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LIMITING CONDITION FOR OPERATION | SURVEILLANCE REQUIREMENT

b. Type B Tests

Type B tests refer to penetrations with gasketed seals, expansion bellows or other type of resilient seals.

1) Test Pressure

All Type B tests shall be performed by local pneumatic pressurization of the containment penetrations, either individually or in groups, at a pressure not less than Pa.

2) Acceptance Criteria

The combined leakage rate of all penetrations subject to Type B and C tests shall be less than 0.60 La.

c. Type C Tests

1) Type C tests shall be performed on containment isolation valves. Each valve to be tested shall be closed by normal operation and without any preliminary exercising or adjustments.

2) Acceptance criteria - The combined leakage rate for all penetrations subject to Type B and C tests shall be less than 0.60 La.

3) The leakage from any one main steam isolation valve shall not exceed ~~11.5~~ 100 scf/hr at ~~an initial~~ test pressure of 24 psig.*

4) The leakage rate from any containment isolation valve whose seating surface remains water covered post-LOCA, and which is hydrostatically Type C tested, shall be included in the Type C test total.

The combined maximum pathway leakage rate for all four main steam lines shall not exceed 200 scf/hr at a test pressure of 24 psig.

* If a main steam isolation valve exceeds 100 scf/hr, it will be restored to ≤ 11.5 scf/hr.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
3.7	4.7
E. ~~Main Steam Isolation Valve Leakage Control System (MSIV-LCS)~~ Deleted	E. ~~Main Steam Isolation Valve Leakage Control System~~ Deleted
1. ~~The MSIV-LCS shall be OPERABLE~~ whenever the reactor is critical or when the reactor temperature is above 212°F and fuel is in the reactor vessel, except as specified in 3.7.E.2 below.	1. ~~MSIV-LCS Testing~~
	Item / Frequency
	a. Simulated Actuation Test — Once/Operating * Cycle
	b. Blower Operability — Once/Month
	c. Motor-operated Valve Operability — Once/3 months
	d. Heater Operability — Once/Month
	e. Blower Capacity — Once/Operating * Cycle
2. From and after the date that one MSIV-LCS subsystem or one blower is made or found to be inoperable for any reason, continued reactor operation is permissible during the succeeding thirty days provided that during such thirty days all active components of the other MSIV-LCS subsystems are OPERABLE.	2. When it is determined that one MSIV-LCS subsystem or one blower is inoperable, the other MSIV-LCS subsystem or blower shall be demonstrated to be OPERABLE immediately. The OPERABLE MSIV-LCS subsystems shall be demonstrated to be OPERABLE weekly thereafter.
3. If the requirements of 3.7.E cannot be met, an orderly shutdown of the reactor shall be initiated and the reactor shall be in the COLD SHUTDOWN Condition within 24 hours.	

* Intent Change Only (definition of operating cycle).

3.7.E & 4.7.E BASES: Deleted

The MSIV-LCS system is provided to minimize the fission products which could bypass the standby gas treatment system after a LOCA. It is designed to be manually initiated after it has been determined that a LOCA has occurred and that the pressure between the MSIV's has decayed to less than 35 psig. The System is also inhibited from operating unless the inboard MSIV associated with the MSIV-LCS subsystem is closed and the reactor vessel pressure has decayed to less than 35 psig.

Checking the operability of the various components of the MSIV-LCS system monthly, and the motor-operated valves once every 3 months, assures that the MSIV-LCS system will be available in the remote possibility of a LOCA. Performance of a capacity test of the blowers and initiation of the entire system once per operating cycle assures that the MSIV-LCS system meets its design criteria. The testing frequency of the motor-operated valves is based on Section XI of the ASME Code. Allowance of thirty days to return a MSIV-LCS subsystem or blower to an operable status allows operational flexibility while maintaining protective capabilities.

Evaluation of Change with Respect to 10 CFR 50.92

Background

Historical problems with Main Steam Isolation Valves (MSIVs) led the BWR Owners Group (BWROG) to form a MSIV Leakage Closure Committee in 1986. This committee studied the issues of MSIV leakage rates and associated excessive maintenance required for the MSIVs and the leakage control systems (LCS). Although the industry has reduced the occurrence of high leakage, leakage rates have still frequently exceeded the unnecessarily low leakage limits. This has resulted in excessive maintenance costs and extended outages and contributed to personnel dose.

As a resolution to these issues, the BWROG has proposed the use of main steam piping and the main condenser as a method for processing leakage and reducing the radiological consequences of MSIV leakage. This alternate MSIV leakage treatment method has been shown to provide effective and reliable fission product attenuation for reducing the radiological consequences of MSIV leakage. This leakage treatment method takes advantage of the large volume in the main condenser to provide hold-up and plate-out of fission products that may leak from closed MSIVs.

IES Utilities Inc., Docket No. 50-331,
Duane Arnold Energy Center, Linn County, Iowa
Date of Amendment Request: August 15, 1994

Description of Amendment Request:

Proposed Change 1

This proposed change increases the allowable leak rate specified in Technical Specification (TS) 4.7.A.2.c.3 from 11.5 standard cubic feet per hour (scfh) for any one main steam isolation valve (MSIV) when tested at 24 psig to 100 scfh for any one MSIV with a total maximum pathway leakage rate of 200 scfh through all four main steam lines when tested at 24 psig. If an MSIV exceeds 100 scfh, it will be restored to less than or equal to 11.5 scfh.

