UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 134 TO FACILITY OPERATING LICENSE NO. DPR-58

AND AMENDMENT NO. 119 TO FACILITY OPERATING LICENSE NO. DPR-74

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-315 AND 50-316

1.0 INTRODUCTION

By letter dated July 31, 1987, (supplemented October 26, 1987) the Indiana Michigan Power Company (IMPC or licensee) requested amendments to the Technical Specifications (TS) appended to Facility Operating License Nos. DPR-58 and DPR-74 for the Donald C. Cook Nuclear Plant, Unit Nos. 1 and 2. The proposed amendments would incorporate TS associated with the radiation monitoring requirements set forth in NUREG-0737 and clarified in Generic Letter (GL) 83-37.

Although the proposed TS were written in accordance with Generic Letter 83-37, there are differences between the proposed TS and GL 83-37, in part, because of unique plant design features at D. C. Cook. In the July 31, 1987, letter IMPC requested NRC approval of previously submitted requests for exemption from certain NUREG-0737 requirements. This letter also requested NRC concurrence with IMPC's position on compliance with specific NUREG-0737 items. This safety evaluation focuses on the concurrences and exemptions requested by IMPC.

2.0 EVALUATION

2.1 Post-Accident Sampling (Item II.B.3)

On June 27, 1986, IMPC submitted a letter that provided a detailed description of the Post Accident Sampling System at Cook and requested exemptions from certain requirements of NUREG-0737, Item II.B.3. The exemptions are discussed below.

Analysis of diluted grab samples of containment atmosphere for determination of hydrogen concentration is not within the measurement capability of the laboratory gas chromatograph (GC). The PASS system at Cook provides the capability to obtain and analyze hydrogen concentration in undiluted containment using an in-line GC.

In-line monitoring of primary coolant for pH and dissolved oxygen and hydrogen is utilized in lieu of grab sample analysis.

Heat-tracing of containment air sample lines to prevent plate-out of iodine is unnecessary since iodine and non-volatile fission products in the reactor coolant and containment sump (i.e., liquid samples) are analyzed by PASS for assessment of core damage.

On November 4, 1986, the staff issued a safety evaluation to IMPC which concluded that the PASS at D. C. Cook, with the three above modifications, meets the criteria of Item II.B.3 in NUREG-0737 and is acceptable. The staff's approval was acknowledged in IMPC's July 31, 1987 submittal.

Generic Letter 83-37 states that an administrative program should be established, implemented, and maintained by the licensee to ensure that their plant has the capability to obtain and analyze reactor coolant and containment atmosphere samples under accident conditions.

IMPC's July 31, 1987, submittal proposed changes to Section 6.8.4 for both Units 1 and 2 that would reference the program for post accident sampling at D. C. Cook. This change is consistent with Generic Letter 83-37 guidance and is acceptable to the staff.

2.2 Noble Gas Effluent Monitors (Item II.F.1-1)

In their July 31, 1987, amendment application, IMPC proposed revising TS Tables 3.3-6 and 4.3-3 for both Units 1 and 2 that incorporate extended range noble gas effluent channels. The proposed changes were predicated on staff approval of the previously submitted exemption and concurrence requests. The staff has determined that the proposed changes to TS related to noble gas monitoring are consistent with the guidance of Generic Letter 83-37 and are acceptable. The staff's assessment of the exemption and concurrence requests related to noble gas monitoring is summarized in the following subsections.

2.2.1 Exemption on NG Monitor Range for GSL Exhaust

In a June 23, 1986, letter IMPC requested an exemption from the Section II.F.1-1 requirement for a design range of 1 E+5 μCi/cc for noble gas monitoring of the gland seal leak off (GSL) exhaust. IMPC intends to rely on a low-range noble gas detector with a maximum range of 5.8 E-7 to 2.7 E-2 μCi/cc to monitor the GSL pathway.

In the analysis supporting the June 23, 1986, letter IMPC calculated the maximum concentration of noble gas at the GSL exhaust to be 5.48 E-3 μCi/cc. The analysis was for a steam generator tube rupture with 1% of the gap inventory released into the coolant. The SGTR represents the most limiting design basis event for radionuclide transport to the secondary system.

Assumptions used in determining the noble gas concentration at the GSL were consistent with the FSAR (e.g., one percent of the fuel rods defective).

Because FSAR assumptions are conservative, the actual concentration of noble gases at the GSL would likely be well below IMPC's calculated maximum concentration of 5.48 E-3 μCi/cc and well within the 2.7 E-2 μCi/cc upper limit on the GSL exhaust noble gas monitor. Additionally, steam to the turbine bypass header, which supplies the turbine gland seal should be isolated from the faulted generator within 30 minutes of a SGTR event. Thus, the GSL exhaust does not represent a long term effluent pathway. IMPC also has provisions for estimating the release rate of effluent through the GSL exhaust pathway as discussed in Subsection 2.2.6. Based on the previously discussed considerations, the staff has determined that the deviation on the GSL noble gas monitor upper range is acceptable.

