Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616-465-5901

April 6, 2000

C0400-06
10 CFR 50.90

Docket Nos.: 50-315
50-316

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
LICENSE AMENDMENT FOR CHANGES IN
HIGH-ENERGY LINE BREAK METHODOLOGY

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, proposes to amend Facility Operating Licenses DPR-58 and DPR-74. I&M proposes to incorporate three methodology changes in the CNP high-energy line break (HELB) program.

The methodology changes are being requested to incorporate: 1) NUREG/CR-2913, "Two-Phase Jet Loads," 2) NUREG-0800, "Standard Review Plan [SRP]," Section 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," and its associated Branch Technical Position (BTP), MEB 3-1, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," Section B.1.b, break exclusion zones, and 3) an SRP 3.6.2, BTP MEB 3-1, Section B.1.e, crack exclusion based on stress analysis into the CNP licensing basis. Each of these methodology changes involves an unreviewed safety question. Therefore, NRC staff review and approval are required in accordance with 10 CFR 50.90. These changes are described below.

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I&M proposes to change the analysis methodology used in the HELB program to incorporate the recommendations of NUREG/CR-2913. The implementation of this methodology change will be performed in accordance with the assumptions presented in NUREG/CR-2913. The methodology of NUREG/CR-2913 is requested to eliminate consideration of jet impingement effects for structures, systems and components located more than ten pipe diameters from postulated HELBs and the ten diameter equivalent for critical cracks.

I&M proposes to apply stress analyses based on American National Standards Institute (ANSI) B31.1.0-1967, "USA Standard Code for Pressure Piping, Power Piping," the design code of record for piping at CNP, for use with SRP 3.6.2, BTP MEB 3-1, Section B.1.b, to establish break exclusion zones for piping between the containment penetration and the first outboard isolation valve. The application of SRP break exclusion zones is requested for the steam generator blowdown and chemical and volume control system letdown lines outside containment based on piping support modifications and revised stress analyses.

I&M proposes to apply stress analyses based on ANSI B31.1.0-1967 for use with the SRP 3.6.2, BTP MEB 3-1, Section B.1.e, methodology to a section of piping for the postulation of critical crack locations based on piping stress for a portion of Unit 2 steam generator blowdown piping located in the normal flash tank room. The application of an SRP crack exclusion is requested to eliminate postulation of a critical crack in this location based on piping and piping support modifications, and acceptable stress analysis. Unit 1 may require the same modifications and application of the SRP methodology for a crack exclusion zone. Further analysis is required to make this determination. I&M requests approval to use the SRP crack exclusion for Unit 1, if necessary.

Attachment 1 provides a detailed description of the proposed changes. Attachment 2 describes the evaluation performed in accordance with 10 CFR 50.92(c), which concludes that no significant hazard is involved. Attachment 3 provides the environmental assessment. Attachment 4 summarizes the new commitments made in this letter.

Copies of this letter and its attachments are being transmitted to the Michigan Public Service Commission and Michigan Department of Environmental Quality, in accordance with the requirements of 10 CFR 50.91.

Should you have any questions, please contact Mr. Robert C. Godley, Director of Regulatory Affairs, at (616) 466-2698.

Sincerely,

R. P. Powers
Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 6th DAY OF April, 2000

Notary Public

PATRICIA A. EDDIE
NOTARY PUBLIC - BERRIEN CO. MICH
MY COMMISSION EXPIRES
NOVEMBER - 5 - 2000

My Commission Expires

\dms

Attachments

c: J. E. Dyer
MDEQ - DW & RPD
NRC Resident Inspector
R. Whale

ATTACHMENT 1 TO C0400-06

DESCRIPTION OF THE PROPOSED METHODOLOGY CHANGES

A. Summary of the Proposed Changes

Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, proposes to amend Facility Operating Licenses DPR-58 and DPR-74. I&M proposes to incorporate three methodology changes in the CNP high-energy line break (HELB) program.

The methodology changes are being requested to incorporate: 1) NUREG/CR-2913, "Two-Phase Jet Loads," 2) NUREG-0800, "Standard Review Plan [SRP]," Section 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," and its associated Branch Technical Position (BTP), MEB 3-1, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," Section B.1.b, break exclusion zones, and 3) an SRP 3.6.2, BTP MEB 3-1, Section B.1.e, crack exclusion based on stress analysis into the CNP licensing basis. Each of these methodology changes involves an unreviewed safety question (USQ). Therefore, NRC staff review and approval are required in accordance with 10 CFR 50.90. These changes are described below.

I&M proposes to change the analysis methodology used in the HELB program to incorporate the recommendations of NUREG/CR-2913. The implementation of this methodology change will be performed in accordance with the assumptions presented in NUREG/CR-2913. The methodology of NUREG/CR-2913 is requested to eliminate consideration of jet impingement effects for structures, systems, and components (SSCs) located more than ten pipe diameters from postulated HELBs and the ten diameter equivalent for critical cracks. The critical crack size is defined to be one-half the pipe diameter in length and one-half the wall thickness in width. The impingement effects for a critical crack will be modeled as a rupture of a pipe with a diameter equivalent to the critical crack area.

