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February 10, 1984

Docket Nos. 50-348
50-364

Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. S. A. Varga

Joseph M. Farley Nuclear Plant - Units 1 and 2
10CFR20 Exemption Request; Iodine Filter Respiratory Protection
Additional Information for Radiological Assessment Branch

Gentlemen:

The attached responses are provided to the request for additional information enclosed in your letter dated February 8, 1984. This information is submitted in support of our January 13, 1984 request for exemption to 10CFR20, Appendix A, footnote (c) to allow credit for a protection factor when using the MSA 466220 GMR-I canister in atmospheres containing radioiodine.

Yours very truly,

F L Clayton Jr

F. L. Clayton, Jr.

FLCJr/WCC:ddr-D8
Attachment
cc: Mr. R. A. Thomas
Mr. G. F. Trowbridge
Mr. J. P. O'Reilly
Mr. R. E. Alexander
Mr. E. A. Reeves
Mr. W. H. Bradford
Dr. I. L. Myers

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Response to: **Radiological Assessment Branch Iodine Canister Question Request**

Question:

471.1 "Describe the methods which will be utilized to reduce potential radioiodine levels in the work area to minimal levels. This should include a discussion of the utilization of engineering controls, reactor coolant cleanup/purification, degasification, decay schemes, and system and area decontamination. Long term efforts to alleviate the root causes of this problem, such as fuel quality control, fission product/iodine trending, and operational controls should be briefly discussed."

Response:

Engineering Controls:

Negative pressure ventilation blowers were procured and are utilized to reduce airborne contamination in steam generator manway openings and general work areas where the reactor coolant system (RCS) is breached. Upon shutdown for an outage, the containment purge system is operated to reduce general airborne contamination to as low as practical.

Reactor Coolant Cleanup/Purification:

Upon each shutdown for refueling, hydrogen peroxide is injected into the reactor coolant system to induce a crud burst. Following the crud burst, purification flow via demineralizers is maximized to accomplish cleanup of the reactor coolant prior to opening the system for maintenance. This procedure reduces iodine concentration levels.

Degasification:

Normal shutdown procedures require degasification of the RCS by venting the pressurizer vapor space and educting the reactor vessel head. Both processes remove and reduce radioactive gas concentrations including iodine.

Decay Schemes:

Maintenance planning for outage items includes consideration of decay times for isotopes of concern, particularly iodine, prior to major breaches of primary systems. If practical, time is allowed for contamination reduction by decay prior to work commencement.

System and Area Decontamination:

Prior to commencing outage maintenance, time is allotted to decontaminate affected areas. Surveys are conducted frequently during maintenance activities and cleanup/decontamination is conducted accordingly. At the end of each outage, time is allotted for decontamination of maintenance areas as well as overall decontamination of containment surfaces. For instance, a strippable coating is applied to the refueling cavity floor and walls to remove loose surface contamination.

Long Term Corrective Action:

A major design change was implemented to alleviate the root cause of the failed fuel and resultant iodine problem as described in the attached letter dated April 5, 1983. Following this design change, iodine levels have been significantly reduced, indicating at least partial success in reducing fuel damage. Key radioisotopes including iodine are trended as a means of monitoring for failed fuel and to identify probable assemblies as leakers.

Question:

471.2 "Discuss the bases for your assessment that the use of positive pressure airline respirators (which provide a high level of protection along with some body cooling) degrade worker performance and efficiency as much as 25-50%. This should include your dose rate, time and manpower estimates for the overall task."

Response:

Airline respirators do provide a high level of protection and some body cooling but also cause a restriction in mobility for the individual worker. This loss of mobility often dictates use of an additional man receiving additional exposure on otherwise one-man jobs. This is not an ALARA practice if acceptable means of non-tethered respiratory protection are available. Airlines become a significant impediment when a task requires numerous workers at one location. An example of such a job is the reactor vessel head removal which subjects workers to dose rates ranging from 150 mr/hr to 900 mr/hr. This task requires approximately one week and typically involves ten workers. Airline hose entanglement and mobility are significant considerations in reducing man-rem.

Question:

471.3 "Describe those actions planned to evaluate actual exposures of workers to airborne radioiodine concentrations as outlined in 10CFR20.103. This should include on-the-job and post task evaluations encompassing surveys, air sampling, and whole body/thyroid counts. A summary of the results of these actions should be provided to the NRC staff for evaluation of program effectiveness."

Response:

Air samples are taken prior to commencing work involving airborne hazards as a routine practice. This is used to determine adequate respiratory protection and to determine isotopic MPC hours. Additional air samples are taken frequently during the job, particularly if potential for creating airborne contamination exists. These are used to evaluate the adequacy of prescribed respiratory protection and to upgrade protection if required. Sample whole body and thyroid counts are conducted afterward for comparison and to verify the adequacy of protective measures. In addition, nasal swipes are taken from each respirator user. These swipes have proven to be reliable indicators for nuclide penetration through a cannister. Records of these actions which are routinely examined by I&E inspectors during radiological protection inspections will be available for review subsequent to use of the GMR-1 canister.

