2 inch sample lines.
- Explain that control room inleakage is negligable.

5. Question

If the estimated doses to the control room operators for the course of the loss-of-coolant accident are greater than the dose guidelines of General Design Criterion 19 (10 CFR Part 50, Appendix A) and Standard Review Plan Section 6.4, indicate what can be done to reduce the doses to within these guidelines.

Response

- The estimated dose to operators does not exceed 5 rem.

6. Question

When providing the requested analysis, describe in more detail the control room ventilation system operation in the accident or emergency mode. Include in this discussion all control room isolation signals, indicate whether manual or automatic, and provide the control room ventilation flowrates and isolation valve closure times for the control room HVAC system. Further, describe how the control room ventilation system is designed to perform its intended function following the worst single active failure in the system.

Response

- Reference Amendment 17, Question 9.16 which gives details of system operation.

- Reference SAR Pages X-10-12 and X-10-13 which describes operation and isolation signals.
- Reference Amendment 15, Question 10.7 which shows system can fail totally for 22 days.

7. Question

The Commission has published amendments to 10 CFR Part 50, §50.44, and Revision 2 to Regulatory Guide 1.7 concerning the control of combustible gases in containment following a Loss-of-Coolant Accident. Your design report on combustible gas control systems should be amended to comply with the new rule and revised regulatory guide.

Response

- The design report was based on a draft of Revision 2 to Regulatory Guide 1.7.
- 10 CFR 50.44 says ACAD is acceptable because CNS was noticed in the Federal Register March 29, 1968 which is before December 22, 1968.

8. Question

Describe how the ACAD venting system meets the requirements of an engineered safety feature and the single failure criteria. More specifically, discuss the impact on the ACAD system capability in the event that a single failure occurs in one train of the venting systems.

Response

- System is safety related and all components are Seismic Category I.
- All active components are redundant.
- Separate power buses are used for each channel of the ACAD and CAM.
- All equipment located in Seismic I Reactor Building.
- System is protected from missiles and high energy pipe ruptures as previously submitted.
- Single failure in one train of the venting system was considered as follows:

  A. No Flow Condition

     1) Alarm in control room
     2) Operation would transfer to redundant system

  B. High Flow Condition

     1) Alarm in control room
     2) Operate manual transfer

  C. High Pressure

     1) Trip pump
     2) Alarm in control room
     3) Operator manual transfer

9. Question

The venting portion of the ACAD system is connected to the downstream of the containment isolation valve on the normal purge line. Discuss how the normal purge line meets the containment isolation criteria when the ACAD system is in operation. In addition, discuss the rationale why a normal purging is needed as a back-up to the combustible gas control system that is designed in accordance with the requirements of an engineered safety feature.

Response

- Reference system flow diagram.
- If isolation fails in one train we can isolate it and use redundant train.
- During ACAD operation the system is lined up to the SGTS.
- During normal operation the ACAD valves are shut.
- Normal purging is not required as a back-up.

10. Question

In your design report, you have discussed how the metal-water reaction is determined, and have concluded that the metal-water reaction is conservatively assumed for the ACAD system design. To expedite the review of the proposed ACAD systems, we will use the assumed metal-water reaction contained in your design report. However, the final acceptance of the proposed ACAD system is contingent upon a NRC approved ECCS analysis.

Response

- The ECCS performance analysis approved by Amendment 46 to the license (May 2, 1978) showed a Core-Wide Metal-Water Reaction of .16%. This is the same number used in the ACAD design report.

11. Question

Recently, concern has been raised that the containment corrosion from zinc or aluminum may be underestimated for the design of combustible gas control systems. Provide the justification and the related materials for assuming that no hydrogen is generated due to corrosion of zinc or aluminum. It will be helpful to our review, if you provide an estimate of the surface area and amount of zinc and aluminum inside the containment.

Response

- Lack of additives in ECCS water makes this a non-problem.
- BNL memo only mentions zinc and borated water.

12. Question

Describe the manner by which the CAM system is activated, and in more detail the principle of operation of the CAM system. Also, indicate the manner by which switch over to a redundant train of either the ACAD system or bleed system would occur should a single failure occur in an operating train.

Response

The CAM system will be in continuous operation when the ACAD system is in operation.

The Containment Atmosphere Monitoring System (CAM), receives input from three points in the drywell and one point in the wetwell. The sample points in the drywell are located at three different elevations, i.e., 965'0", 930'0", and 900'0". The sample point in the wetwell is located midway between the water surface and the top of the torus structure.

Each one of the four sample lines has a manual valve and a solenoid valve before the analyzer unit. For the purpose of providing redundance each sample line is branched between the first isolation and the solenoid valves to a redundant manifold solenoid valve station. Power to the solenoid valves is provided from separate and redundant emergency buses.

Upon leaving the solenoid valves the four sample lines become one line which feeds into a hydrogen analyzer. Upon leaving the hydrogen analyzer the sample line is piped to the wetwell.

Samples are taken in a continuous sequence for the three drywell points and the wetwell point and are recorded in the control room. When the concentration in the drywell or wetwell reaches a high concentration setpoint an alarm in the control room is activated.

The system is initiated manually. Upon failure of any part of an operating train the operator would manually shift the system to the redundant train.