Basis for Proposed No Significant Hazards Consideration Determination:

Proposed Change 1

The Commission has provided standards (10 CFR 50.92(c)) for determining whether a significant hazards consideration exists. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the

facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

IES Utilities Inc. has reviewed the proposed change and determined it does not involve a significant hazards consideration based on the following:

1. The change does not involve a significant increase in the probability or consequences of an accident previously evaluated. The proposed amendment does not involve a change to structures, components, or systems which would affect the probability of an accident previously evaluated in the DAEC Updated Final Safety Analysis Report (UFSAR). It results in acceptable radiological consequences for the design basis loss of coolant accident (LOCA) which was previously evaluated in the UFSAR.

   Plant specific radiological analyses have been performed to assess the effects of the proposed increase in the allowable MSIV leak rate in terms of control room, technical support center (TSC), and offsite doses following a postulated design basis LOCA. These analyses utilize the hold-up volumes of the main steam piping and condenser as an alternate method for treating MSIV leakage. The radiological analyses use standard conservative assumptions for the release of source terms consistent with Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," Revision 2, dated June 1974.

   Dose contributions from the proposed MSIV leakage rate limit of 100 scfh per MSIV (with a maximum pathway leakage rate not to exceed 200 scfh through all four main steam lines) were calculated. The analysis demonstrated that the dose contributions from the proposed MSIV leakage rate resulted in an acceptable increase to the LOCA doses previously evaluated against the regulatory limits for the offsite, control room, and TSC doses as contained in 10 CFR 100 and 10 CFR 50, Appendix A (General Design Criterion 19). The revised LOCA doses are the LOCA doses previously evaluated in the UFSAR plus the MSIV leakage doses calculated assuming use of the alternate treatment method. Table 1 of Attachment 2 shows the previously calculated doses and the newly calculated doses.

It is important to note that the resulting doses are dominated by the organic iodine fractions which occur because of the conservative source term assumptions used in this analysis. For a total leakage rate of 200 scfh through all four main steam lines, more than 90 percent of the offsite, control room, and TSC iodine doses are due to the organic iodine from the Regulatory Guide 1.3 source term and organic iodine converted from the elemental iodine deposited in main steam piping systems. If the actual iodine composition from the fuel release (cesium iodine) is used in the calculations, essentially all of this organic iodine dose would be eliminated.

The TSC doses due to MSIV leakage are especially conservative. It is not expected that there will be any radioactive releases to the TSC due to MSIV leakage during the initial stages of a LOCA since it would take considerable time for the MSIV leakage to travel through the main steam lines and main steam line drain system to the condenser, into the turbine building, and finally to the atmosphere and TSC. It was conservatively estimated that the 30-day integrated dose to personnel in the TSC would increase by only 0.02 rem. The dose calculations were performed using control room occupancy factors specified in NUREG 0800, Standard Review Plan (SRP) Section 6.4.

Therefore, we conclude that the proposed change will not significantly increase the probability or consequences of any previously analyzed accidents.

2. The proposed change will not create the possibility of a new or different kind of accident from any previously evaluated. The BWROG evaluated MSIV leakage performance and concluded that MSIV leakage rates up to 100 scfh will not inhibit the capability and isolation performance of the valves to isolate the primary containment. There is no new modification to the MSIVs which could impact their operability. The LOCA has been analyzed using the main steam piping and condenser as a treatment method to process MSIV leakage at the proposed maximum rate of 200 scfh through all four main steam lines. Therefore, the proposed change will not create any new or different kind of accident from any accident previously analyzed in the UFSAR.

3. Operation of the DAEC in accordance with the proposed change will not involve a significant reduction in the margin of safety. The allowable leak rate limit specified for the MSIVs is used to quantify a maximum amount of bypass leakage assumed in the LOCA radiological analysis. Results of the

analysis are evaluated against the dose requirements contained in 10 CFR 100 for the offsite doses and 10 CFR 50, Appendix A (General Design Criterion 19) for the control room and TSC doses.

The margins of safety are not significantly affected because the dose levels remain well below the limits of 10 CFR 100 and General Design Criterion 19. Therefore, the proposed change does not involve a significant reduction in the margin of safety at the DAEC.

Description of Amendment Request:

Proposed Change 2

This proposed change to delete TS 3.7.E and 4.7.E and Bases section 3.7.E and 4.7.E involves eliminating the MSIV leakage control system (LCS) requirements from the TS.

Basis for Proposed No Significant Hazards Consideration Determination:

Proposed Change 2

The Commission has provided standards (10 CFR 50.92(c)) for determining whether a significant hazards consideration exists. A proposed amendment to an operating license for a facility involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

IES Utilities Inc. has reviewed the proposed change and determined it does not involve a significant hazards consideration based on the following:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated. As currently described in the UFSAR, the LCS is manually initiated after a design basis LOCA occurs. Since the LCS is operated only after an accident has occurred, this proposed amendment has no effect on the probability of an accident. The proposed change results in acceptable radiological consequences of the design basis LOCA previously evaluated in the UFSAR.