2.2.2 Concurrence on the use of the Eberline SPING

In order to comply with NUREG-0737 requirements for noble gas effluent monitoring, IMPC installed a Eberline SPING monitoring system. However, IE Information Notice 86-30, dated April 29, 1986, stated that SPING would be inappropriate for this purpose since "...its associated microcomputer is vulnerable to radiation damage from a total integrated dose greater than 1000 rads." The results of IMPC's analysis showed that the noble gas monitors at D. C. Cook would not be expected to receive more than 1000 rads of integrated dose during the course of an accident. In their July 31, 1987, submittal IMPC requested NRC concurrence in using the SPING system for post-accident noble gas monitoring.

IMPC has provided the necessary information, including an internal calculation via letter dated October 5, 1989, showing that the radiation monitor could survive in a post accident environment. This calculation showed that the monitor will not receive a total integrated dose greater than 1000 rads. It was the intent of the information notice, to alert licensees to design limitations noted in the use of Eberline SPING-4. The staff concurs with the use of the SPING system for noble gas monitoring at D. C. Cook.

2.2.3 Xenon-133 Equivalent Correction Curves

The noble gas monitoring system at D. C. Cook does not have the capability to correct automatically for the changing gas mixture prior to its reading out (displaying) or recording. Instead, the Xe-133 equivalent correction curve is included in the Offsite Dose Assessment Program (DAP) and is implemented through written procedures. In a July 23, 1986, submittal and later in a July 31, 1987, submittal, IMPC requested an exemption from the requirements stated in Table II.F.1-1 of NUREG-0737: "DISPLAY - Continuous and recording as equivalent Xe-133 concentrations or μCi/cc of actual noble gases."

IMPC has provided documents to justify this proposed deviation. Explicit information showing how the data provided by the readout can be directly translated into doses from airborne gamma emitting radionuclides at off-site locations was demonstrated during a November 6, 1989, visit to the site. In addition, appropriate correction factors have been incorporated into IMPC's Dose Assessment Program (DAP). Therefore, the staff finds the deviation acceptable.

2.2.4 Unit Vent/SJAE NG Monitor Upper Range

In a letter dated June 23, 1986, IMPC submitted a justification for an upper range of 1 E+4 μCi/cc for the unit vent and steam jet air ejector (SJAE) noble gas monitors. This justification and a request for NRC concurrence with this upper range for these two pathways was reiterated in the July 31, 1987, submittal.

IMPC's justification for the upper range on the unit vent was based on the fact that the containment exhaust pathway is through the unit vent, which is always diluted by the auxiliary building exhaust air.

The justification for the upper range on the SJAE was based on IMPC's analysis that showed that the concentration in the SJAE exhaust would not exceed 2 E+3 μCi/cc. Following a SGTR, the SJAE effluent path would be isolated from the faulted SG after steam generator stop valve closure as discussed in Subsection 2.2.1. In addition, IMPC has provisions for estimating the release rate of effluent through the SJAE and unit vent exhaust pathways as discussed in Subsection 2.2.6.

The staff finds the above deviations acceptable. The upper range on the unit vent noble gas monitors meets the intent of NUREG-0737, Table II.F.1-1, which provides for a design basis maximum range of 1 E+4 μCi/cc for diluted exhaust gases from containment. The upper range for the SJAE is also acceptable based on the analysis indicating that the noble gas concentration from the steam jet air ejector would be less than 1 E+4 μCi/cc. If existing radiation monitors were to malfunction or go off scale, the licensee would still have the capability to estimate the release rate through these pathways.

2.2.5 PORV NG Monitor Upper Range

In a letter dated September 8, 1986, IMPC requested an exemption from the NUREG-0737 upper limit range requirement for noble gases monitoring of main steam power operated relief valves (PORVs). This exemption was again requested in IMPC's July 31, 1987, submittal. This request was based on IMPC's analysis which showed that for a steam generator tube rupture (SGTR) the maximum radionuclide concentration would be 0.263 μCi/cc Xe-133 equivalent. On this basis, IMPC requested an upper limit of 1 E+2 μCi/cc Xe-133 equivalent rather than the NUREG-0737 upper limit of 1 E+3 μCi/cc Xe-133 equivalent.

