March 19, 1987

Docket No. 50-298

Mr. George A. Trevors, Division Manager -
Nuclear Support
Nuclear Power Group
Nebraska Public Power District
P.O. Box 499
Columbus, Nebraska 68601

SUBJECT: JANUARY 20, 1987, MINUTES OF MEETING WITH BWR OWNERS GROUP TO DISCUSS SYSTEMS FOR COMBUSTIBLE GAS CONTROL DURING A LOSS OF COOLANT ACCIDENT

Re: Cooper Nuclear Station

Dear Mr. Trevors,

On Tuesday, January 20, 1987, a meeting was held at NRC, Bethesda, Maryland, with representatives from GPU Nuclear (GPUN), Commonwealth Edison, Northeast Utilities and Nebraska Public Power District (NPPD) on the systems used in their Mark I containment (Mark I) plants for combustible gas control. These licensees have the following boiling water reactor (BWR) plants: Dresden 2/3 and Quad Cities 1/2 (Commonwealth Edison), Cooper (NPPD), Millstone 1 (Northeast Utilities) and Oyster Creek (GPUN).

Attachment 1 is the meeting summary which describes the significant items discussed and the actions, if any, taken or proposed. Attachment 2 is the list of the participants that attended the meeting. Attachment 3 contains the handout from the licensees for their presentation. The handout is arranged in the order of the licensees' presentation.

The staff requested that each licensee submit its plant-specific position on its compliance to 10 CFR 50.44(g). This submittal should include the assumptions made by the licensees to justify their position on 10 CFR 50.44. This submittal should also include the information discussed during the meeting on the reliability and capability of the containment inerting system and the window of accident sequences for which this system would be effective in controlling combustible gases. The staff stated that a passive system, such as the inerted containment, is not sufficient to meet 10 CFR 50.44(g) and that an active system, such as the containment inerting system, is required. The staff further stated that the reliability and capability of the existing containment inerting systems may be sufficient to meet, as a minimum, the intent of the GDC 41, 42 and 43 of 10 CFR 50.44(g). This is because the RG 1.7 hydrogen and oxygen source term indicative of large metal-water reactions may show that the licensee has sufficient time to respond with the existing system to the increasing combustible gas concentrations in the containment from radiolysis of water before the acceptable limits are exceeded.

The time available until unacceptable concentrations are reached would allow the licensee to overcome the lack of redundancy in components and in providing power to the system. This time period for the plant and the actions taken by the licensee should be discussed in the licensee's justification of the reliability of its containment inerting system.

Original signed by

William O. Long, Project Manager
BWR Project Directorate #2
Division of BWR Licensing

Attachments:
1. Summary
2. List of Attendees
3. Licensees' Handout for Meeting

cc w/attachments:
See next page

DISTRIBUTION
Docket File
NRC PDR
Local PDR
PD#2 Reading File
DMuller
WLong
OGC-Bethesda
EJordan
BGrimes
ACRS (10)
TRotella
JZwolinski
RBernero
GLainas
JDonohew
JStang
JShea
PHearn
JKudrick
JHulman

OFFICIAL RECORD COPY

DBL:BWD2	DBL:BWD2	DBL:BWD2
SNorris	WLong	DMuller
/ /87	3/19/87	3/19/87

Mr. George A. Trevors
Nebraska Public Power District

Cooper Nuclear Station

cc:
Mr. G. D. Watson, General Counsel
Nebraska Public Power District
Post Office Box 4999
Columbus, Nebraska 68601

Cooper Nuclear Station
ATTN: Mr. G. Horn, Division
Manager of Nuclear Operations
Post Office Box 98
Brownville, Nebraska 68321

Mr. M. Steffensmeier, Supervisor
Hazardous Waste Section
Nebraska Department of Environmental Control
Post Office Box 94877
Lincoln, Nebraska 68509

Mr. William Siebert, Commissioner
Nemaha County Board of Commissioners
Nemaha County Courthouse
Auburn, Nebraska 68305

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Post Office Box 218
Brownville, Nebraska 68321

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Mr. Harold Borchart, Director
Division of Radiological Health
Department of Health
301 Centennial Mall, South
Post Office Box 95007
Lincoln, Nebraska 68509

ATTACHMENT 1

SUMMARY OF JANUARY 20, 1987 MEETING WITH BWR OWNERS GROUP

INVOLVING COMBUSTIBLE GAS CONTROL

The licensees began their presentation with a history of the licensing activity concerning combustible gas control systems. These are pages 1 through 5 in the handout. The regulations governing the standards for these systems are contained in 10 CFR 50.44. These regulations are discussed below:

Paragraph 50.44(c)(3)(i) requires each Mark I containment be normally inerted during power operation. All these plants meet this requirement and the containments are inerted for power operation except for 24 hours during startup to inert and shutdown to deinert.