The DAEC has an inherent MSIV leakage treatment capability. IES Utilities Inc. proposes to use the main steam line drains and condenser as an alternative to the LCS. Figure 1.1 of Attachment 2 shows the primary and alternate drain paths. The proposed primary drain path at DAEC employs an MSL drain downstream of the MSIVs. There are two motor-operated valves (MOVs) in series in this line between the MSL and the main condenser. Both valves must be open to establish the required drain path. Both MOVs will be provided with essential power to assure that they can be opened following the DBA LOCA to establish a large enough drain path to support the radiological analysis.

An alternate drain path will be available to convey MSIV leakage to the isolated condenser if either MOV fails to open. The alternate drain path consists of the bypass lines around the MOVs in the primary drain path. This alternate path contains a "fail open" valve and a restricting orifice. Consequently, if either primary MOV failed to open as required, the second drain path would be available to convey MSIV leakage to the main condenser. Radiological dose calculations have been performed for this alternate path as well as for the primary path. The results were acceptable. IES Utilities Inc. will update DAEC procedures as necessary to address the applicable alternate leakage treatment methods.

IES Utilities Inc. contracted with EQE Engineering Consultants (EQE) to confirm the seismic capability of the DAEC's main steam piping and condenser to serve as an alternate leakage treatment system. Seismic verification walkdowns were performed to assure that the MSLs, the steam drain lines, the condenser, and interconnecting piping and equipment that were not seismically analyzed fall within the bounds of the design characteristics of the seismic experience database as discussed in Section 6.7 of the BWROG report.

The DAEC main steam lines, main steam drain lines, condenser, and applicable interconnecting piping and equipment, are well represented by the earthquake experience data demonstrating good seismic performance, are confirmed to exhibit excellent resistance to damage from a design basis earthquake and have been shown to have substantial margin for seismic capability. The outliers that were identified are discussed in Attachment 7. They have been either evaluated to demonstrate their acceptability as they currently exist, or plant modifications will be implemented to resolve the concerns. By taking the measures discussed

in Attachment 7 to ensure resolution for all of the identified outliers, IES Utilities Inc. is assured that the damage reported for the database components should not occur to the DAEC main steam piping and condenser or to the associated support systems.

Therefore, the proposed method for MSIV leakage treatment is seismically adequate to withstand the DAEC design basis earthquake and maintain pressure retaining integrity and serve as an acceptable alternative to the currently installed LCS. The capability of the alternate MSIV leakage treatment system to withstand the effects of the safe shutdown earthquake and continue to perform its intended function (treatment of MSIV leakage) satisfies the intent of the seismic requirement of Appendix A to 10 CFR 100.

Plant specific radiological analyses have been performed to assess the effects of MSIV leakage in terms of control room and offsite doses following a postulated design basis LOCA. While not previously considered a requirement for the design of the LCS, dose calculations were also performed for the TSC. These analyses utilize the hold-up volumes of the main steam piping and condenser as an alternate treatment method for the MSIV leakage. The analysis demonstrates that the proposed change results in an acceptable increase in the radiological consequences of a LOCA previously evaluated in the UFSAR. The LOCA previously evaluated in the UFSAR is still the bounding accident; the proposed change will not involve a significant increase in the consequences of an accident previously analyzed.

The LCS lines will be disconnected, capped and welded, ensuring that the integrity of the primary containment is maintained. IES Utilities Inc. will incorporate the alternate leakage treatment system into the inservice inspection (ISI) and inservice testing (IST) programs, consistent with program requirements.

2. The proposed change does not create the possibility of a new or different kind of accident from any previously evaluated. The purpose of the LCS is to reduce the untreated MSIV leakage when isolation of the primary coolant system and containment are required. Radiological dose contributions due to MSIV leakage are bounded by a LOCA. The LOCA has been analyzed using the main steam piping and condenser as a treatment method to process MSIV leakage at the proposed maximum rate of 100 scfh per MSIV and 200 scfh total maximum pathway leakage, and determined to be within the regulatory requirements. The LCS lines connected to the main steam

lines will be permanently closed to assure the primary containment integrity, isolation, and leak testing capability are not compromised.

3. The proposed change to delete TS 3.7.E and 4.7.E and Bases section 3.7.E and 4.7.E does not involve a significant reduction in the margin of safety. The intended function of the LCS for treatment of MSIV leakage will be performed by using the more effective alternate path via the main steam drain lines and condenser. This treatment method is effective for treatment of MSIV leakage over an expanded leakage range. Except for the requirement to assure that certain valves are opened to establish a proper flow path from the MSIVs to the condenser and that certain valves are closed to establish the seismic boundary, the proposed method is passive and does not require any logic controls or interlocks. On the other hand, the LCS consists of complicated logic controls and sensitive equipment which must be maintained at significant cost and radiation exposure. The radiological effects on the margin of safety are discussed above for Change 1. The safety significance of the LCS in terms of public risk was addressed in NUREG/CR-4330 which contains the evaluation for eliminating the LCS and disabling the systems currently installed at BWRs. The conclusion was that the increased public risk is less than 1 percent. Therefore, the proposed change does not involve a significant reduction in the margin of safety at the DAEC.

Based upon the above, we have determined that the proposed amendment will not involve a significant hazards consideration.