Question:

471.4 "What additional training will be conducted to familiarize workers and health physics personnel with the restrictions and limitations for use of the GMR-I Canister for radioiodine protection?"

Response:

Upon approval of a protection factor for iodine cannisters (GMR-I), procedures will be revised to incorporate the restrictions and limitations listed in our January 13, 1984 letter. Each health physics technician controlling respirator issue or use will receive training on these limitations. Each individual who is issued a GMR-I cannister will be briefed on the restrictions and limitations of the device. This information will be incorporated into the plant's respirator training program.

Question:

471.5 "Work performed by LANL on several brands of cartridges (NUREG/CR 3403) showed a difference in penetration of radioiodine gas for some cartridges when cartridges were tested under conditions of flow cycling (representative of breathing) versus the same flowrate but under constant or steady state flowrate conditions. In general cyclic flow caused a decrease in service life of the cartridges. The experimenter suggests that unknown factors perhaps charcoal granule size, packing density, bed depth, etc., may be effecting penetration since the effect is unpredictable based on comparison with computer modeling calculations or data supplied to him by the cartridge manufacturers. The experimenter recommends incorporating flow cycling based on breathing patterns into the test method. The licensee's exemption request does not include flow cycling in the test protocol. On the basis of what testing data does the licensee intend to account for this effect or lack thereof in testing or using cartridges?"

Response:

The LANL work did indicate a decrease in service life for cyclic flow versus constant flow for a variety of charcoals, referring to cannisters from all manufacturers in general. However, the LANL test results, specific to MSA, reveal that the GMR-I canister performed equally in cyclic flow and constant flow conditions. The LANL results for the GMR-I canister are consistent with experimental results obtained by the manufacturer. Subsequent to receipt of the NRC request for additional information, MSA conducted additional tests on February 2, 1984 using cyclic flow. MSA has reported, "it was found that the cyclic tests did not result in a reduced service time. In fact, it has been our general experience that constant flow testing results in less service time than cyclic testing."

Question:

471.6 "Los Alamos found that water vapor in air was by far the most significant variable effecting the service life of the cartridges at expected conditions of use. Since the amount of water in the air or relative humidity is greater as the temperature of the air increases (i.e., warmer air holds more water than cold air) the air temperature during testing and use is crucial. The log percent relative humidity versus service life is a linear relationship.

a. How does your test protocol account for the temperature the cartridges will see in use, i.e., 30°C versus 25°C as proposed?

b. Does the test protocol allow for extrapolation (via the above relationship between relative humidity and service life at a given temperature) to worst case relative humidity/temperature of proposed use?"

Response:

In clarification, it should be noted that two test protocols used by MSA have been referenced in our correspondence; a qualification test protocol and a QA test protocol.

The initial qualification tests were conducted for three conditions as follows:

	Temperature	Relative Humidity	Flow
Qualification Test 1	110°F	50%	Constant 64 Lpm
Qualification Test 2	110°F	90%	Constant 64 Lpm
Qualification Test 3	50°F	50%	Constant 64 Lpm

A subsequent qualification test was conducted by MSA on February 2, 1984, refernced in response to 471.5 above and summarized below:

	Temperature	Relative Humidity	Flow
Qualification Test 4	110°F	90%	Cyclic 56 Lpm (maximum capacity of MSA's cyclic machine)

All qualification tests demonstrated an eight hour use time to be acceptable.

The QA test protocol, submitted in our January 13, 1984 request for exemption, proposed the following conditions:

	Temperature	Relative Humidity	Flow
Proposed QA Testing	77°F (25°C)	85%	Constant 64 Lpm

The qualification tests demonstrate the canister's adequacy for an eight hour use time at the test conditions. Thusfar, the most extreme qualification test (Test 2) was at 110°F and 90% relative humidity. We do not intend to attempt extrapolating a use time beyond these conditions since the qualification tests thusfar were conducted for a specified time interval rather than to canister breakthrough. These limits will not be exceeded until MSA conducts actual tests at more extreme conditions or until tests are conducted to breakthrough which would provide time duration data points permitting extrapolation.

The QA tests are intended only to verify the acceptability of a manufactured lot and therefore do not require the extreme test conditions of the qualification test. To comply more closely with the LANL testing recommendations, MSA has agreed to conduct QA testing at 30°C vice 24°C as originally proposed.

Question:

471.7 "What is the value of performing the equilibration test?"

Response:

Quoting the manufacturer: "LANL found water vapor to be the most significant factor affecting canister service life. While it is recognized that the canister inlet and outlet openings are sealed and service time should start when the seals are removed, we felt it would still be valuable to run tests with equilibrated canisters. This, of course, was a more stringent, conservative test which allows for water vapor adsorption in the event the canister seals are less than perfect."

Question:

471.8 "The licensee proposes to provide for quality control of the cartridges pursuant to the proposed test method per MIL STD-105. What is the criteria for acceptable service life under the proposed test conditions? What AQL is proposed for use in conjunction with MIL STD? What are the limits on variability for service life values?"

