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Docket No. 50-245

Director of Nuclear Reactor Regulation
Attn: Mr. D. L. Ziemann, Chief
Operating Reactors Branch #2
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
SEP Topic VI-5 Combustible Gas Control

In response to questions received informally from the NRC Staff, regarding SEP Topic VI-5, Combustible Gas Control, Attachment I is provided.

The responses in the attachment to this letter are based on the current method of Combustible Gas Control which is oxygen control at Millstone Unit No. 1. It is recognized that criteria evolving from TMI-2 may impact NNECO's method for dealing with this issue; however, the attached description reflects a satisfactory method for mitigating the effects of combustible gas in the containment.

Should you have any questions, please contact us.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
Vice President

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Attachment

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MILLSTONE UNIT NO. 1
RESPONSES TO NRC QUESTIONS ON SEP TOPIC VI-5
COMBUSTIBLE GAS CONTROL

(1) NRC Question

The three systems needed for combustible gas control are (1) systems to mix the containment atmosphere, (2) systems to monitor combustible gas concentrations within the containment, and (3) systems to reduce combustible gas concentrations within the containment. For each of these three systems, provide the following information.

(a) Discuss the capability of the system to remain operable, assuming a single active failure, with or without the loss of offsite power.

(b) Discuss the capability of the system to withstand the dynamic effects, associated with a loss of coolant accident, to withstand the Safe Shutdown Earthquake without loss of function, and to remain operable in the accident environment.

(c) Discuss the codes, standards, and guides applied in the design of the systems and system components. Also, specify the functional design requirements for each component or system.

(d) Provide piping and instrumentation diagrams of the systems.

(e) Specify the plant protection system signal(s) that actuate the systems and components. Include a discussion of which systems or components are to be manually operated from the main control room, or from another point outside the containment and discuss the accessibility of the location following an accident.

Response

A system to mix the containment atmosphere is not needed since natural convection and diffusion have been analyzed in the response to Question 6.f in Appendix B of our FTOL application and shows effective mixing is achieved. Results of the analysis also show that oxygen concentration does not vary more than two percent throughout the containment under natural mixing conditions.

Millstone Unit No. 1 has an O_2 analyzer and grab sample capability which are normally used to ensure Technical Specification 3.7.A.6 compliance and to test containment atmosphere prior to personnel entry. While the O_2 analyzer is not designed for pressures significantly greater than atmospheric or high moisture conditions, sampling and analysis with a gas chromatigraph can be used under currently analyzed post-accident conditions.

Control of combustible gas concentrations following an accident can be achieved by adding additional N_2 to the containment atmosphere. In the event that containment pressure approaches containment design pressure, containment atmosphere can be vented through the standby gas treatment system (SGTS).

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(a) Samples may be manually taken from two locations in the drywell and one location in the torus, and may be analyzed using the single gas chromatograph (not on the emergency bus) or a portable oxygen analyzer as a backup. Thus, samples are obtainable after a single active failure and loss of power.

The N_2 system has redundant vaporizers, redundant N_2 addition pathways, and redundant containment isolation valves.

Active components of the SGTS and containment isolation valves are redundant except for one air operated valve. This valve fails open allowing venting through the SGTS. Both the N_2 addition system and SGTS are powered from emergency buses in the event of an LNP.

(b) All components of the nitrogen addition system, the SGTS, and the sampling system, except portions of the sample lines, are located outside the containment and will not be exposed to the dynamic effects of a LOCA or the accident environment. Failure of a sample line due to pipe whip or jet impingement does not preclude obtaining a representative sample because of the previously discussed uniformity of gas concentrations.

Seismic documentation is available for all piping between the reactor building wall penetration of line 6"-AC-2 and penetrations X-26 and X-205, penetrations X-25 and X-202 and Valve V-12-10, and from HVE-5A and B up to the underground piping leading to the stack.

(c) All electrical and instrument cabling was procured to Category 1E standards, containment isolation valve solenoids for the containment atmospheric sampling system were installed to IEEE-279 (1968). Piping for the nitrogen addition system, the SGTS and the containment atmospheric sampling system was designed, manufactured and installed in accordance with ANSI B31.1. Other equipment codes and standards are not readily available.