Local Public Document Room Location: Cedar Rapids Public Library, 500 First Street SE, Cedar Rapids, Iowa 52401

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Safety Assessment

INTRODUCTION

By letter dated August 15, 1994, IES Utilities Inc. submitted a request for revision of the Technical Specifications (TS) for the Duane Arnold Energy Center (DAEC).

IES Utilities Inc. proposed an alternative to Regulatory Guide (RG) 1.96, "Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants," by utilizing the main steam lines, the main steam drain lines, and the main condenser as an alternate method for main steam isolation valve (MSIV) leakage treatment. The proposed changes are the result of extensive work performed by the Boiling Water Reactor Owners Group (BWROG) in support of the resolution of NRC Generic Issue C-8, "Main Steam Isolation Valve Leakage and Leakage Control System Failure." In addition to IES Utilities Inc.'s submittal, General Electric (GE) Report NEDC-31858P, Revision 2, "BWROG Report for Increasing Main Steam Isolation Valve Leakage Rate Limits and Elimination of Leakage Control Systems," dated September 1993, provides the technical justification for the proposed changes. This proposed TS change is consistent with an amendment issued to the Edwin I. Hatch Nuclear Plant, Unit 2 (Docket No. 50-366), by the NRC on March 17, 1994.

The proposed changes would:

1. Increase the allowable leak rate specified in TS 4.7.A.2.c.3 from 11.5 standard cubic feet per hour (scfh) for any one main steam isolation valve (MSIV) when tested at 24 psig to 100 scfh for any one MSIV with a total maximum pathway leakage rate of 200 scfh through all four main steam lines when tested at 24 psig. If an MSIV exceeds 100 scfh, it will be restored to less than or equal to 11.5 scfh.

2. Delete TS 3.7.E and 4.7.E and Bases section 3.7.E and 4.7.E, thus eliminating the MSIV leakage control system (LCS) requirements from the TS.

Also, the index would be administratively modified to reflect the above changes.

Assessment

Each of the four main steam lines (MSLs) contains two (one inboard and one outboard of primary containment) quick-closing MSIVs. These valves function to isolate the reactor system in the event of a break in a steam line outside the primary

containment, a design-basis loss-of-coolant accident (LOCA), or other events requiring containment isolation. Although the MSIVs are designed to provide a leak-tight barrier, it is recognized that some leakage through the valves will occur. Operating experience at various BWR plants has indicated that degradation has occurred occasionally in the leak-tightness of MSIVs, and that the specified low leakage has not always been maintained.

Due to recurring problems with excessive leakage of MSIVs, the Staff issued RG 1.96, which recommends the installation of a supplemental LCS to ensure that the isolation function of the MSIVs complies with the limits specified. IES Utilities Inc.'s MSIV LCS is designed to control the release of fission products. The LCS develops a negative pressure, by use of blowers, in the sections of the MSL between the inboard and outboard MSIVs. The leakage is discharged to the standby gas treatment system.

Due to design limitations, the LCS is ineffective when the MSIV leakage rate is greatly in excess of the TS-allowable value. Hence, NRC Generic Issue C-8 was initiated in 1983 to assess: (1) the causes of MSIV failures, (2) the effectiveness of the LCS and alternative leakage paths, and (3) the need for regulatory action to limit public risk. The Staff's resolution of Generic Issue C-8, published in NUREG-1372, "Regulatory Analysis for the Resolution of Generic Issue C-8, 'Main Steam Isolation Valve Leakage and LCS Failure,'" dated June 1990, concluded that no backfit was warranted to reduce public risk associated with MSIV leakage and that maintaining the current requirements, systems, and leakage treatment practices, should be adequate. Furthermore, the Staff concluded that there was insufficient basis for a generic requirement to remove the LCS from operation, although plant-specific requests to remove the LCS may be justified.

The BWROG formed an MSIV Leakage Committee in 1982 to identify and resolve the causes of high MSIV leakage rates. The BWROG then formed an MSIV Leakage Closure Committee to address alternate actions to resolve ongoing but less severe MSIV leakage problems and to address the limited capability of the LCS. The results of these committee activities were submitted to the NRC in several GE proprietary reports. These reports are: NEDC-31643P, dated November 1988; NEDC-31858P, Revision 0, dated February 1991; NEDC-31858P, Revision 1, dated October 1991; and NEDC-31858P, Revision 2, dated September 1993.

The latest GE report concludes that the proposed increase of the MSIV leakage limit will reduce radiation exposures to maintenance personnel, reduce outage durations, and extend the effective service life of the MSIVs. The report also concludes that the proposed elimination of the LCS will similarly reduce exposures

to maintenance personnel and reduce outage durations, and that the LCS can be replaced with an alternate method for MSIV leakage treatment using the MSL drains and condenser. IES Utilities Inc. referred to this report as a basis for deleting the TS requirements for the MSIV LCS, and requested a higher MSIV leak rate limit.

