



March 17, 2006

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No. 06-140
KPS/LIC/GR: R2
Docket No. 50-305
License No. DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
LICENSE AMENDMENT REQUEST - 215
MODIFICATION OF INTERNAL FLOODING DESIGN BASIS

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) requests an amendment to Facility Operating License Number DPR-43 for Kewaunee Power Station (Kewaunee). This amendment requests approval of a change to design criteria described in the Updated Safety Analysis Report (USAR). The change would add new design criteria associated with internal flooding to the current licensing basis for Kewaunee.

The Kewaunee USAR states, in part, that Class I items are protected against damage from rupture of a pipe or tank resulting in serious flooding. However, Kewaunee's USAR does not contain specific design criteria for internal flooding evaluations. Therefore, DEK has compiled specific design criteria for internal flooding evaluations and requests Nuclear Regulatory Commission (NRC) approval of these design criteria.

It has been determined that this amendment application does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment. The KPS Plant Operation Review Committee and the Management Safety Review Committee reviewed this amendment application.

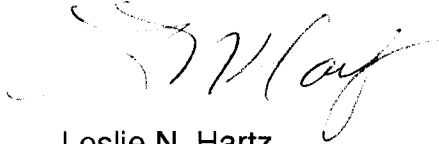
Dominion requests approval of the proposed change by March 15, 2007. Once approved, the change will be implemented within 60 days.

Attachment 1 to this letter contains a description, a safety evaluation, a significant hazards determination, and environmental considerations for the proposed change. Attachment 2 contains the USAR pages that reflect the addition of the new design criteria.

In accordance with 10 CFR 50.91, a copy of this application is being provided to the designated Wisconsin official.

If you have any questions or require additional information, please contact Mr. Gerald Riste at (920) 388-8424.

Very truly yours,



Leslie N. Hartz
Vice President – Nuclear Engineering

Attachments:

1. Discussion of Change, Safety Evaluation, Significant Hazards Determination and Environmental Considerations
2. USAR pages

Commitments made in this letter: None

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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President – Nuclear Engineering of Dominion Energy Kewaunee, Inc. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 17th day of March, 2006.

My Commission Expires: August 31, 2008.

Margaret B. Bennett
Notary Public

(SEAL)

Attachment 1

**LICENSE AMENDMENT REQUEST-215
MODIFICATION OF INTERNAL FLOODING DESIGN BASIS**

Kewaunee Power Station

Dominion Energy Kewaunee, Inc.

Introduction

In 2005, a re-constitution of the design basis for internal flooding was initiated in support of several internal flooding protection modifications. During the period the Operating License for Kewaunee Power Station (Kewaunee) was issued, the Atomic Energy Commission (AEC) was pursuing resolution of the issue of internal flooding for previously licensed plants. The AEC identified the issue as Multi-Plant Generic Issue B-11, "Susceptibility of Safety Related Systems to Flooding Caused by Failure of Non-Class I Systems [MPA B011]." Under this generic issue, the AEC developed a set of guidelines for internal flooding protection. No correspondence has been found indicating these guidelines were sent to Kewaunee for consideration. However, the guidelines have been considered in this proposed change to the Kewaunee internal flooding design basis.

1.0 DESCRIPTION

This amendment requests approval of a change to design criteria described in the Kewaunee Updated Safety Analysis Report (USAR). The change would add new design conditions associated with internal flooding evaluations to the Kewaunee USAR.

Kewaunee's USAR Appendix B, "Special Design Procedures," Section B.5, "Protection of Class I Items," states:

"The Class I items are protected against damage from:

- a. Rupture of a pipe or tank resulting in serious flooding or excessive steam release to the extent that the Class I function is impaired."

A review performed during the first half of 2005 determined there were postulated scenarios where Kewaunee may not comply with this statement. The purpose of this amendment request is to add the specific design criteria to Kewaunee's current licensing basis, which provides additional clarity to ensure compliance with the USAR statement in Section B.5.

2.0 PROPOSED CHANGE

This change would add the following flooding design criteria for internal flooding evaluations to the Kewaunee USAR:

- a. Only non-Class I/I* pipe or tanks are considered to fail and, of these, individual items may be determined not to fail if evaluated to withstand a Design Basis Earthquake.
- b. Only failures in piping and branch runs exceeding 1 inch are considered.

- c. Pipe and tank failures assume the single most limiting failure in an area, as determined by maximum flood level calculated in that area.
- d. Operator actions and design features are considered, but an additional single failure is not.
- e. Flooding is assumed coincident with a loss of offsite power if it increases the consequences of a flood.
- f. Protected equipment is sufficient to achieve and maintain safe shutdown requirements.