I&M proposes to apply stress analyses based on American National Standards Institute (ANSI) B31.1.0-1967, "USA Standard Code for Pressure Piping, Power Piping," the design code of record for piping at CNP, for use with SRP 3.6.2, BTP MEB 3-1, Section B.1.b, to establish break exclusion zones for piping between the containment penetration and the first outboard isolation valve. The application of SRP break exclusion zones is requested for the steam generator blowdown (SGBD) and chemical and volume control system (CVCS) letdown lines outside containment based on piping support modifications and revised stress analyses. The break exclusion zone is established via revised stress analyses and minor support modifications to bring the piping stresses into compliance. The break exclusion zones for these systems consist of approximately 10 to 15 feet of piping for each system.

I&M proposes to apply stress analyses based on ANSI B31.1.0-1967 for use with the SRP 3.6.2, BTP MEB 3-1, Section B.1.e, methodology to a section of piping for the postulation of critical

crack locations based on piping stress for a portion of Unit 2 SGBD piping located in the normal flash tank room. The application of an SRP crack exclusion is requested to eliminate postulation of a critical crack in this location based on piping and piping support modifications, and acceptable stress analysis. This small section of piping (approximately 10 feet) will be replaced with heavy wall piping to reduce the piping stresses to below the threshold for break or crack postulation. Unit 1 may require similar modifications and application of the SRP methodology for a crack exclusion zone. Further analysis is required to make this determination. I&M requests approval to use the SRP crack exclusion for Unit 1, if necessary.

The proposed changes are described in detail in Section D of this attachment.

B. Description and Bases of the Current Requirements

A nuclear plant must be designed to ensure that the effects of a pipe break (large or small) do not damage the minimum required equipment or systems to shut down the plant safely. Loading on surrounding structures and equipment caused by the high-energy fluid jet exiting from the break or crack and pipe whip are primary concerns.

In the early 1970s, the Atomic Energy Commission (AEC) review of reactor power plant safety indicated that the effect of postulated pipe failure outside the containment structure, including the break of a main steam or feedwater line, needed to be adequately documented and analyzed by licensees and applicants, and evaluated by the staff as soon as possible. This conclusion prompted the AEC to issue generic correspondence on the consequences of postulated piping failures (the "Giambusso letter") on December 18, 1972.

In the Giambusso letter, the AEC requested information from licensees and established criteria, including those used to define high-energy piping, address physical separation and pipe whip, determine design basis piping break locations, analyze dynamic effects of break jets, demonstrate environmental qualification, and postulate an open critical-sized crack at the worst location. The Giambusso letter requirement to consider the dynamic effects of break jets out to an unspecified distance is of specific relevance. To be conservative, this distance is typically where the resulting pressure profile from the jet returns to atmospheric pressure. As applied inside the plant areas, this distance is from the break location out to the farthest SSCs.

The Giambusso letter did not include allowances for a break exclusion zone at or near containment penetrations. The Giambusso letter included design criteria for postulating breaks at containment penetrations, which are defined as terminal ends. Additionally, the Giambusso letter included design criteria for postulating a critical crack at the most adverse location, which could be anywhere along the pipe. The Giambusso letter did not consider the postulation of crack location based on piping stress analysis.

The CNP HELB program is based on the intent of the AEC's Giambusso letter, as amended by an errata sheet dated January 31, 1973. Appendix O to the CNP Final Safety Analysis Report contains the licensing commitments related to the implementation of the CNP HELB program, including CNP specific design criteria used and the piping break and critical crack locations considered.

C. Need for Revision of the Requirement

Non-conformances with regard to the CNP HELB program were identified during the current extended outage. Subsequent efforts to reconstitute the CNP HELB program identified that the original jet loading calculations and analyses could not be located. Walkdowns of equipment to assess the adequacy of HELB protection support the conclusion that the original jet loading calculations and resulting requirements for protective devices in the field appear to have been flawed. Reconstruction of jet loadings in accordance with the original licensing and design basis would result in costly, time-intensive recalculation and reanalysis and may have required numerous modifications to change or install HELB protective features in the plant. I&M is requesting the use of NUREG/CR-2913 in order to reconstitute the CNP HELB program using the latest NRC guidance on jet loading.

The original design basis for many of the HELB protective features in the plant is a one-dimensional mathematical model of the jet loading. The Giambusso letter requirements were established based on the one-dimensional modeling of high-energy line break flow. Additionally, the one-dimensional model approximations have resulted in costly over-design and poor utilization of limited space inside plants, as described in the study of two-phase jets presented in NUREG/CR-2913.

The jet resulting from a HELB is two-phase and a complicated multi-dimensional flow. The use of the one-dimensional model is inappropriate for load calculations on two-phase jets. The high pressure and high temperature fluid that exits the break expands with supersonic velocities downstream of the break. Upon encountering a target (or obstacle), a shock wave forms in the flow field, and the thermodynamic properties downstream of this shock wave determine the pressure field and load on the target. A multi-dimensional analysis that is capable of modeling strong shocks is needed to evaluate the thermodynamic properties downstream of the shocks. This is needed in order to provide realistic zones of influence of the jets and the resulting target loads. NUREG/CR-2913 provides such an analysis. The use of the NUREG/CR-2913 methodology provides a more realistic evaluation of target loads and permits the relaxation of protection requirements for SSCs located more than ten pipe diameters from a pipe break or the equivalent for a critical crack. This results in a reduction of associated maintenance costs and radiological exposure. NUREG/CR-2913 has been reviewed and approved by the NRC for use at other nuclear plants.

