Nebraska Public Power District

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July 17, 1985

U.S. Nuclear Regulatory Commission
Attention: Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Subject: Response to Request for Additional Information - Hydrogen Recombiner Capability
Cooper Nuclear Station
NRC Docket No. 50-298, DPR-46

Reference:

1) Letter from T. J. Dente to D. G. Eisenhut dated August 12, 1982, "NEDO-22155, Generation and Mitigation of Combustible Gas Mixtures in Inerted BWR Mark I Containments"

2) SECY-83-292 dated July 19, 1983, "Applicability of Recombiner Capability Requirements of Revised 10CFR50.44 to BWR Licensees with Mark I Containments"

3) Letter from D. G. Eisenhut to all Licensees of Operating Reactors dated May 8, 1984, "Recombiner Requirements of 10CFR50.44(c)(3)(ii) (Generic Letter No. 84-09)"

4) Regulatory Guide 1.7, Revision 2, November, 1978, "Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident"

5) Letter from W. Gammill to J. M. Pilant dated August 27, 1979.

Dear Mr. Vassallo:

This letter is written to provide the additional information requested in your letter of May 15, 1985, in order to complete the review of the Hydrogen Recombiner/Hydrogen Control System at Cooper Nuclear Station. The information contained herein shows how the CNS inerting system meets the requirements of

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10CFR50.44(g) and the provisions of Regulatory Guide 1.7, "Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident." Commitments are made to delete additional potential oxygen sources in the containment, such as the Air Containment Atmosphere Dilution (CAD) System, in order to be in conformance with Generic Letter No. 84-09, "Recombiner Capability Requirements of 10CFR50.44(c)(3)(ii)"

Accordingly, the District has shown that hydrogen recombiner capability is not required at CNS.

Sincerely,

Jay M. Pilant

Jay M. Pilant
Technical Staff Manager

JMP:rs17/5

ENCLOSURE

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

HYDROGEN RECOMBINER CAPABILITY

COOPER NUCLEAR STATION

REQUEST 1. Provide a list of all pressurized systems within the containment using atmospheric air. Include the volumes and flow rates of air that could be released into the containment in case of system failure. Describe the isolation provisions for these systems and provide a reference to relevant drawings. In general, justify the use of atmospheric air within the containment.

RESPONSE 1:

SYSTEM	COMPONENT SUPPLIED BY AIR	COMPONENT DESCRIPTION	FLOWRATES (SYSTEM FAILURE)	DRAWINGS	NOTES
Reactor Recirculation	RR-741AV	Inboard Sample Line Isolation	500 SCFH	Burns & Roe Dwg. 2027	A, C, D
Residual Heat Removal	RHR-512AV	Testable Check Loop A	1880 SCFH	Burns & Roe Dwg. 2040	B, C, D
Residual Heat Removal	RHR-532AV	Testable Check Loop B	1880 SCFH	Burns & Roe Dwg. 2040	B, C, D
Core Spray	CS-684AV	Testable Check Loop A	1880 SCFH	Burns & Roe Dwg. 2045	B, C, D
Core Spray	CS-678AV	Testable Check Loop B	1880 SCFH	Burns & Roe Dwg. 2045	B, C, D

NOTES:

A. Currently uses instrument air; however, the existing instrument air supply will be converted to Nitrogen supply, with instrument air backup during the next refueling outage, currently scheduled for September, 1986. At that time, the backup instrument air will be manually isolated from the Nitrogen supply to prevent automatic injection of instrument air into primary containment, in the event of a pressure drop in the Nitrogen supply.

For the duration of the present operating cycle, the IA supply to RR-741AV will be a potential source of Oxygen to the containment, in the event of equipment failure. However, a complete IA line shear would result in an oxygen addition of only 100 SCFH (Oxygen concentration is only 20% of the total 500 SCFH). Over an eight hour period this volume is less than 0.6% of the total drywell and vent system free air space. Additionally, in the event that such a failure would go unnoticed by plant operating personnel (local and remote indicator readings every 8 hours and continuous chart recorder indication), containment O_2 analyzers would alarm at 3.6% volume O_2, alerting operators in time to take the appropriate corrective actions before the Technical Specification O_2 limit of 4% is reached.