As explained in IMPC's September 8 submittal, the PORV noble gas monitor geometry results in a high degree of attenuation of low energy gamma rays. The monitor is calibrated to account for the low energy gamma rays, but the calibration constant limits the range capability of the monitor. Studies of mock-ups of the SG PORVs by IMPC's consultant indicate that the count rate remains linear up to about 2 E+5 cpm, which corresponds to effluent concentration of about 1.6 E+2 μCi/cc Xe-133 equivalent. Thus, the upper limit requested by IMPC is consistent with the upper range of linear response for the detector.

As discussed in Subsection 2.2.1, IMPC's analysis of the maximum release rate associated with a SGTR is consistent with FSAR assumptions. SGTR represents the most limiting design basis event for radionuclide transport to the secondary system. Because FSAR assumptions are conservative, the actual concentration of noble gases released via the steam generator PORV pathway would likely be well below IMPC's calculated maximum concentration of 2.63 E-1 μCi/cc and well within the 1 E+2 μCi/cc upper limit on the main steam effluent released from the steam generator PORV. Furthermore, IMPC has provisions for obtaining a secondary system grab sample as a back-up means of determining the concentration of noble gas effluent released via the SG PORV. Additional methods for determining release levels from the main steam system in the event that the PORV noble gas monitor is unavailable or off scale are also available as discussed in Subsection 2.2.6.

Based on the above, the staff has determined that the deviation on the main steam effluent noble gas monitor upper range is acceptable.

2.2.6 Location of SG PORV Monitor

The acceptable location for externally mounted monitors specified by NUREG-0737, Item II.F.1, Attachment 1, Clarification (3), "Noble Gas Effluent Monitor," is on the main steam line upstream of the safety valves/PORV pathway. The post-accident noble gas effluent monitoring system at D. C. Cook deviates from this specification in that the monitors are located on the PORV discharge vent to atmosphere. A justification of this deviation was requested by the staff on December 19, 1985. In a letter dated May 20, 1986, IMPC justified the deviation and applied to the NRC staff to obtain approval of this deviation.

On October 18, 1988, IMPC met with the NRC staff to further justify their deviation from NUREG-0737. At the conclusion of the meeting, the staff recommended that IMPC perform a reliability study on the SG PORVs to show that they would be highly likely to function upon demand. IMPC provided the result of this study in a letter dated February 7, 1989.

On November 6, 1989, an NRR representative visited the D. C. Cook site to examine the location of the monitors on the PORV discharge vent. There are five safety valve discharge lines on each of the four main steam lines for each unit. The area is extremely congested, and the temperature on the outside of the steam lines exceeds the monitors' operational temperature limit of 180 degrees F. The space available on the main steam line is insufficient to mount the noble gas monitors directly on this line. There does not appear to be any practical alternative location for these monitors in order to allow for monitoring the safety relief valves except by providing individual monitors for each of the 40 valve-to-atmosphere stacks.

IMPC has procedures to monitor a radiation release from the main steam line in the event that the SG PORV monitor is bypassed during a SGTR event. Operators would be aware of SG PORV noble gas monitor bypass from indications in the control room. PORV status can be determined from the SG PORV hand auto station (valve open or closed indication based on limit switch) or from an indicator that shows valve position (percent open). Although the SG PORV block valve is a manual isolation valve, operators would know this valve was closed because procedures require a tag to be hung in the control room.

The Cook plant has in place an emergency plan procedure that contains diverse methods for determining release levels from the main steam system in the event that the PORV vent path is unavailable. IMPC stepped through these procedures during the November 6, 1989, meeting.

The procedure, entitled "Alternate Release Level Determinations" (PMP 2081 EPP.107), would be used if the radiation data display system (includes all CRT's, and local indications at the SPINGs) is inoperable or if a radiation monitor is off scale or bypassed. Four major effluent paths are considered in the procedure: the gland seal leak off, the SJAE exhaust, the unit vent, and main steam (SG safeties/PORV). The method of estimating a release rate involves sending out radiation monitoring teams to predesignated locations to obtain dose rate measurements or grab samples. Release rate is then determined by multiplying the dose rate (R/hr) or grab sample results (μCi/cc) by the appropriate correction factors.

EPP.107 also includes a method to estimate release rate if sampling and monitoring data is unavailable or cannot be obtained in time to support a dose assessment. This method involves the use of a logic diagram that utilizes information on plant conditions, when it is available, and utilizes conservative default values when information on plant conditions is unavailable.

Based on previous discussion, the staff finds IMPC's deviation from NUREG-0737 on the location of the SG PORV noble gas monitor to be acceptable.

2.3 Sampling and Analysis of Plant Effluent (Item II.F.1-2)

2.3.1 Iodine/Particulate Sampling Capability for the SJAE and GSL Exhaust

In their June 23, 1986, submittal IMPC requested exemptions from NUREG-0737 requirements on the following items related to iodine/particulate capability for the SJAE and GSL exhaust.