A break in the containment penetration area of either the CVCS letdown or the SGBD piping would result in unacceptable environmental effects. The CVCS letdown piping is routed near one of the primary heating, ventilation, and air-conditioning ducts for the auxiliary building. A break would result in the general auxiliary building environment becoming a harsh environment. The alternatives for fixing this problem would be to re-route the piping or modify the plant ventilation system. These alternatives are costly to implement. The SGBD break exclusion zone is requested to prevent the consideration of an uncontrolled (i.e., non-isolable) blowdown of a steam generator into the auxiliary building. This problem represents a flooding hazard, which would require extensive coping modifications. Use of the SRP for break exclusion is therefore requested to preclude the installation and maintenance of unnecessary protective hardware. Application of the SRP for break exclusion zones to the SGBD and CVCS letdown piping outside containment from the containment wall out to the first isolation valve would preclude the need for modifications to SSCs in proximity to these sections of piping based on acceptable piping analysis and associated piping support modifications.

Use of the SRP methodology to identify critical crack locations based on piping stress analysis is requested to eliminate the postulation of a critical crack in one short length of piping (approximately 10 feet). The piping is a portion of the Unit 2 SGBD system located in the normal flash tank room. A critical crack in this piping could adversely impact safe shutdown equipment, namely the "N-Train" batteries, which are located in the same room. Using the SRP for the postulation of crack locations based on piping stress analysis is requested to provide a solution that would preclude installing other extensive and complicated protective devices while ensuring adequate protection for the equipment in the room. The modification consists of replacing the existing piping with heavy wall piping and piping support modifications to ensure that the stresses are below the threshold for critical cracks. Unit 1 may require similar modifications and application of the SRP methodology for a crack exclusion zone. Further analysis is required to make this determination.

The methodology changes to incorporate NUREG/CR-2913, SRP break exclusion zones, and the SRP methodology for the postulation of cracks based on stress analysis were determined to involve USQs. Therefore, NRC staff review and approval are required in accordance with 10 CFR 50.90. These determinations were made were based on the use of a different methodology from that used in the CNP licensing basis and the relaxation of requirements that the new methodologies permit.

D. Description of the Proposed Changes

I&M proposes to use the NUREG/CR-2913 methodology for determining the distance of influence for jet spray from breaks and critical cracks in high-energy line piping. Using the NUREG/CR-2913 methodology for modeling the influence of jet spray from critical cracks as a pipe break of the same area is conservative although this application is not specifically addressed within NUREG/CR-2913. The implementation of this methodology change will be performed in

accordance with the assumptions presented in NUREG/CR-2913. The results presented in NUREG/CR-2913 have been reviewed and approved by the NRC for the Crystal River Unit 3, Vogtle Units 1 and 2, and Watts Bar facilities with the conclusion that the unprotected SSCs located more than a distance of ten pipe diameters from a pipe break, without further analysis, are assumed to be undamaged by a jet. The NUREG/CR-2913 methodology will be applied in a similar fashion at CNP. The implementation of the NUREG methodology at CNP consists of limiting the influence of jets to within ten diameters from the break or critical crack. The jet forces within the ten diameters are calculated as done previously. This modifies the CNP licensing and design basis to define more accurately the characteristics of HELB jets.

I&M proposes to apply stress analyses based on ANSI B31.1.0-1967 for use with SRP 3.6.2, BTP MEB 3-1. Consistent with the NRC position stated in a letter to Crystal River Unit 3, dated September 28, 1989, I&M has incorporated the following conditions under which stress calculations based on ANSI B31.1.0-1967 would be acceptable for HELB calculations applied to the SRP:

- Occasional loads include seismic and safety relief valve loads.
- The moment components due to occasional and sustained loads are combined by absolute sum (if they are combined directly), prior to the calculation of the resultant bending moment.
- The calculated bending stresses due to sustained plus occasional loads are amplified directly by the corresponding stress intensification factor for fitting or location being evaluated.
- Stress intensification factors for fittings not listed in ANSI B31.1.0-1967 are included and justified, as appropriate.
- The corresponding stress criteria for HELB postulation are those listed in the Giambusso letter (i.e., break stress threshold equals $0.8(S_h+S_a)$ and crack threshold equals $0.4(S_h+S_a)$).

I&M proposes to apply stress analyses based on ANSI B31.1.0-1967 for use with SRP 3.6.2, BTP MEB 3-1, Section B.1.b, to establish break exclusion zones. The application of SRP break exclusion zones is requested for the SGBD and CVCS letdown lines outside containment based on piping support modifications and revised stress analyses (see Figure 1). The SRP 3.6.2, BTP MEB 3-1, Section B.1.b, provides for an exemption from break and crack considerations in the containment penetration area for piping exiting penetrations up to the first isolation valve when piping stresses are within specified limits and where the piping cannot be adversely impacted by breaks or cracks in other parts of the piping. This modifies the CNP licensing and design basis to preclude the consideration of breaks and cracks in the SGBD and CVCS letdown lines based on acceptable piping analysis in accordance with ANSI B31.1.0-1967, "USA Standard Code for Pressure Piping, Power Piping," the design code of record. This break exclusion is incorporated into the plant by modification of piping supports to ensure that the piping stresses are below the

required values. The supports requiring modification were identified by detailed stress analyses of the piping in question.