B. Instrument air to the valve inside primary containment is normally isolated, except for performance of monthly Technical Specification operability surveillances.

C. Air supply is provided with manual valve isolation.

D. The volumes apply only to tubing runs and are considered insignificant in relation to total drywell volume.

REQUEST 2. In case of a pressure drop in the normal Nitrogen Supply System for the drywell pneumatic system, the check valve between the Nitrogen Supply System and Instrument Air System would automatically open and inject atmospheric air into the drywell piping. We do not find automatic actuation of a back-up air system to be in compliance with the criteria provided in Generic Letter 84-09. To be acceptable, the system should be designed such that an inadvertent inleakage of air can be prevented and adequate administrative controls should be developed to prevent the use of the back-up air system during power operation and during post-accident situation. If the air supply is used during cold shutdown modes, give the procedures preventing start-up of the plant whenever the drywell accumulators are filled with air.

RESPONSE 2:

Manual or power operated isolation valves will be evaluated for those containment N_2 systems which utilize back-up air systems. The District will review and revise applicable procedures to provide adequate administrative controls regarding the use of back-up air systems during power operation and during post-accident situations. Procedure revisions will include isolation of back-up air to drywell pneumatic systems as well as appropriate measures to monitor containment nitrogen supply system pressure on a periodic basis. The evaluation, review, and revision of procedures will be completed prior to startup from the first refueling outage commencing 180 days after NRC acceptance of this approach.

The combined volume of drywell accumulators when converted to standard pressure and temperature is approximately 100 ft^3; of this, only 20 ft^3 would be O_2. This amounts to only .01% of the total drywell and vent system free air space. Procedures to prevent start-up of the plant with the drywell accumulators filled with air are unnecessary.

REQUEST 3. Plants such as Cooper are required by 10CFR50.44(g) to be provided with a post-accident combustible gas control system. In meeting this requirement, the staff requires that the hydrogen generation rates stipulated in Regulatory Guide 1.7 be used in evaluating the adequacy of those systems which were a part of the original design basis accident (DBA) analysis. Consequently, you are requested to show how Cooper meets the requirements of 10CFR50.44(g) and show that the hydrogen generation rates used in the combustible gas control analysis comply with Regulatory Guide 1.7.

RESPONSE 3:

10CFR50.44(g)

10CFR50.44(g) requirements are as follows:

> "For facilities with respect to which the notice of hearing on the application for a construction permit was published on or before December 22, 1968, if the combined radiation dose at the low population zone outer boundary from purging (and repressurization if a repressurization system is provided) and the postulated LOCA calculated in accordance with 10CFR100.11(a)(2) is less than 25 rem to the whole body and less than 300 rem to the thyroid, only a purging system is necessary, provided that the purging system and any filtration system associated with it are designed to conform with the general requirements of Criteria 41, 42, and 43 of Appendix A to 10CFR50. Otherwise, the facility shall be provided with another type of combustible gas control system (a repressurization system is acceptable) designed to conform with the general requirements of Criteria 41, 42, and 43 of Appendix A to 10CFR50. If a purge system is used as part of the repressurization system, it shall be designed to conform with the general requirements of Criteria 41, 42, and 43 of Appendix A to 10CFR50. The containment shall not be repressurized beyond 50 percent of the containment design pressure."

10CFR50.44(g) requires either a purging system designed to conform with General Design Criteria (GDC) 41, 42, and 43 or another type of combustible gas control system designed to conform with GDC 41, 42, and 43. CNS has a properly designed other type of combustible gas control system. 10CFR50.44(h)(2) defines a combustible gas control system as a system that operates after a LOCA to maintain the concentrations of combustible gases within the containment below flammability limits. The analysis which shows that oxygen concentrations at CNS are below the flammability limits was submitted by the BWR Owners Group in Reference 1, and accepted by the staff in References 2 and 3. By definition, to "operate" means to perform a function or to produce an appropriate effect. The inerted containment at CNS functions effectively after a LOCA to maintain the concentrations of combustible gases within the containment below flammability limits. An inerted containment, which is a passive combustible gas control system, is in general conformance with GDC 41, 42, and 43.