Paragraph 50.44(c)(3)(ii) requires plants relying on a purge/repressurization system as the primary means of combustible gas control shall have an installed recombiner capability. The Commission determined in Generic Letter 84-09 dated May 8, 1984, that Mark I plants did not have to have this capability if the plant met the 3 technical criteria listed in the letter. The 3 criteria are given on page 3 of the handout.

Paragraph 50.44(g) requires all combustible gas control systems to meet General Design Criteria (GDC) 41, 42 and 43. This regulation applies only to those plants which have the notice of hearing on its application for the construction permit published on or before December 22, 1968. All of the plants involved in this meeting meet this condition and paragraph 50.44(g) applies to them. The GDC are in Appendix A to 10 CFR Part 50.

The licensees stated that their plants comply with the above regulations. The containments are inerted during power operation except briefly (24 hours) during startup and shutdown. This is allowed by the plant Technical Specifications (TS). It is the licensees' position that the primary means of combustible gas control is the inerted containment and not a purge/repressurization system, and the licensees have addressed in submittals to NRC how the 3 criteria in GL 84-09 are met at their plants. Therefore, the licensees stated that a hydrogen recombiner capability is not required, the combustible gas control system of Paragraph 50.44(g) is the inerted containment and it meets GDC 41 to 43. The basis for the licensees' conclusion that the inerted containment is sufficient to assure peak combustible gas concentrations are below acceptable limits without the need to take any action to purge, repressurize or provide a recombiner is General Electric Report NEDO-22155, "Generation and Mitigation of Combustible Gas Mixtures in Inerted BWR Mark I Containments" dated 1982.

The licensees stated that the NRC has identified some concerns in its review of NEDO-22155. This report was part of the NRC staff's basis for and was indirectly addressed in GL 84-09. The licensees explained that these concerns, listed in page 5 of the handout were addressed in a submittal dated November 5, 1982, from Millstone 1 which had additional information not given in NEDO-22155. This additional information was not discussed in this meeting.

The licensees discussed the typical system used to inert or de-inert the containment at their plants. The figure on page 6 is a typical containment inerting system for these plants. This system is operated during startup to inert the containment with nitrogen. This is through the nitrogen (N_2) makeup line and purging the containment through the ventilation exhaust line. The containment atmosphere is reduced to less than 4% oxygen for power operation. During shutdown, the containment atmosphere is increased to atmospheric conditions using the nitrogen purge line and the ventilation exhaust line. The containment is inerted during startup and de-inerted during shutdown to allow personnel to be in containment with a breathable atmosphere and conduct needed surveillance of the reactor coolant system while the reactor is at high temperature and pressure. This period of time is restricted by TS to 24 hours for startup and 24 hours for shutdown.

The licensees explained that this containment inerting system is a backup to the inerted containment for controlling combustible gases during a LOCA. This system could be used to purge the containment of such gases or to pressurize the containment to dilute the concentration of the gases. The licensees presented page 8 of the handout which compares the inerted containment and the containment inerting system to GDC 41, 42 and 43 of 10 CFR 50.44(g). The licensees concluded that the containment inerting system almost meets these GDC except for loss of power to the system and lack of some redundancy in components.

The "features" referred to on page 8 are the plant-specific features in the systems at each plant. These features might be different for each plant. The licensees explained that the containment inerting system is used continually during power operation. Besides startup and shutdown, these systems are used during power operation to maintain pressure in the atmosphere at about 1 psi gauge and to reduce containment pressure for the monthly tests of the torus-to-drywell vacuum breakers. The licensees stated that no additional surveillance should be needed for these systems to meet GDC 42 and 43.

The licensees further explained that the difference between the existing inerting system and a system meeting GDC 41 is the lack of redundancy in components and in supplying power. The existing inerting systems do not meet GDC 41 on single failure.

The staff stated that it did not consider the containment inerting system as a backup to the inerted containment. This system could not itself deal with the metal water reaction which generates large quantities of hydrogen at a high rate at the beginning of an accident. The production rate of hydrogen is too high for the current inerting system alone to keep combustible gases within acceptable limits. The inerted containment is the safety system to keep the hydrogen from the metal water reaction within acceptable limits. For the duration of an accident, an active combustible gas control system is required to maintain the hydrogen and oxygen concentrations from the radiolysis of water within acceptable limits.