These new design criteria will be added to the Kewaunee USAR as part of a new Section B.11, "Internal Flooding." The proposed new Section B.11 is included for information as Attachment 2.

3.0 BACKGROUND

On May 28, 1968, the Atomic Energy Commission (AEC) issued a Construction Permit (CP) and associated safety evaluation (SE) for the construction of the Kewaunee Power Station (Kewaunee). In the introduction section of the SE, the AEC stated that before issuing an operating license the AEC would review the final design thoroughly to determine that all the Commission's safety requirements were met¹.

On January 15, 1970, Wisconsin Public Service Corporation (WPSC), the licensee at that time, submitted a response to a request for additional information from the AEC². This response added information to the Facility Description and Safety Analysis Report (FDSAR). The FDSAR was later titled the Preliminary Safety Analysis Report (PSAR). Specifically the changes were associated with Appendix B, "Special Design Procedures," of the PSAR.

The purpose of the changes was to re-classify structures and equipment. Previously in Appendix B, structures and components were divided into two classes, Class I and Class II. The earthquake loads for Class I items were defined as the Design Basis Earthquake (DBE) and for Class II items were specified to be in accordance with the requirements of the Uniform Building Code, Zone 1. To clearly establish the Kewaunee existing design basis, these two classifications were expanded to three classifications. The classification of all items was then clearly identified. Appropriate revised pages and a reclassified list of structures and components in a tabular form, were inserted in the PSAR.

This change also included new Section B.11, "Protection of Class I Systems." Under Section B.11 was Item (a), which stated:

"The Class I systems have to be protected against damage from:

- a. Rupture of a pipe or tank resulting in serious flooding or excessive steam release to the extent that Class I function is impaired."

The original Section B.11 was later changed to Section B.5 and the criteria subsequently changed to state:

"The Class I items are protected against damage from:

- a. Rupture of a pipe or tank resulting in serious flooding or excessive steam release to the extent that the Class I function is impaired."

Although not a part of the operating license review process, an issue was raised by the AEC during original licensing³. This issue involved a postulated failure of the expansion joint connecting the circulating water piping to the condenser. In response,⁴ WPSC stated such a failure was not a probable event at Kewaunee. However, if such a failure did occur, the event would be terminated by manually tripping the circulating water pump. Additionally WPSC's response stated:

"Spillage from a credible break in the circulating water line could cause some minor flooding over the turbine building floor prior to removal from the turbine building sumps. However, since the turbine building elevation is higher than the lake surface elevation, flooding would stop when the circulation water pump operation was terminated. The control room would be alerted by the turbine building sump high level alarm. Spillage from breaks in other process lines in the turbine building basement would be similarly detected and appropriate operator action would be taken to stop pumps or isolate the line causing the spillage."

Subsequently, several issues surfaced in the industry relating to interactions between safety related and non-safety related systems, structures, or components (SSC's) including:

- A-17, Systems Interactions In Nuclear Power Plants,
- Generic Issue 77, Flooding of Safety Equipment Compartments by Backflow Through Floor Drains, and
- Unresolved Safety Issue (USI) USI-46, Seismic Qualification of Equipment in Operating Plants.

In 1988, the NRC issued Generic Letter (GL) 88-20, "Individual Plant Examinations." This GL requested the industry perform a review of plant SSC's using a probabilistic risk assessment methodology to determine vulnerabilities in the design of their facilities. The Kewaunee staff performed the requested individual plant examination (IPE) and determined there were scenarios where a flood, caused by a failure of a non-Class I SSC, could affect the ability of a safety-related SSC to perform its safety-related function. To address these scenarios, some minor changes were made to the facility and the PRA results were transmitted to the NRC. A subsequent safety evaluation (SE) was issued by the NRC on the Kewaunee PRA.

In 2002, an industry peer review of the PRA analysis developed for plant IPE's was performed at Kewaunee. On July 2, 2002, a corrective action program (CAP) item was issued concerning the results of this PRA peer review. This CAP stated that the June 10-14, 2002, Westinghouse Owners Group PRA Peer Review identified eight issues associated with the PRA analysis of internal flooding. Additionally, the CAP stated that the flooding analysis done for the IPE had not been updated and was not consistent with the current methods for analyzing flooding risk.

Independently, in the summer of 2004 an NRC Resident Inspector stationed at Kewaunee questioned the adequacy of internal flooding mitigation features as part of a routine baseline inspection.