The proposed alternative treatment method recommended in the BWROG report, and proposed by IES Utilities Inc., takes advantage of the large volume in the MSL drains and main condenser to provide holdup and plateout of fission products that may leak through closed MSIVs. This method uses the main steam drain lines to direct leakage to the main condenser. In this approach, the main steam piping, the drain piping, and the main condenser are used to mitigate the consequences of an accident that could lead to potential offsite exposures in excess of 10 CFR Part 100 limits. However, as required by General Design Criterion (GDC) 2 of Appendix A to 10 CFR Part 50, the components and piping systems used in the alternative treatment path must be capable of performing their function during and following a safe-shutdown earthquake (SSE). The BWROG report and IES Utilities Inc.'s submittal provide the technical justification for the seismic capability of the alternate treatment path and also provide the dose calculations to demonstrate the acceptability of the system.

RADIOLOGICAL EVALUATION

To demonstrate the adequacy of the DAEC engineered safety features (ESFs), IES Utilities Inc. assessed the offsite radiological consequences that could result from the occurrence of design-basis-accidents (DBAs) with a leakage rate of 100 scfh per MSIV with a total leakage rate of 200 scfh through the four MSLs and without the MSIV LCS. The results of the offsite dose calculations are presented in the submittal. The DAEC ESFs are designed to mitigate the radiological consequences of the DBAs.

Iodine Release Pathways

Following a LOCA, three potential release pathways exist for main steam leakage through the MSIVs:

1. main steam drain lines to the condenser, with delayed release through the low-pressure turbine seals;

2. turbine bypass lines to the condenser, with delayed release through the low-pressure turbine seals; and

3. main steam lines through the closed turbine stop and control valves, through the high pressure turbine, with release via the high pressure turbine seals.

The consequences of leakage from pathways 1 and 2 will be essentially the same, since the condenser will process the MSIV leakage. The condenser's iodine-removal efficiency will vary depending on the inlet location of the bypass or drainline piping; however, in either case, iodine will be removed. For pathway 3, MSIV leakage through the closed turbine stop and control valves will not be processed via the condenser. For this case, the high-pressure turbine (having a large internal surface area associated with the turbine blades and casing) will remove iodine. As long as either turbine bypass or drain line leakage pathway is available, MSIV leakage through the closed turbine stop and control valves (pathway 3) will be negligible. Essentially all of the releases will be through the main condenser because there will be no differential pressure in the MSL downstream of the MSIVs following the closure of the valves.

IES Utilities Inc. has selected pathway 1 to mitigate the radiological consequences of an accident that could result in potential offsite exposures comparable to the dose reference values specified in 10 CFR Part 100. In the calculation of the contribution to the LOCA dose, the inboard MSIV is assumed to fail to close, thus allowing potentially contaminated steam to travel to the outboard MSIV. The total leak rate, from both this outboard MSIV combined with the other three MSL outboard MSIVs, was assumed to be 200 scfh.

Iodine Transport Model

Chemical and physical principles predict that gaseous iodine and airborne iodine particulate material will deposit on surfaces. Several laboratory and in-plant studies have demonstrated that gaseous iodine deposits by chemical adsorption and particulate iodine deposits through a combination of sedimentation, molecular diffusion, turbulent diffusion, and impaction. Gaseous iodine exists in nuclear power plants in several forms: elemental (I_2), hypoiodous acid (HOI), organic (CH_3I), and particulate. RG 1.3, Revision 2, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," dated June 1974, assumed that 91 percent of the reactor core's iodine inventory is in the elemental form (includes hypoiodous acid), 5 percent in the particulate form, and 4 percent in the form of organic iodides.

Each of these forms deposits on surfaces at a different rate, described by a parameter known as the deposition velocity. The elemental iodine form, being the most reactive, has the largest deposition velocity, and organic iodide has the smallest. Furthermore, studies of in-plant airborne iodine show that iodine (elemental and particulate) deposited on the surface undergoes both physical and chemical changes and can either be resuspended

as an airborne gas or become permanently fixed to the surface. The data also shows that the iodine can change its form so that iodine deposited as one form (usually elemental) can be resuspended in the same or in another form (usually organic). Conversion can be described in terms of resuspension rates that are different for each iodine species. Chemical surface fixation similarly can be described in terms of a surface fixation rate constant.

The GE model is based on time-dependent temperature adsorption phenomena with instantaneous and perfect mixing in a given volume. GE assumed steady-state iodine in equilibrium in a large volume. The GE model indicates that particulate and elemental iodine would be expected to deposit on surfaces with rates of deposition varying with temperature, pressure, gas composition, surface material, and particulate size. Therefore, an appropriate credit for the removal of iodine in the MSLs and main condenser should be given in the radiological consequence assessment following a design-basis accident. Consequently, the proposed elimination of the LCS and higher allowable MSIV leakage are appropriate.

For the purpose of giving credit for iodine holdup and plateout, the main steam piping (including its associated piping to the condenser) and the condenser must remain structurally intact following an SSE, so they can act as a holdup volume for fission products. "Structurally intact," means that the steam line will retain sufficient structural integrity to transport the relatively low flow rate of MSIV bypass leakage throughout the steam lines and condenser. In the radiological consequence assessment, the condenser is assumed open to the atmosphere via leakage through the low-pressure turbine seals. Thus, it is only necessary to ensure that gross structural failure of the condenser will not occur.