I&M proposes to apply stress analyses based on ANSI B31.1.0-1967 for use with the SRP 3.6.2, BTP MEB 3-1, Section B.1.e, methodology to a section of piping for the postulation of critical crack locations based on piping stress for a portion of Unit 2 SGBD piping located in the normal flash tank room (see Figure 2). The SRP methodology is used to eliminate postulation of a crack in this location based on acceptable stress analysis. This modifies the CNP licensing and design basis for this portion of piping to base the postulation of cracks on piping stress analysis. This crack exclusion is incorporated into the plant by replacing approximately 10 feet of piping with heavy wall piping and piping support modifications. These modifications were determined to be required by the detailed stress analyses to bring the piping stress into compliance with the regulatory guidance for crack exclusion. Unit 1 may require similar modifications and application of the SRP methodology for a crack exclusion zone. Further analysis is required to make this determination. I&M requests approval to use the SRP crack exclusion for Unit 1, if necessary.

E. Bases for the Proposed Changes

NUREG/CR-2913 is the current NRC and industry-accepted standard for determining the characteristics of a jet spray exiting a HELB location. This design methodology is used for determining the jet spray impingement force, angle of spray influence, and distance of influence from the pipe break based upon the energy conditions, pipe diameter, and pipe configuration at the time and point of a postulated HELB. NUREG/CR-2913 was published to provide a better source of calculated target loads. NUREG/CR-2913 has been accepted by the American Nuclear Society in ANSI/ANS 58.2-1988, "Design Basis for Protection of Light Water Nuclear Power Plants Against the Effects of Postulated Pipe Rupture," and the NRC as a valid two-phase flow methodology.

The following information provides examples of other plants that include NUREG/CR-2913 in the licensing basis. This listing is not all-inclusive.

- Byron Nuclear Power Station Unit 1, Docket 50-454, submittal on "Fluid Jet Impingement Analyses," dated January 21, 1985, used NUREG/CR-2913 to establish its protection against the effects of high-energy line breaks and cracks.

- Comanche Peak Steam Electric Station, Units 1 and 2, Dockets 50-445 and 50-446, submittal on "Jet Impingement Analysis," dated March 28, 1988, and the NRC's response, dated September 30, 1988, reinforce that the use of the NUREG/CR-2913 methodology for steam and flashing jets is acceptable.

- Crystal River Unit 3, Docket 50-302, submittal dated May 28, 1998, in part, incorporates NUREG/CR-2913, "Two-Phase Jet Loads," as part of the approved licensing basis for evaluating pipe breaks inside containment. The NRC's SER, dated July 27, 1999, documented that the use of the NUREG/CR-2913 methodology is acceptable.

- Vogtle, Units 1 and 2, Dockets 50-424 and 50-425, NRC Supplemental Safety Evaluation Report (SSER) 5, Section 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," dated January 1987, stated, in part, that, "[u]nprotected components at a distance beyond 10 pipe diameters from the broken pipe are considered undamaged by the jets without further analysis." This SSER concluded that, "[t]he staff has reviewed NUREG/CR-2913 and has concluded that the methodology that predicts that jet impingement loads are negligible at a distance beyond 10 pipe diameters from breaks in pipes that contain high-pressure steam or subcooled liquid that flashes at the breaks is acceptable."

- Watts Bar, Docket 50-390, NRC SSER 6, Section 3.6, "Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping," dated April 1991, established, in part, that unprotected components located more than ten diameters from a pipe break are without further analysis assumed undamaged by a jet. This NRC SSER also states that, "[t]he staff has previously reviewed the methodology used in NUREG/CR-2913 for determining the effects of such a jet on components at a distance greater than 10 diameters and has found it acceptable. Similar application of this criterion has been approved for other plants and is, therefore, acceptable for Watts Bar."

The use of the break exclusion zones allowed by the SRP on the SGBD and CVCS letdown lines will provide the necessary reasonable assurance for protection from HELB events and incorporates the increased understanding of HELB mechanisms as addressed in the current regulatory guidance. As part of Generic Letter 87-11, "Relaxation in Arbitrary Intermediate Pipe Rupture Requirements," the NRC issued a revision to SRP Section 3.6.2, and its associated Branch Technical Position, MEB 3-1. The updates to the SRP were provided to incorporate lessons learned from operating experience and to achieve consistency with current practices. MEB 3-1, Section B.1.b, states that "[b]reaks and cracks need not be postulated in those portions of piping from [the] containment wall to and including the inboard or outboard isolation valves..." provided that the piping meets specific requirements.

The proposed changes to incorporate SRP break exclusion zones permit a relaxation of the requirement to postulate breaks and cracks in the piping from the containment wall to and including the outboard isolation valves for the SGBD and CVCS letdown lines. The SGBD and CVCS letdown piping has been analyzed in accordance with ANSI B31.1.0-1967, and support modifications have been performed to ensure that the piping stresses are below the SRP threshold for break exclusion. This analysis maintained the use of the Giambusso break stress threshold of $0.8(S_h+S_a)$, which is more conservative than the SRP threshold of $0.8(1.8S_h+S_a)$. The S_h and S_a

are allowable stresses at maximum (hot) temperature and allowable stress range for thermal expansion, respectively. The use of this approach to account for the differences between the ASME Code stress methodology used in the SRP and the ANSI B31.1.0-1967 stress methodology has been reviewed and approved by the NRC for use on ANSI B31.1.0-1967 piping located inside containment at Crystal River Unit 3 by letter dated September 28, 1989. Also, the effects of breaks outside of the break exclusion zones have been reviewed and determined to not have an adverse impact on the piping within the exclusion zone. The use of this methodology and the modification of the supports ensure sufficient margin to preclude breaks and cracks in this region of piping.