Response:

Again quoting the manufacturer: "In our original test protocol proposal, we suggested a total of eight canisters be tested; four as received, and four equilibrated. We would like to change this number to five in each conditions for a total of ten tests. This sample size complies with MIL-STD 105 Level S-1. If a single canister of the ten total canisters does not pass the test protocol, the entire lot will be rejected (hence, variability is not a consideration). This sample size covers lot sizes ranging from 501 to 35,000 units, which our production lots will always fall between. The AQL for this level is 2.5%." Summarizing, the proposed QA test acceptance criteria will be no breakthrough beyond .25 ppm with a challenge concentration of 25 ppm CH_3I and a 64 Lpm flowrate for 8 hours at 30°C and 85% RH.

Question:

471.9 "What actions will be taken by the licensee to ensure that the 8 limitations for use enumerated by the licensee on page 2 of the request for exemption are not exceeded?"

Response:

A specific procedure will be written and implemented to incorporate the referenced limitations. Health physics technicians issuing respirators and/or providing health physics coverage on work requiring respirators will be required to qualifiy on these procedures.

Question:

471.10 "Identify the procedures which will incorporate the controls and restrictions associated with the use of GMR-I canisters for radioiodine protection."

Response:

Draft procedure FNP-0-RCP-117, "Issue and Use of GMR-I Idodine Canisters" will be issued upon NRC approval of a protection factor.

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Alabama Power
the southern electric system

April 5, 1983

Docket No. 50-348

Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. S. A. Varga

Joseph M. Farley Nuclear Plant - Unit 1
Reactor Internals Upflow Conversion

Dear Mr. Varga:

In our letter of August 16, 1982 Alabama Power Company advised the NRC that the Farley Nuclear Plant Unit 1 was experiencing higher than expected reactor coolant system radioactivity levels. These radioactivity levels were believed to have been caused by excessive clearances in the reactor vessel lower internals baffle joints which would allow unacceptable water jetting (baffle jetting) on certain fuel assembly rods thereby inducing fuel rod vibration resulting in rod damage or failure due to wear and/or fatigue. Previous baffle peening employed at Farley was believed to have exacerbated the baffle joint clearance problem at other baffle joints. Subsequent inspections of these joints have proven this hypothesis correct.

Although the reactor coolant system radiochemistry continued to remain within Technical Specification limits, Alabama Power Company, in concert with Westinghouse Electric Corporation, performed extensive planning and development work in preparation for correcting this anticipated baffle jetting problem. On January 14, 1983 Farley Nuclear Plant Unit 1 was shutdown for normal refueling and implementation of the modification developed to resolve the baffle jetting problem. This modification consisted of converting the reactor coolant flow direction between the core barrel and the baffles from downflow to upflow to reduce the pressure differential across the baffle joints. Specifically, the modification was accomplished by plugging holes in the core

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barrel; by drilling holes in the upper former plate; and by closing all baffle gaps. The modification was completed as planned with all aspects of the job being covered in Alabama Power Company's planning base for the work.

Alabama Power Company performed a detailed review of the upflow modification which included mechanical, nuclear and thermal-hydraulic design considerations, appropriate accident analyses, and the comprehensive test program employed by Westinghouse to confirm the validity of the proposed upflow conversion. This review concluded that the Unit 1 reactor lower internals upflow conversion could be accomplished in accordance with plant design criteria and within existing plant safety analyses. Alabama Power Company's Plant Operations Review Committee concluded that no unreviewed safety question or technical specification changes were involved and, accordingly, the modification was performed under 10CFR50.59.

During the full core offload which preceded the upflow modification work, fuel cladding damage was visually observed on eleven Cycle 4 baffle fuel assemblies. The damage to the assemblies was at the corner injection baffle joints, primarily in the top fuel span region between grids 7 and 8. Fuel rod and pellet debris resulted from this damage. In addition to the eleven visually observed damaged fuel assemblies, one assembly located at a center injection baffle joint in Cycle 4 and three assemblies in interior core positions were determined to be leaking by fuel sipping. The damaged and leaking assemblies are now stored in the spent fuel pool and will not be utilized in the next reload core. At no time was the health and safety of the public affected. This fuel cladding damage information was provided to the Office of Inspection and Enforcement, Region II, on February 11, 1983 via Joseph M. Farley Nuclear Plant, Unit 1, Licensee Event Report No. LER 83-005/01T-0.

At the request of Mr. E. A. Reeves of your staff, two condensed video-tapes of the eleven fuel assemblies exhibiting visual damage have been forwarded. The one-half inch VHS format tape runs approximately eighty minutes and provides high and low magnification scans of the damaged areas. The three-quarter inch commerical format tape runs approximately eleven minutes and is primarily low magnification scans. These tapes are provided for your use; however, it is requested that they be returned upon completion of your review.

Alabama Power Company is confident that the modifications made during this refueling outage have resolved the problems identified above. We will continue to keep you informed of any changes to this position.

If you have any questions, please advise.

Yours very truly,

F. L. Clayton Jr.

F. L. Clayton, Jr.

FLCJr/JAR:jc-D40

cc: Mr. R. A. Thomas
Mr. G. F. Trowbridge
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Mr. W. H. Bradford