The licensees continued their presentation with a discussion on when the inerting systems would be effective during accidents. This is pages 9 to 15 of the handout. The licensees stated that these systems are effective only for accident sequences where the metal water reaction is between 1% and 10% of the fuel cladding and channels in the core. The licensees explained that this is based on the report NEDO-22155 which shows that for above 10% the amount of hydrogen in containment will suppress the generation of oxygen and hydrogen generated from the radiolysis of water. This would be through the recombination of oxygen and hydrogen.

The licensees' conclusions of this discussion are on pages 14 and 15 of the handout. Page 14 is the accident event tree for the containment inerting system for Millstone Unit 1. The system is effective for only 1.7% of all core damage accident sequences. For this 1.7%, the system is effective 99.5% of the time. The existing system failure rate with core damage is only 2.6×10^{-8} events/year.

The licensees stated that requiring the existing containment inerting system to meet 10 CFR 50.44(g) could at best only raise the effectiveness of the system by 0.5% from 99.5% to 100.0%.

The licensees concluded their presentation with the following: (1) the Mark I plants meet 10 CFR 50.44(g) with the inerted containment and (2) the existing non-safety containment inerting systems are sufficient for addressing those accident sequences where the metal water reaction is between 1% and 10%. This is page 16 of the handout.

The staff stated that the window of accident sequences where the containment inerting system is effective may be too small. It further stated that the arguments presented had been reviewed when the staff reviewed NEDO-22155 prior to issuing GL 84-09. The staff did not agree with the report conclusion that above 10% metal water reaction the hydrogen generated suppressed the further generation of oxygen and hydrogen from the radiolysis of water. It stated that the uncertainties listed on page 5 of the handout were the basis for the staff's position that Regulatory Guide (RG) 1.7 should be used to calculate the generation of combustible gases during an LOCA.

In response to the staff, the licensees stated that if RG 1.7 were used, the number of accident sequences in which the inerting system could be used does increase. The licensee further stated that the existing system should be sufficiently reliable to handle these additional sequences; however, if this increase in accident sequences is high enough, it would be the justification for having the system meet GDC 41, 42 and 43.

The staff requested that each licensee submit its plant-specific position on its compliance to 10 CFR 50.44(g). This submittal should include the assumptions made by the licensees to justify their position on 10 CFR 50.44. This submittal should also include the information discussed during the meeting on the reliability and capability of the containment inerting system and the window of accident sequences for which this system would be effective in controlling combustible gases. The staff stated that a passive system, such as the inerted containment, is not sufficient to meet 10 CFR 50.44(g) and that an active system, such as the containment inerting system, is required. The staff further stated that the reliability and capability of the existing containment inerting systems may be sufficient to meet, as a minimum, the intent of the GDC 41, 42 and 43 of 10 CFR 50.44(g). This is because the RG 1.7 hydrogen and oxygen source terms indicative of large metal-water reactions may show that the licensee has sufficient time to respond with the existing system to the increasing combustible gasses concentrations in the containment from radiolysis of water before the acceptable limits are exceeded. The time available until unacceptable concentrations are reached would allow the licensee to overcome the lack of redundancy in components and in providing power to the system. This time period for the plant and the actions taken by the licensee should be discussed in the licensee's justification of the reliability of its containment inerting system.

ATTACHMENT 2

MINI-OWNERS MEETING TO DISCUSS SYSTEMS

FOR COMBUSTIBLE GAS CONTROL

JANUARY 20, 1987

NAME	ORGANIZATION
T. Rotella	NRC/NRR/DBL/BWD1
I. Johnson	CECo-Nuclear Licensing
J. Zwolinski	NRC/NRR/DBL/BWD1
D. Farrar	CECo-Nuclear Licnesing
E. Rowley	CECo-Engineering
R. Benero	NRC/NRR/DBL
G. Lainas	NRC/NRR/DBL
J. Donohew	NRC/NRR/DBL/BWD1
T. Pickens	NSP-Licensing
L. Nexbitt	GE San Jose Engineering
J. Lachenmayer	GPUN
G. Smith	NPPD Licensing
C. Grimes	NRC/NRR/DPLB/ISAPD
P. Blasioli	NU-Licensing
J. Stang	NRC/NRR/DBL/BWD1
J. Shea	NRC/NRR/DPLB
C. Wright	GE-Licensing
P. Hearn	NRC/NRR/DBL/PSB
J. Kudrick	NRC/NRR/DBL/PSB
J. Hulman	NRC/NRR/DBL/PSB
L. Gifford	GE-Licensing
M. Laggart	GPUN

Commonwealth Edison (CECo)
General Electric (GE)
GPU Nuclear (GPUN)
Nebraska Public Power District (NPPD)
Northern States Power (NSP)
Northeast Utilities (NU)