The use of the SRP BTP MEB 3-1, Section B.1.e, methodology for postulation of crack locations based on piping stress analysis permits a relaxation of the Giambusso requirement to postulate a critical crack in the most adverse location. The SRP methodology allows postulation of crack locations based on piping stresses alone. Consistent with the methodology reviewed and approved by the NRC for Crystal River Unit 3, the crack threshold used in the stress analysis was one-half of the Giambusso criteria ($0.4(S_h+S_a)$), which is more conservative than the SRP threshold of $0.4(1.8S_h+S_a)$. This approach accounts for the differences between the ASME Code calculations per the SRP and ANSI B31.1.0-1967 calculations. This crack exclusion is being sought for a single case. The piping is a portion of the Unit 2 SGBD piping located in the normal flash tank room. Currently, a critical crack in this piping could adversely impact the N-Train batteries, which are located in the same room.

The use of piping stresses to predict crack formation is acceptable based on the SRP methodology. The stress analysis methods and the allowable stresses for exclusion of crack formation are conservative in nature and provide margin to failure, which is inherent in the material properties and allowables. The replacement of the normal piping with heavy wall piping in this area, piping support modifications, and reanalysis in accordance with ANSI B31.1.0-1967 ensures sufficient stress margin for compliance with the regulatory guidance for crack postulation. Therefore, the use of this method in this instance provides adequate assurance that the "N-Train" equipment is protected from the harsh effects of a critical crack in this piping. Unit 1 may require similar modifications and application of the SRP methodology for a crack exclusion zone. Further analysis is required to make this determination.

F. Impact on Previous Submittals

No previous submittals are affected by this request.

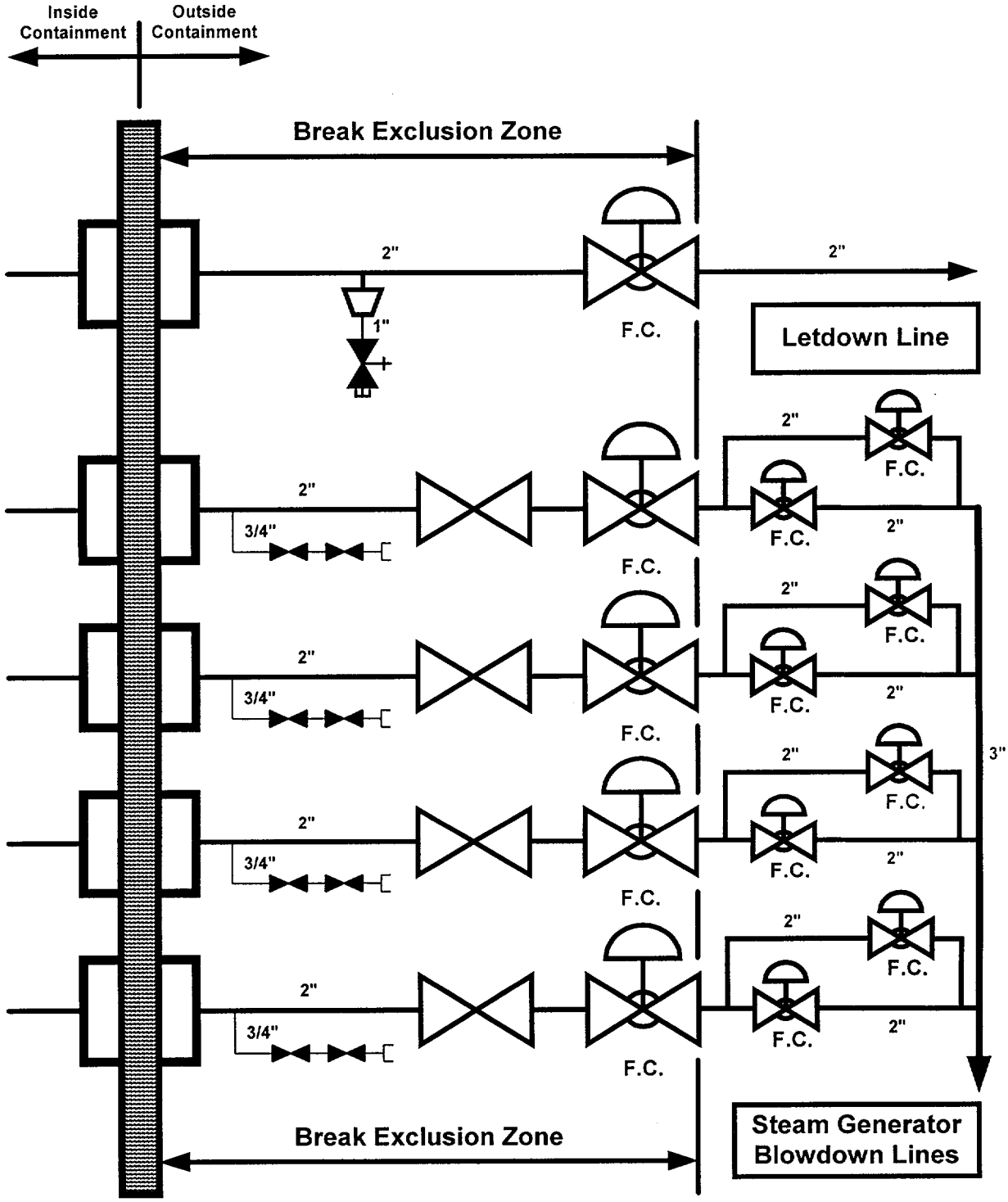

Figure 1: Break Exclusion Zones

(No Longitudignal or Circumferential Breaks, No Critical Cracks, No Terminal End Breaks)
Typical for Both Units