Control Room Habitability

Radiation protection for operating personnel in the control room under accident conditions is provided by the operation of either of two high-efficiency air filtration trains in conjunction with the installed control room shielding. Two 1000-cfm single-pass high-efficiency filter trains are provided in parallel with an outside air inlet duct. Each filter train consists of inlet and outlet isolation dampers, a heating coil, a prefilter, a high-efficiency particulate (HEPA) filter, a charcoal filter (2-in. bed, tray type), and a final HEPA filter. Should fission products leaving the main stack reach ground level during a brief atmospheric fumigation, outside air radiation monitors will isolate the normal ventilation path and initiate high-efficiency filtration of incoming outside air. Control room air is

recirculated through dust filters and heated or cooled as necessary to maintain comfortable working conditions. Power for the filtration-recirculation system is supplied from an emergency diesel generator-backed bus. The filtration-recirculation system is seismic Category I and is located in a seismic Category I structure.

The doses to the operators in the control room following a postulated LOCA were evaluated and found to be within the guidelines of NUREG 0800, Standard Review Plan (SRP) Section 6.4.

Conclusion

IES Utilities Inc.'s analysis assessed the radiological consequences resulting from the MSIV leakage transport pathway described in this safety assessment. Based on the above evaluation and the calculated radiological consequences, IES Utilities, Inc. concludes that the MSIV leak rate limit of 100 scfh per MSIV (200 scfh total through four MSLs) and the proposed deletion of the TS requirements for the MSIV LCS are acceptable.

IES Utilities Inc. further concludes that the radiological consequences of a postulated LOCA will be within the dose reference values stated in 10 CFR Part 100, and within the dose limits specified in GDC 19 of Appendix A to 10 CFR Part 50.

EVALUATION OF SEISMIC ANALYSIS OF PIPING, SUPPORTS, AND EQUIPMENT

IES Utilities Inc. proposed to use the main steam piping, main steam drain lines, and main condenser as an alternate method for MSIV leakage treatment. Because certain main steam piping and components were not designed as seismic Category I items, detailed evaluations and seismic verification walkdowns were performed to demonstrate that the main steam system piping and equipment that constitute the alternate treatment path are seismically rugged and meet GDC 2 of Appendix A to 10 CFR Part 50 with regard to seismic adequacy.

These proposed changes to the TS are supported by work performed by the BWROG, with IES Utilities Inc.'s participation. This work, as documented in GE Report NEDC-31858P, Revision 2, serves as the generic basis of the acceptability of the above DAEC proposal. The Staff reviewed this report and found the BWROG approach of utilizing earthquake experience data to demonstrate the seismic ruggedness of the nonseismically analyzed main steam system piping and main condenser, as supplemented by plant-specific seismic walkdowns, to be acceptable for a similar amendment request for the Edwin I. Hatch Nuclear Plant, Unit 2 (Docket No. 50-366) in their Safety Evaluation dated March 17, 1994.

The BWROG contracted with EQE Engineering Consultants (EQE) to perform a review of the performance of main steam system piping and condensers in conventional power plants during past strong motion earthquakes. EQE also compared these piping systems and condenser designs to the piping systems and condensers typically used in domestic BWR plants. The res lt of the comparison supports the BWROG view that the main steam piping and condensers employed in GE BWRs would maintain their pressure-retention capability during a design-basis earthquake. EQE stated that, for welded steel piping and condensers designed and constructed to normal industrial practices (e.g., ANSI B31.1 and Heat Exchanger Institute (HEI) standards, respectively), earthquake experience shows that welded steel piping and condensers are seismically rugged, contain some safety margin, and have not shown a primary collapse mode of failure. A relatively small number of seismically induced piping failures have occurred due to excessive relative support movements or seismic interactions.

The EQE database covers facilities with underlying foundations varying from soft soils to rock. Hundreds of structures with a wide diversity of structural types and design criteria are included that house thousands of pipe runs, cable trays, conduits, tubing, and related components. In addition, thousands of equipment installations, from 1930s vintages to new items, are in the database. The strong-motion earthquakes included in the database range in Richter magnitude from 5.4 to 8.1. The average peak ground accelerations (PGAs) range from 0.1 g to 0.85 g, with strong motions lasting up to about 50 seconds. The survey found no precedent for failure of the main steam piping pressure boundary or the condenser shell. The survey did, however, find damage to piping insulation, valve operators, piping supports, and condenser tubes.

EQE has also obtained additional data for a wide range of both large- and small-bore piping which demonstrated good seismic performance during other strong motion earthquakes not covered in BWROG report NEDC-31858P, Rev. 2. This detailed database includes 24 earthquakes and about 126 sites, some of which were originally included in the BWROG report. The measured or estimated horizontal ground accelerations for these sites range from 0.15 g to 1.0 g, with the majority of the sites experiencing an acceleration of 0.3 g or higher. The duration of strong motion (on the order of 0.10 g or higher) range from 5 seconds to more than 50 seconds.

Seismic Analysis of Piping and Equipment

The primary components to be relied upon for pressure boundary integrity in resolution of the DAEC MSIV leakage issue are: (1) the main condenser, (2) the main steam lines from the MSIVs to

the turbine stop and bypass valves, and (3) the main steam turbine bypass and drain line piping to the condenser. The condenser forms the ultimate boundary of the leakage pathway. Boundaries were established upstream of the condenser by utilizing existing valves to limit the extent of the seismic boundary for the alternate leakage path. Specifically, normally closed valves will be assured to remain closed; normally open valves will be required to close and remain closed; and other valves that require operator action will be operated to ensure closure.