Kewaunee staff reviewed the results of the PRA peer review, factored in the concerns of the NRC Resident Inspector, and updated the Kewaunee PRA analysis. Based on this review Kewaunee staff determined that changes were needed to the facility to appropriately address internal flooding and reduce the associated risk.

In February of 2005, while the unit was shutdown, Kewaunee staff made a decision to install additional internal flood mitigation features. In order to determine the design of these additional internal flood mitigation features, a set of detailed design criteria was needed. Based on a review of Kewaunee's licensing basis and industry practices and precedence, detailed design criteria for internal flooding analysis were developed.

4.0 TECHNICAL ANALYSIS

Design Criteria (a): Only non-Class I/I* pipe or tanks are considered to fail and, of these, individual items may be determined not to fail if evaluated to withstand a Design Basis Earthquake.

The KPS updated safety analysis report (USAR), Section 1.8, "Atomic Energy Commission (AEC) General Design Criteria," item I, "Overall Plant Requirements," contains design criteria for KPS. Criterion 2, "Performance Standards," states:

"Those systems and components of reactor facilities which are essential to the prevention of accidents which could affect the public health and safety

or to mitigation of their consequences shall be designed, fabricated and erected to performance standards that will enable the facility to withstand without loss of the capability to protect the public.[sic] The additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, flooding conditions, winds, ice and other local site effects. The design bases so established shall reflect:

- a) appropriate consideration of the most severe of these natural phenomena that have been recorded for the site and the surrounding area, and
- b) an appropriate margin for withstanding forces greater than those recorded to reflect uncertainties about the historical data and their suitability as a basis for design.”

The KPS USAR also states that the systems and components designated Class I in Appendix B are designed to withstand, without loss of capability to protect the public, the most severe environmental phenomena ever experienced at the site with appropriate margins included in the design for uncertainties in historical data.

KPS USAR Section B.6 contains the design criteria for KPS structures while USAR Section B.7 contains the design criteria for components. Specific information on the load combinations required for the different classes is contained in KPS USAR Table B.6-1 for structures, and Table B.7-1, for components.

Class I structures are analyzed under various conditions of loading, two of which are design basis earthquake conditions and tornado conditions. Class I components are analyzed under various conditions of loading, one of which is design basis earthquake conditions. Additionally, Class I* structures and components analyzed conditions of loading include the design basis earthquake.

Thus, Class I and Class I* structures and components have been designed to withstand the loads associated with a design basis earthquake and can be assumed to remain intact. For other classes of structures or components an evaluation must be performed to determine if the structure or component would continue to maintain integrity following a design basis earthquake.

The criteria for protection of Class I equipment in USAR Section B.5.a states that Class I items are protected against damage from the rupture of a pipe or tank resulting in serious flooding. This protection ensures that the Class I function is not impaired. The Class I functions required following a rupture of a pipe or tank which results in internal flooding are those functions necessary to achieve and maintain safe shutdown of the reactor. For internal flooding, safe shutdown is defined as hot shutdown. The design criteria for the design basis earthquake are that the reactor can be safely shutdown and that there is no uncontrolled release of radioactivity.

Some non-Class I/I* pipes have been excluded from consideration as a potential flood source based on seismic evaluations which provide a reasonable assurance the pipe would sustain the combined effects of a design basis earthquake and deadweight loading without leaking. This assurance is obtained from experience based evaluations and/or by bounding evaluations. Criteria from the ASME Code, Section III for evaluation of level D loading or from ASME Section III, Appendix F can be used to establish reasonable assurance against leakage from a pressure boundary.

Design Criteria (b): Only failures in piping and branch runs exceeding 1-inch are considered.

Kewaunee is not licensed to the criteria contained in NUREG 0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." However, consistent with NUREG-0800, Section 3.6.1, "Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," only breaks in piping and branch runs exceeding 1-inch need to be considered as a flooding source.

Design Criteria (c): Pipe and tank failures assume the single most limiting failure in an area, as determined by maximum flood level calculated in that area.

The consideration of only non-Class I/I* pipe or tank failures is consistent with the original AEC flooding guidance developed as part of Multi-Plant Generic Issue B-11. Likewise, the assumption that only one such failure is assumed is also consistent with the AEC flooding guidelines.