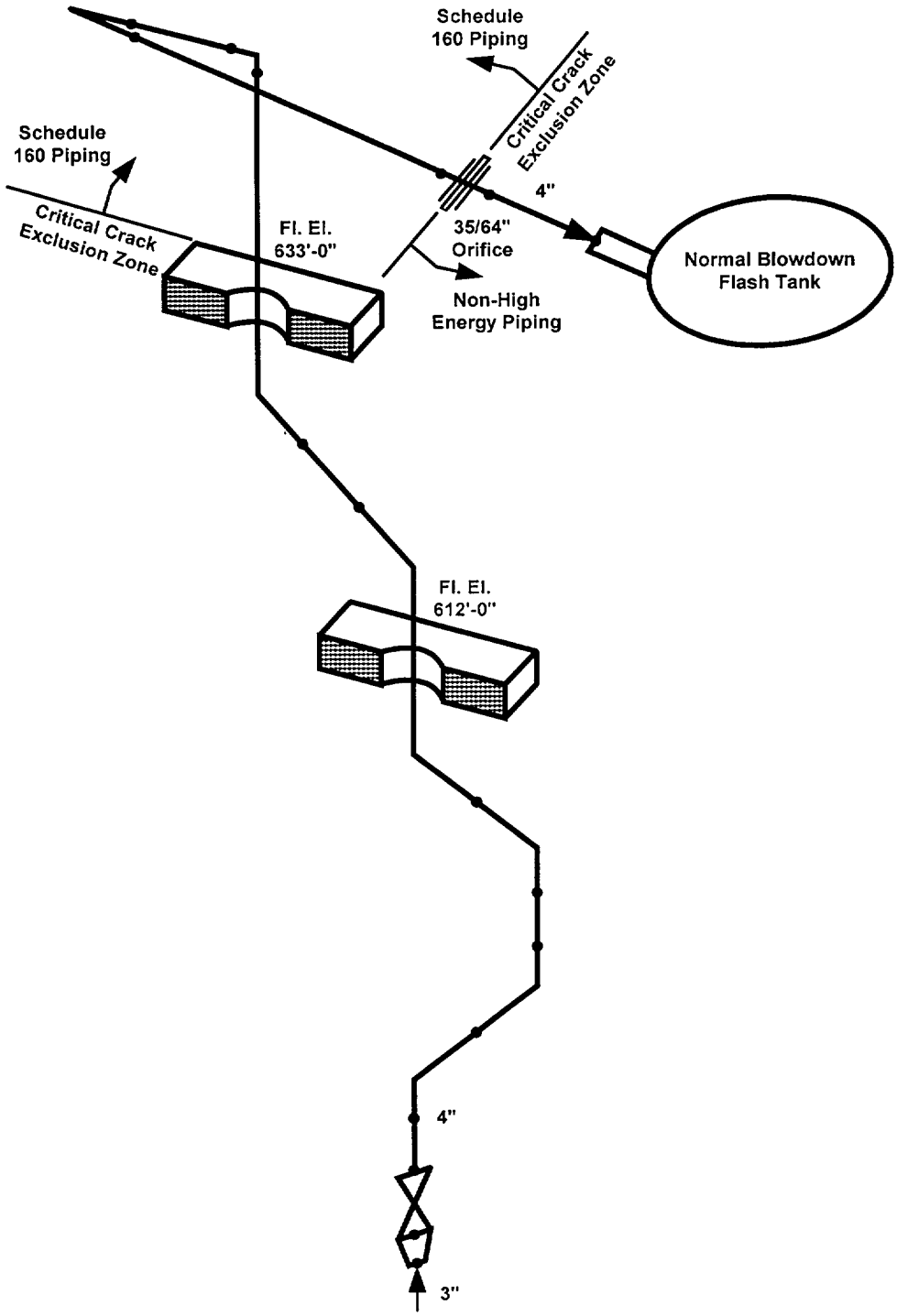

Figure 2: Steam Generator Blowdown Line Crack Exclusion Zone
(No Critical Cracks)
Specific to Unit 2, Unit 1 Similar

ATTACHMENT 2 TO C0400-06

NO SIGNIFICANT HAZARDS CONSIDERATION EVALUATION

Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, has evaluated this proposed amendment and determined that it does not involve a significant hazard. According to 10 CFR 50.92(c), a proposed amendment to an operating license 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 of occurrence or consequences of an accident previously evaluated;

2. create the possibility of a new or different kind of accident from any previously analyzed; or

3. involve a significant reduction in a margin of safety.

I&M proposes to incorporate three methodology changes to the CNP high-energy line break (HELB) program.

The methodology changes are being requested to incorporate: 1) NUREG/CR-2913, "Two-Phase Jet Loads," 2) NUREG-0800, "Standard Review Plan [SRP]," Section 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," and its associated Branch Technical Position (BTP), MEB 3-1, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," Section B.1.b, break exclusion zones, and 3) an SRP 3.6.2, BTP MEB 3-1, Section B.1.e, crack exclusion based on stress analysis into the CNP licensing basis. Each of these methodology changes involves an unreviewed safety question. Therefore, NRC staff review and approval are required in accordance with 10 CFR 50.90. These changes are described below.