To confirm the capability of the main steam piping and condenser to serve as an alternate leakage treatment system, IES Utilities Inc. has performed seismic verification walkdowns to assure that the MSLs, the main steam drain lines, the condenser, and interconnecting piping and equipment that were not seismically analyzed fall within the bounds of the design characteristics of the seismic experience database as discussed in Section 6.7 of the BWROG report. Specifically, the walkdowns were performed to (1) physically verify that DAEC features have the attributes similar to those in the earthquake experience database that have demonstrated good seismic performance, (2) verify general conformance of pipe support spans to the requirements of ANSI B31.1, and (3) identify potential seismic vulnerabilities considering those structural details and causal factors that resulted in component damage at database plants. These potential vulnerabilities were identified as "outliers" for subsequent resolution. IES Utilities Inc.'s submittal presents a complete list of the outliers identified during the walkdowns. These outliers fall within one of the following five types:

1. potential deficiency in anchorage or support capacity;
2. potential valve malfunction and collapse of the masonry walls which support the piping;
3. potential damaging interaction between piping and nearby components;
4. differential displacement of piping supports or attachments;
5. valves with extended motor operators beyond screening guidelines.

Each one of the outliers, identified in the walkdowns as a potential source of damage, was either evaluated to demonstrate its acceptability as it exists, or designated to be modified. IES Utilities Inc. is assured that upon completion of all necessary modifications, the supports will keep the piping in place and the piping pressure boundary integrity will be maintained, under both normal and earthquake loadings.

Those portions of the DAEC main steam and drain line/bypass piping that were not seismically analyzed as part of the original

plant design were evaluated to demonstrate that piping and supports fall within the bounds of design characteristics found in conventional power plant steam piping which demonstrated good seismic performance. These conventional designs were shown to be comparable to the steam piping design for DAEC.

Portions of the main steam piping that were seismically analyzed as part of the original plant design included the main steam lines (from the outboard MSIV to the turbine stop valve), the main steam bypass line (to the bypass valves), and portions of various main steam branch connections to the seismic anchor downstream of the isolation valves for the branch. Design methods for these analyzed lines were consistent with seismic Category I qualification methods for DAEC.

The lines designed by rule or by approximate methods such as the drain path and interfacing piping are made of welded steel piping and standard support components well represented in conventional plants in the earthquake experience database. Further, it was demonstrated that adequate capacity exists for typical or boundary support anchorages.

The DAEC condenser design is typical of those at facilities in the earthquake experience database that have experienced earthquakes in excess of the DAEC design bases earthquake. The DAEC condenser anchorage is comparable to the anchorage of earthquake experience database condensers.

IES Utilities Inc. performed walkdowns to identify and evaluate any of the characteristics associated with the limited component damage observed at the database facilities. The walkdowns also included an inspection for those structural details and causal factors that resulted in component damage at industrial sites contained in the database to ensure that such conditions are evaluated to satisfaction or that plant modifications are implemented to resolve the concern. An engineering analysis of selected critical supports was performed which showed that the supports exhibited substantial margin. As a result of the walkdowns, IES Utilities Inc. identified the need to implement minor modifications or repairs to several components. The appropriate modifications or repairs will be completed prior to implementing the proposed TS change, ensuring that the damage reported for the database components should not occur to the DAEC main steam piping and condenser or to the associated support systems.

In summary, IES Utilities Inc. has concluded that the DAEC main steam lines, main steam drain lines, condenser, and applicable interconnecting piping and equipment, are well represented by the earthquake experience data demonstrating good seismic

performance, are confirmed to exhibit excellent resistance to damage from a design basis earthquake and have been shown to have substantial margin for seismic capability. Therefore they are seismically adequate to withstand the DAEC design basis earthquake and maintain pressure retaining integrity. This capability of the alternate MSIV leakage treatment system to withstand the effects of the safe shutdown earthquake and continue to perform its intended function (treatment of MSIV leakage) satisfies the intent of the seismic requirement of Appendix A to 10 CFR 100. IES Utilities Inc. therefore concluded that the proposed method for MSIV leakage treatment is seismically adequate to serve as an acceptable alternative to the currently installed LCS.

IES Utilities Inc. will incorporate the alternate leakage treatment system into the inservice inspection (ISI) and inservice testing (IST) programs, consistent with program requirements.

Seismic Analysis of Piping Supports

Performance of the turbine building during a seismic event is of interest to the issue of MSIV leakage only to the extent that the building structure and its internal components should survive and not degrade the capabilities of the selected main steam and condenser pathways. The turbine building is classified as nonseismic, however the criteria for seismic Category I structures were used for the structural design of the entire building. A complete dynamic analysis was performed for the turbine building. The same design procedures used for the reactor building were also used for the turbine building. Thus the turbine building was specifically designed for seismic loading.

Pipe support anchorage was evaluated using the philosophy of the Seismic Qualification Utility Group (SQUG) Generic Implementation Procedure (GIP). Anchorage seismic capacity vs demand was checked using the GIP Appendix C criteria. The seismic demand was conservatively determined using a factor of 1.25 times the peak of the appropriate in-structure floor response. All supports demonstrated adequate seismic capacity to resist the estimated demand.