Regulatory Guide 1.7

The hydrogen and oxygen generation rates stipulated in Regulatory Guide 1.7, (Reference 4) have been considered. The BWR Owners Group analysis (Reference 1) determined that the peak oxygen concentration at CNS will be below the maximum allowable concentration specified in Regulatory Guide 1.7,

using conservative assumptions, at all times without requiring containment venting or hydrogen recombiners. The key physical feature for assuring combustible gas control is the existence in all cases of a hydrogen gas overpressure in the containment. This hydrogen gas overpressure assures a dissolved hydrogen concentration in coolant liquids which is sufficient to stabilize radiolysis, but is insufficient to become flammable. Therefore, the CNS combustible gas control analysis can be considered to comply with the Regulatory Guide 1.7 hydrogen generation rates. Additionally, the NRC Safety Evaluation for this oxygen analysis has been stated as being implicit in Generic Letter 84-09 (Reference 3) and used on another docket as the basis for the same combustible gas control system as exists at CNS.

Generic Letter 84-09

CNS meets the three criteria of Generic Letter No. 84-09 in that 1) Technical Specification 3.7.A.5 meets the 4% oxygen limit, 2) nitrogen will be used in all pneumatic control systems within the containment after modifications and, 3) there will be no potential sources of oxygen within the containment when the modifications of Requests No. 1 and 2 are completed and the air CAD System is removed.

Paragraph 3 of Generic Letter No. 84-09 made it "clear that a plant that has a 'safety grade' purge/repressurization system designed to conform with the general requirements of Criteria 41, 42, and 43 of Appendix A of 10CFR, Part 50, and installed in accordance with 50.44(f) or 50.44(g) must continue to have that system . . ." CNS does not have a safety grade purge/repressurization system (i.e., CAD system) which is complete and licensed. The following is a brief history of the air CAD system development at CNS. In early 1971, a description for a nitrogen CAD system was submitted with the FSAR. In early 1973 the CNS Safety Evaluation Report was issued on the basis of an inert nitrogen atmosphere to preclude flammable gas concentrations in the containment. With the issuance of the predecessors to the present Regulatory Guide 1.7, the District made the decision to proceed with the design and installation of an air CAD System in mid-1975. In early-1976 a description of the air CAD System was submitted to the NRC and a meeting with the staff was held. The NRC issued questions on the proposed system on various occasions until August 27, 1979, when the District received a letter stating that the staff had suspended further review work on the air CAD system due to events involving Three-Mile Island-2. Various issues and modifications remained to be resolved and completed before the staff would consider the air CAD System operable and issue the necessary Technical Specifications.

Because the present combustible gas control system (i.e., inerting) meets the LOCA design basis accident conditions, and because of the expense of backfitting and completing the air CAD system to convert it to a nitrogen CAD system, the District does not intend to perform this backfit. Additionally, regulations and NRC guidance criteria clearly do not require this expenditure.

REQUEST 4. If it is your intention to obtain approval for the currently-designed air CAD system as a means of compliance with 10CFR50.44(g), note that this CAD system would be a potential source of oxygen to the containment following a LOCA. As such, it would not meet Criterion 3 of Generic Letter No. 84-09. It is necessary that Cooper meet all three criteria of Generic Letter 84-09 to demonstrate that the facility does not rely primarily on purge/repressurization for post-LOCA combustible gas control. Plants that rely on purge/repressurization as the primary means of post-LOCA combustible gas control are required by 10CFR50.44(c)(3)(ii) to be provided with the capability for hydrogen-oxygen recombination. Therefore, if you conclude in response to Item 3 above that a CAD System is required to meet 10CFR50.44(g), please discuss how you intend to comply with 10CFR50.44(c)(3)(ii) without either converting your air CAD system to a nitrogen CAD System or adding recombiner capability.

RESPONSE 4:

The District does not intend to obtain approval for an additional system since the present combustible gas control system is in compliance with 10CFR50.44(g). After the modifications committed to previously, CNS will meet all three criteria of Generic Letter 84-09. CNS does not, and will not, rely upon purge/repressurization as the primary means of post-LOCA combustible gas control.