I&M proposes to change the analysis methodology used in the HELB program to incorporate the recommendations of NUREG/CR-2913. The implementation of this methodology change will be performed in accordance with the assumptions presented in NUREG/CR-2913. The methodology of NUREG/CR-2913 is requested to eliminate consideration of jet impingement effects for structures, systems, and components (SSCs) located more than ten diameters from postulated HELBs and the ten diameter equivalent for critical cracks. The results presented in NUREG/CR-2913 have been reviewed and approved by the NRC for the Crystal River Unit 3, Vogtle Units 1 and 2, and Watts Bar facilities with the conclusion that the unprotected SSCs located more than a distance of ten pipe diameters from a pipe break, without further analysis, are assumed to be undamaged by a jet. The NUREG/CR-2913 methodology will be applied in a similar fashion at CNP.

I&M proposes to incorporate SRP break exclusion zones. The SRP allowance for a break exclusion zone is requested for the steam generator blowdown (SGBD) and chemical and volume control system (CVCS) letdown lines outside containment based on piping support modifications and revised stress analyses. The SGBD and CVCS letdown piping has been analyzed in accordance with ANSI B31.1.0-1967, and support modifications have been performed to ensure that the piping stresses are below the SRP threshold for break exclusion. This analysis maintained the use of the Giambusso break stress threshold of $0.8(S_h+S_a)$, which is more conservative than the SRP threshold of $0.8(1.8S_h+S_a)$. The S_h and S_a are allowable stresses at maximum (hot) temperature and allowable stress range for thermal expansion, respectively. The use of this approach to account for the differences between the ASME Code stress methodology used in the SRP and the ANSI B31.1.0-1967 stress methodology has been reviewed and approved by the NRC for use on ANSI B31.1.0-1967 piping located inside containment at Crystal River Unit 3 by letter dated September 28, 1989.

I&M proposes to incorporate the SRP methodology for the postulation of critical crack locations based on piping stress for a portion of SGBD piping located in the normal flash tank room. The SRP crack exclusion is requested to eliminate postulation of a critical crack in this location based on piping and piping support modifications and an acceptable stress analysis. Consistent with the methodology reviewed and approved by the NRC for Crystal River Unit 3, the crack threshold used in the stress analysis was one-half of the Giambusso criteria ($0.4(S_h+S_a)$), which is more conservative than the SRP threshold of $0.4(1.8S_h+S_a)$.

The determination that the criteria set forth in 10 CFR 50.92 are met for this amendment request is indicated below.

1. Does the change involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated?

The proposed changes do not impact the design of these high-energy lines such that previously analyzed SSCs would now be more likely to fail. The changes will not modify high-energy lines to reduce their design capability of maintaining pressure boundary integrity during normal operating and accident conditions. The use of the NUREG/CR-2913 methodology to more accurately define the dynamic effects from high-energy line breaks and cracks does not affect the probability of any analyzed piping break or critical crack events. The use of the NUREG/CR-2913 methodology does not affect high-energy line break or crack initiators or precursors. The SGBD and CVCS letdown piping will be modified and analyzed, as required, to ensure that the piping stresses remain below the threshold for postulation of a critical crack or break. Also, the effects of breaks or critical cracks outside of the break exclusion zones have been reviewed and determined to not have an adverse impact on the piping within the exclusion zone. The modified SGBD piping in the normal flash tank room will be analyzed to ensure that the application of the SRP for postulating cracks based on piping stresses is acceptable. Therefore, incorporating these

new methodologies does not affect equipment malfunction probability, nor does it affect or create new accident initiators or precursors. Additionally, the NRC expected the results of revisions to SRP Section 3.6.2 requirements to yield more efficient regulatory practices, improve plant piping systems design, increase plant reliability, and decrease occupational radiation exposure associated with inspections and repairs.

The proposed changes permit relaxation of protective requirements that may represent a potential increase in the consequences of an accident. However, the proposed changes are consistent with the current regulatory guidelines for HELB evaluations and continue to ensure that protection of SSCs required for accident mitigation is maintained. The NUREG/CR-2913 methodology for determining the effects of jet flow from HELB events shows that SSCs outside the distance of ten piping diameters from the break or critical crack are undamaged. The SRP allowances for break and crack exclusions embody the understanding that the probability of breaks or critical cracks in piping systems that satisfy the stress criteria is extremely low. For those areas addressed by the methodology changes, protection is not required while still providing reasonable assurance that there is no undue risk to the health and safety of the public. Therefore, protection of SSCs required for accident mitigation is assured by use of these well-defined design methodologies. Thus, there will be no reduction in the capability of those SSCs in limiting the consequences of previously evaluated accidents. Malfunctions caused by HELBs and critical cracks have been previously analyzed in the Updated Final Safety Analysis Report (UFSAR). Thus, no additional radiological source terms are generated, and the consequences of an accident previously evaluated in the UFSAR will not be increased.

Therefore, the probability of occurrence or the consequences of accidents previously evaluated are not significantly increased.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

The proposed changes do not impact the design of these high-energy lines such that previously unanalyzed breaks would now occur. The change to incorporate the NUREG/CR-2913 methodology does not introduce any new malfunctions; it more accurately defines the effects from the high-energy line breaks and cracks for use in the HELB program.