Conclusion

Upon completion of the plant modifications necessary for the identified outliers, there is reasonable assurance that the DAEC main steam drain lines, condenser, associated interconnecting piping and equipment, and their supports in the reactor and turbine buildings, will be seismically adequate to serve as an

alternate MSIV leakage treatment system. This is based on the fact that portions of the main steam system piping and their associated supports have been seismically analyzed, and that the remaining nonseismically analyzed piping and equipment (1) are well represented by those in the earthquake experience database that demonstrated good seismic performance, (2) are able to exhibit adequate resistance to damage from a design-basis earthquake, and (3) have been shown to have adequate margins for seismic capability. The supports for the nonseismically analyzed piping have been evaluated and the evaluation shows that they have sufficient margin. Therefore, the proposed alternate leakage treatment system is seismically adequate to withstand the DAEC design-basis earthquake and maintain its pressure-retaining integrity, and hence, is in conformance with GDC 2 of Appendix A to 10 CFR Part 50.

DRAIN PATH FUNCTIONAL DESIGN EVALUATION

Figure 1.1 of Attachment 2 shows the primary and alternate drain paths. The proposed primary drain path at DAEC employs an MSL drain downstream of the MSIVs. There are two motor-operated valves (MOVs) in series in this line between the MSLs and the main condenser. Both valves must be open to establish the required drain path. Both MOVs will be provided with essential power to assure they can be opened following the DBA LOCA to establish a large enough drain path to support the radiological analysis.

An alternate drain path will be available to convey MSIV leakage to the isolated condenser if either MOV fails to open. The alternate drain path consists of the bypass lines around the MOVs in the primary drain path. This alternate path contains a "fail open" valve and a restricting orifice. Consequently, if either primary MOV failed to open as required, the second drain path would be available to convey MSIV leakage to the main condenser. IES Utilities Inc. will update DAEC procedures as necessary to address the applicable alternate leakage treatment methods.

CONCLUSION

Based on the above evaluation, the proposed design provides a reliable leakage path that meets the single-failure criterion of GDC 41, "Containment Atmosphere Cleanup."

(1) The proposed increase in allowable MSIV leakage rates should avoid exposing maintenance personnel to unnecessary doses, reduce outage durations, extend the effective service life of the MSIVs, and has the potential to significantly reduce recurring valve leakage caused by repairs. In addition, the proposed alternate treatment method will be able to process

larger leakage rates which could not be processed at all by the LCS because of design limitations, and the resulting doses remain well within the guidelines of 10 CFR Part 100 for the offsite doses and within 10 CFR Part 50, Appendix A (GDC 19) for the control room doses.

(2) The design of the alternate treatment path, including piping and supports, structures, and components, meets GDC 2 of Appendix A to 10 CFR Part 50, with respect to performing its function following a design-basis seismic event, and

(3) The design of the alternate treatment path also meets the requirements of GDC 41 with respect to performing its function with and without offsite power and assuming a single active failure.

ENVIRONMENTAL CONSIDERATION

10 CFR 51.22(c)(9) identifies certain licensing and regulatory actions which are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and (3) result in a significant increase in individual or cumulative occupational radiation exposure. IES Utilities Inc. has reviewed this request and determined that the proposed amendment meets 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 needs to be prepared in connection with the issuance of the amendment. The basis for this determination follows:

Basis

This revision meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) for the following reasons:

1. As demonstrated in Attachment 4 to this letter, the proposed Amendment does not involve a significant hazards consideration.

2. The proposed Amendment will not result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite. The proposed action will not increase potential radiological environmental effects due to MSIV leakage beyond those already permitted by the regulations.

   MSIV leakage, along with containment leakage, is used to calculate the maximum radiological consequences of a design basis accident. Standard conservative assumptions were used to calculate offsite, control room and the technical support center (TSC) doses, including the doses due to MSIV leakage, which could potentially result from a postulated design basis LOCA at DAEC and are described in the DAEC Updated Final Safety Analysis Report (UFSAR). This analysis demonstrated that a total leakage rate of 100 scfh per MSIV (200 scfh total maximum pathway leakage for 4 MSLs) results in dose exposures for the control room, TSC, and offsite (exclusion area boundary and low population zone) that

remain within the requirements of 10 CFR Part 100 for offsite doses and 10 CFR Part 50, Appendix A, for the control room and TSC.

With regard to potential nonradiological impacts, the proposed amendment involves components in the plant which are located within a restricted area as defined in 10 CFR Part 20. It does not affect nonradiological plant effluents and has no other environmental impacts. Therefore, there are no significant nonradiological environmental impacts associated with the proposed amendment.

Therefore, there will not be a significant increase in the types or amounts of any effluent that may be released offsite and, as such, the proposed amendment does not involve irreversible environmental consequences beyond those already associated with normal operation of the plant.

3. Deletion of the MSIV Leakage Control System will reduce the overall occupational exposures to radiation because maintenance and surveillance activities associated with the system will be eliminated. The exposure associated with actually removing or capping the system incorporates the as low as reasonably achievable philosophy and will be less than the dose which would result from maintenance and surveillance activities associated with the present system for the remainder of plant life. Therefore, the proposed amendment will not result in a significant increase in individual or cumulative occupational radiation exposure.