1. Iodine/particulate source term requirement in Section II.F.1-2 for the SJAE and GSL exhaust systems.

2. Iodine and particulate grab and continuous sampling capability for the SJAE and GSL exhaust pathways as required in Section II.F.1-2.

This exemption was again requested in IMPC's July 31, 1987, submittal.

For a SGTR (the most limiting design basis event for GSL and SJAE exhaust activity), IMPC calculated a maximum iodine concentration of 1.5 E-6 at the SJAE exhaust and 1.0 E-8 at the GSL exhaust. IMPC's calculations further indicated that no particulates would be released through the GSL or SJAE pathways. For this analysis, a number of highly conservative assumptions were made.

a. The break occurred high up on the steam generator tube bundles.

b. No credit was taken for the transfer of radionuclides to the steam generator water. All radionuclides (including particulates and iodine) assumed to enter the main steam system.

c. Iodine spike of 500 times normal coolant concentration.

d. The primary to secondary leak rate remained constant.

e. No deposition of iodine on any surface.

f. One percent of the fuel was assumed to have cladding defects (see Subsection 2.2.1).

Thus, taking into account the previously listed conservative assumptions, the actual concentrations of iodine and particulates at the GSL and SJAE exhausts during a SGTR event would be considerably lower than the maximum concentrations calculated by IMPC.

In lieu of taking grab samples and having a continuous sampling system, IMPC proposes to estimate the iodine concentration at the GSL and SJAE exhaust by applying a predetermined iodine to noble gas ratio correction factor to the noble gas readings at these locations.

Based on the above, the staff has determined that the exemption requested on iodine/particulate grab and continuous sampling is acceptable.

2.3.2 Filter Change Out

In a July 23, 1986, submittal IMPC requested NRC concurrence with their interpretation of NUREG-0737 with respect to continuous sampling of iodine/particulate for unit vent effluent. Although IMPC has a system that is capable of continuous sampling, a brief sampling interruption (i.e., 2-3 minutes) may be required in order to change out iodine and particulate filters.

Interruption of continuous sampling to change filters is acceptable. NUREG-0737, Table II.F.1-2, "Design Basis Shielding Envelope," allows personnel to perform these duties. Monitors should be designed to allow personnel to remove, replace, and transport sampling media without exceeding the General Design Criterion 19 of five rem to the whole body and 75 rem to the extremities. IMPC meets the intent of this NUREG-0737 requirement.

2.3.3 Sampling Time

NUREG-0737 Section II.F.1-2 requires a 30-minute sampling time for obtaining an iodine/particulate grab sample of effluent releases. In their July 23, 1986, letter IMPC requested an exemption from the requirement for a 30-minute sampling time, in part, because of ALARA concerns.

The 30-minute sampling time is part of the design basis envelope for shielding, handling, and analytical purposes and is used to develop a source term by assuming 30 minutes of integrated sampling time at sampler design flow, an average concentration of 1E+2 μCi/cc of radionuclides in gaseous or vapor form, an average concentration of 1E+2 of particulate radioiodines, and an average gamma photon energy of 0.5 MeV per disintegration. It is not a requirement to sample for 30 minutes, but establishes the need to provide sufficient shielding to allow the operator to do so if the circumstances so requires. Therefore, no deviation is necessary.

2.4 Containment High Range Radiation Monitor (Item II.F.1-3)

In a letter dated July 31, 1987, IMPC requested changes to the D. C. Cook Units 1 and 2 Technical Specifications related to requirements set forth in NUREG-0737. IMPC submitted additional information in their October 26, 1987, response to staff questions. IMPC's submittal addresses the requirements of NUREG-0737, Item II.F.1-3 "Containment High-Range Radiation Monitor," clarified in Generic Letter 83-37.

The TS changes are in accordance with the guidance and intent of NUREG-0737, Item II.F.1-3, which requires that containment high-range radiation monitors be installed with a maximum range of 10 E+8 rad/hr (total radiation) or 10 E+7 R/hr (photon radiation only). IMPC has installed two high range containment radiation monitors in each unit. One monitor is installed in the lower containment volume and the other in the upper containment volume. These monitors are physically separated to monitor widely separated spaces within containment, as addressed in NUREG-0737, II.F.1, Attachment 3.

The staff concludes that IMPC has adequately addressed the criteria of Item II.F.1-3 of NUREG-0737 and finds the containment high-range area radiation monitors as presently installed at the D. C. Cook Plant meet the redundancy requirements of NUREG-0737 with regard to monitor location (i.e., one monitor in the lower containment volume and the other in the upper containment volume) and the specification of Table II.F.1-3 of NUREG-0737 and are acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

These amendments involve a change in a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and a change in a surveillance requirement. We have determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of these amendment.

4.0 CONCLUSION

We have concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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