Regarding the incorporation of the SRP break exclusion zones, the break exclusion stress thresholds provide assurance that the piping is capable of withstanding the design loadings without the possibility of developing a through wall crack or break. The piping will be modified and completely analyzed to ensure that the piping stresses are below the threshold for break exclusion. The effects of breaks outside of the break exclusion zones have been reviewed and determined to not have an adverse impact on the piping within the exclusion zone. The modified SGBD piping in the normal flash tank room will be analyzed to ensure that the application of the

SRP for postulating cracks based on piping stresses is acceptable. The proposed changes do not result in modification to high-energy lines that would reduce their design capabilities to maintain pressure boundary integrity during normal operating and accident conditions. Therefore, use of the new design methodologies does not affect or create new accident initiators or precursors or create the possibility of a new or different kind of accident.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the change involve a significant reduction in a margin of safety?

The approval of the license amendment will not result in any modifications to high-energy lines that would reduce their design capabilities to maintain pressure boundary integrity during normal operating and accident conditions. By using these new design methodologies, protection of SSCs required for accident mitigation is assured.

The NUREG/CR-2913 methodology better defines the extent of impingement loads from the postulated high-energy line breaks and cracks. Use of the NUREG/CR-2913 methodology establishes that unprotected components located more than ten diameters from a pipe break or crack in piping containing fluids within the assumptions of NUREG/CR-2913 are without further analysis assumed undamaged by a jet. This conclusion has been reviewed and accepted by the NRC as providing adequate safety margin for high-energy piping. Protection of SSCs required for accident mitigation will continue to be assured by use of the NUREG/CR-2913 methodology if modifications to those SSCs are implemented in the future.

The use of the SRP break exclusion zones incorporates industry lessons learned and ensures that an adequate safety margin is maintained. The SGBD and CVCS letdown piping will be analyzed after modifications are performed in accordance with the original piping design code to ensure that the piping stresses are below the SRP threshold for break exclusion. Also, the effects of breaks outside of the break exclusion zones have been reviewed and determined to not have an adverse impact on the piping within the exclusion zone. The modified SGBD piping in the normal flash tank room will be analyzed to ensure that the application of the SRP for postulating cracks based on piping stresses is acceptable. Therefore, the capability of those SSCs to limit the offsite dose consequences of previously evaluated accidents to levels below the approved acceptance limits will continue to be assured.

The SRP presents the most definitive basis available for specifying the NRC's design criteria and design guidelines for an acceptable level of safety. The SRP guidelines resulted from many years of experience gained by the NRC in establishing and using regulatory requirements in the safety evaluation of nuclear facilities. The implementation of the design guidelines contained in MEB 3-1 assures that adequate protection is provided and a consistent level of safety is

maintained. In addition, some regulatory requirements developed over the years as part of the licensing process have resulted in additional safety margins that overlap the safety margins provided by the criteria of MEB 3-1. Consequently, use of these new design methodologies instead of the previous licensing basis requirements cannot significantly reduce the existing margin of safety.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

In summary, based upon the above evaluation, I&M has concluded that the proposed changes involve no significant hazards consideration.

ATTACHMENT 3 TO C0400-06

ENVIRONMENTAL ASSESSMENT

Indiana Michigan Power Company (I&M) has evaluated this license amendment request against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. I&M has determined that this license amendment request meets the criteria for a categorical exclusion set forth in 10 CFR 51.22(c)(9). This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50 that changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or that changes an inspection or a surveillance requirement, and the amendment meets the following specific criteria.

(i) The amendment involves no significant hazards consideration.

As demonstrated in Attachment 2, this proposed amendment does not involve significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

As documented in Attachment 2, there will be no significant change in the types or significant increase in the amounts of any effluents released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed changes will not result in significant changes in the operation or configuration of the facility. There will be no change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposal result in any change in the normal radiation levels within the plant. Therefore, there will be no significant increase in individual or cumulative occupational radiation exposure resulting from this change.

ATTACHMENT 4 TO C0400-06

COMMITMENTS

The following table identifies those actions committed to by Indiana Michigan Power Company (I&M) in this submittal. Other actions discussed in the submittal represent intended or planned actions by I&M. They are described to the Nuclear Regulatory Commission (NRC) for the NRC's information and are not regulatory commitments.

Commitment	Date
The piping support modifications necessary to bring the steam generator blowdown and chemical and volume control system letdown piping stresses below the acceptance criteria for the application of the Standard Review Plan, Branch Technical Position, MEB 3-1, Section B.1.b, break exclusion zones will be implemented by Mode 3 from the current outage for the applicable unit.	Prior to Mode 3 entry from the current outage for the applicable unit
The modifications necessary on Unit 2 to replace the normal piping segment of steam generator blowdown line that is run through the normal flash tank room with heavy wall piping to ensure sufficient stress margin for compliance with the regulatory guidance of the Standard Review Plan, Branch Technical Position, MEB 3-1, Section B.1.e, for crack postulation will be implemented by Mode 3 from the current outage for Unit 2.	Prior to Mode 3 entry from the current outage for Unit 2
If required by analysis, any modifications necessary on Unit 1 to the piping segment of steam generator blowdown line that is run through the normal flash tank room to ensure sufficient stress margin for compliance with the regulatory guidance of the Standard Review Plan, Branch Technical Position, MEB 3-1, Section B.1.e, for crack postulation will be implemented by Mode 3 from the current outage for Unit 1.	Prior to Mode 3 entry from the current outage for Unit 1