13. Question

§50.44 requires that the licensee demonstrate the capability for containment mixing. You have included, in your design report, a discussion of the inherent capabilities for containment mixing during and following a LOCA. We find that the following information is needed in order to continue our review (1) how long will the inherent containment mixing capability remain effective, and (2) what means are available to maintain effective containment mixing as the natural circulation mixing capability diminishes.

Response

- The containment mixing capability remains effective because of fan coil continuous operation.

14. Question

In your analysis for the ACAD system design, constant containment temperature is assumed. To substantiate the foregoing assumption, describe the method or mechanism for containment cooling during the period of repressurization in order to keep the containment temperature reasonably constant.

Response

- Temperature transients are not of concern prior to ACAD system initiation, at which time containment cooling would be maintained through the use of the drywell fan coil units, initiation of RHR torus cooling, or containment spray.

15. Question

You have indicated that a test connnection will be provided between the first and second isolation valves for the purpose of containment leak testing (Type C test). As a result, one of the valves will be subjected to reverse flow condition. If you ever intend to test one of the valves in reverse flow condition, you must demonstrate that the results from reverse flow conditions is equivalent to or more conservative than those from forward flow conditions. In addition, describe the administrative procedures to ensure proper closure of testing connections after each test.

Response

- Reference I & E Inspection Report 77-06 Page 1 and 10.
- The manufacturer of these valves (Anchor/Darling Valve Company) had been contacted previously about this due to I & E Inspection Report 77-06. Their response was "the test pressure of 58 psig is small in comparison with the design differential pressures and would not be expected to affect the unit seat loading enough to influence the seat leakage results." The Tech Specs permit this type of testing and where necessary (e.g. MSIV's) a relaxation of the full test pressure has been obtained.
- The test valves are normally checked by a system valve line-up prior to start-up, but there are not direct procedural controls over these valves.

16. Question

Describe the administrative procedure by which the ACAD system operators will be readily available at the time of a LOCA, and how many operators will be needed to operate the ACAD system which includes the hydrogen monitoring system, repressurization system and venting system.

Response

- Only one operator is required to operate the ACAD system and CAM system. Administrative Procedure 1.4.11.6, Manning of the Control Room and Control Room Watch Requirements, states that one licensed operator must be in the Control Room at all times (accept if uninhabitable). It further states that a two-man rule is always in effect for the Control Room. Technical Specification, Section 6, details station manning requirements.

17. Question

Describe the bases for the selection of the location of the hydrogen sensing point in both the drywell and wetwell. Describe the precautions that were taken to preclude the detectors that are located in the suppression chamber from being immersed in water at any time during a LOCA. If no precautions were taken to preclude immersion of the detectors, what effect would this have on the detector output?

Response

- Locations are based on a representative sample.
- The detectors are not in the drywell or subject to immersion. The analyzers are approximately 50 feet above the torus.
- Reference detector prints to show water drainage mechanisms.

18. Question

In accordance with BTP CSB 6-2 Section B.3, the instrumentation for the CAM and ACAD systems are required to be designed to the requirements of Engineered Safety Features and as such must satisfy requirements of IEEE 279-1971. Document this requirement and describe the system to the extent necessary for an independent reviewer to be able to analyze the design and verify that the design satisfy the IEEE 279-1971 requirements.

Response

Prints and documentation will be provided or discussed after the meeting.

19. Question

Describe how the proposed combustible gas control system meets the requirements of Branch Technical Position EICSB 19.

Response

- Reference EICSB 19. Show not applicable to CNS.

20. Question

The licensee's letter of October 12, 1976 contained the responses to nine questions. Question 3 requested information on both the ACAD and CAM systems; but the response addressed only the ACAD system. Respond to the two-part question for the CAM system.

Response

Question 3 was as follows:

"Describe the bases which assure that the ACAD and CAM systems are protected from the effects of missiles and high energy line ruptures."

- The CAM system was not described before because their location was uncertain. They meet the same criteria as the ACAD system.
- The location of the CAM system H_2 analyzers does not make them susceptible to damage from missiles. The analyzers are close to the Standby Liquid Control Pumps, but the axis of rotation for the pumps are perpendicular to the analyzers. The analyzers are separated by distance. Sample lines are separate.

- There are no high energy lines in the area. The analyzers are located on opposite sides of the Standby Liquid Control System Pumps.

21. Question

Address the question of location of the hydrogen analyzers as to the environmental qualifications and separation of redundant systems.

Response

- Space is isolated with no energy sources (i.e. not in drywell).

22. Question

Describe seismic qualifications of presently installed H_2 sampling system (piping) that is utilized by the CAM system.

Response

The Hydrogen Sampling System piping is Seismic Class I as presently installed. Support spacing does not exceed the suggested pipe support spacing of ANSI B31.1 1973 Power Piping Code. Piping material is Stainless Steel Schedule 40 seamless which meets specification ASME-SA 312 TP 304 and ANSI B36.19 all piping is adequately supported and located free of interference with other piping and equipment. The quality of work meets the standards and specifications in USASI B31.1, or USAS B31.7 for Class IS systems. Where more than five (5) lines are run adjacent and parallel to one another, tubing trays are to be used. Tubing in trays is strapped together and tied down. Tubing runs outside, trays are strapped together and routed to afford maximum physical protection from mechanical damage and are protected by lightweight angle iron.