The functional design requirements of SGTS are in Section V-3.2.5 of the FSAR. The N_2 addition system was functionally designed to purge the containment volume (260,000 ft) down to four percent (4%) O_2 in four (4) hours and to provide continuous makeup of 200 - 1000 scf per day. The N_2 storage vessel has a capacity of 970,000 scf and a design pressure of 64 psig. The steam purging vaporizer has a capacity of 200,000 scfh and the makeup vaporizer has a 200 scf capacity.

(d) Drawings 25202 - 24002 HVAC Flow Diagram Reactor & Radwaste Buildings and 25202 - 26009 Flow Diagram Atmospheric Control System (enclosed) show the N_2 addition, purge exhaust, and SGTS.

(e) Containment isolation valves for the nitrogen addition systems, the SGTS and the containment atmospheric sampling system close on a containment isolation signal. SGTS is initiated on high reactor building exhaust radiation, high refueling floor area radiation, high primary containment pressure, low reactor vessel water level, or manually from the control room. All other systems for combustible gas control except sampling are also controlled from the control room. Containment isolation valves needed for combustible gas control can only be opened from the control room using jumpers if a containment isolation signal is present. Samples must be manually taken in the vicinity of the standby liquid control room in the reactor building.

(2) NRC Question

With regard to the systems that are relied on to mix the containment atmosphere, identify the ductwork that must remain intact to mix the containment atmosphere. Include a discussion of the design provisions that will ensure the ductwork will remain intact.

Response

Millstone Unit No. 1 does not have a system to mix the primary containment post-LOCA (see response to Question 1).

(3) NRC Question

For the system provided to monitor the combustible gas concentrations within the containment following an accident, provide the following information:

(a) Discuss the operating principle and accuracy of the combustible gas analyzer, and the method of readout employed (continuous or intermittent). If readout is intermittent, or samples must be taken, specify the time interval between readings or the taking of samples for analysis.

(b) Specify the locations of the multiple sampling points within the containment.

(c) Discuss the capability to monitor the combustible gas concentration within the containment independent of operation of the other combustible gas control systems.

(d) Discuss the temperature limitations of the sampling gas on the analyzing equipment, and the effect of prolonged exposure to radiation.

Response

(a) The gas chromatograph mentioned in 1(a) above has an accuracy of $\pm 5\%$. Plant procedures are being prepared that require the sampling of drywell and torus atmospheres every two (2) hours post-LOCA.

(b) Drywell atmospheric samples can be taken from the lower level sample point and the upper level sample point adjacent to the head seal area. There is one sample point in the torus.

(c) Sampling is completely independent of the N_2 addition system or SGTS operation.

(d) Due to the dilution of an extremely small sample volume with argon in the gas chromatograph, temperature and radiation effects are negligible.

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(4) NRC Question

In order to perform a confirmatory analysis of the production and accumulation of combustible gases within the containment following an accident, the following information is needed:

(a) The surface area and thickness of aluminum components, aluminum base paint, galvanized steel and zinc base paint.

(b) The basis (time or hydrogen concentration) for actuation of the combustible gas reduction system. Specify the design flow rate and the flow rate assumed in the analysis.

(c) The weight of the zirconium fuel cladding for Millstone Unit No. 1

Response

The Millstone Unit No. 1 systems used for combustible gas control are not dependent on hydrogen generation since oxygen control is utilized. Post-accident O_2 and H_2 curves have been generated to answer Question 6 in Appendix B to the Millstone Unit No. 1 FTOL application. Note that five percent metal-water reaction for the H_2 curve was assumed per Safety Guide 7, in effect at the time. The curve also assumed an initial O_2 concentration of four percent while Technical Specification 3.7.A.6 requires a five percent maximum.

O_2 concentration is normally maintained below four percent during normal plant operation and a Technical Specification change to lower the limit to four percent was proposed to the NRC in Appendix J to the Millstone Unit No. 1 FTOL application.

The N_2 addition system is capable of a maximum flow of 200,000 scfh which is orders-of-magnitude above the 1200 scfh required for dilution of O_2 formed from radiolysis. N_2 would be added following an accident as needed to keep O_2 below five percent. Therefore, the specific information requested in the above NRC question is not directly applicable to the current method of combustible gas control.

(5) NRC Question

Describe the program for periodic operability testing of the combustible gas control systems and system components. Discuss the scope and limitations of these tests.

Response

Containment isolation valves are tested per Technical Specifications 3/4.7A and 3/4.7D. The SGTS is tested per Technical Specification 3/4.7B.

IMAGE EVALUATION TEST TARGET (MT-3)

6"