Multiple pipe or tank failures are not considered because the potential interactions, such as pipe whip or jet impingement, are not applicable to lines that are not defined as high-energy lines. As discussed in USAR Section 10A, high-energy line break scenarios must consider consequential failures due to the initial rupture. Multiple failures resulting from seismic loadings are not considered as credible because of the robust design of non-Class I/I* piping. Specific evaluations of non-Class I/I* piping in the Class I portion of the Turbine Building basement (safeguards alley) have demonstrated that the Class II and Class III piping in this area are capable of withstanding the effects of a DBE without failure. The piping in this area was installed to the same standards as the rest of the station's non-Class I/I* piping. These standards are listed in KPS USAR Section B.3, "Design Codes."

It is not possible to ensure that the non-Class I/I* tanks and piping outside of safeguards alley would remain intact during a DBE without additional evaluation. Accordingly, a non-Class I/I* pipe or tank that has not been seismically evaluated is assumed to fail due to DBE seismic loads. However, only one pipe or tank component is assumed to fail. The failure is conservatively assumed to be the worst case (complete double-ended rupture) with respect to flooding potential in each area evaluated.

Design Criteria (d): Operator actions and design features are considered, but an additional single failure is not.

Operator actions and design features are considered in the evaluation of internal flooding consequences. Operator actions in response to control room indications are the primary means of identification and termination of flooding sources. The design features include, but are not limited to, level sensing devices which alert operators to take action, check valves to prevent backflow through pipes, barriers to protect safety-related equipment (including existing walls, flood doors, dikes, etc.), equipment elevation and circulating water pump trips on high water level in the turbine building to minimize flood sources. Other design features such as sump pump capability, height of equipment from floor level, and the ability of doors and other structures to limit flooding flow rates from room-to-room may also be considered on a case-by-case basis.

The NRC guidelines for internal flooding (MPA B011) do not require an additional single failure to be considered coincident with an internal flood. These guidelines were utilized by most early plant licensees and have been reflected in the design requirement precedents observed from similar vintage facilities, such as Surry, Prairie Island, and Monticello.

Single failure criteria are typically established for specified plant systems, in accordance with applicable codes and standards, and within specific safety analyses in the KPS current licensing basis (e.g., HELB) and are discussed in the USAR. Beyond these specific requirements, single failure assumptions are not required.

Design Criteria (e): Flooding is assumed coincident with a loss of offsite power if it increases the consequences of a flood.

Loss of offsite power (LOOP) is assumed unless the LOOP results in less consequence. Design features that rely on electric power to operate (such as sump pumps) are only credited for flood protection if they are powered by site emergency power sources or in the cases where a LOOP is not assumed.

An internal flooding event is not assumed to occur coincident with any other design basis event described in Chapter 14 of the USAR. However, if flooding is a result of a design basis event (e.g., a HELB outside containment, App. R fire, etc.) the consequences of the flooding are considered in the evaluation of the plant's ability to achieve and maintain safe shutdown.

Design Criteria (f): Protected equipment is sufficient to achieve and maintain safe shutdown requirements.

Safe shutdown following an internal flood is defined as hot shutdown. The reactor can be maintained in the hot shutdown condition for an extended period, if necessary, for repair of equipment that may be needed to maintain cold shutdown.

5.0 **REGULATORY SAFETY ANALYSIS**

5.1 **No Significant Hazards Consideration**

Dominion Energy Kewaunee, Inc. (DEK) requests approval of a change to the Kewaunee USAR. The proposed change would revise the current licensing basis for Kewaunee associated with internal flooding. This change would add the following flooding design criteria for internal flooding evaluations:

- a. Only non-Class I/I* pipe or tanks are considered to fail and, of these, individual items may be determined not to fail if evaluated to withstand a Design Basis Earthquake.
- b. Only failures in piping and branch runs exceeding 1 inch are considered.
- c. Pipe and tank failures assume the single most limiting failure in an area, as determined by maximum flood level calculated in that area.
- d. Operator actions and design features are considered, but an additional single failure is not.
- e. Flooding is assumed coincident with a loss of offsite power if it increases the consequences of a flood.
- f. Protected equipment is sufficient to achieve and maintain safe shutdown requirements.

DEK has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The proposed change provides clarification to the existing functional requirements in the USAR by including specific design criteria for analyzing internal flooding in order to verify the capability of an SSC to perform its design function. The proposed change does not affect any of the previously evaluated

accidents in the KPS updated safety analysis report (USAR). No SSCs, operating procedures, or administrative controls that have the function of preventing or mitigating any of these accidents are affected.

This proposed change to incorporate design criteria into the USAR provides added administrative assurance that internal flooding will be appropriately addressed, consistent with existing functional requirements, and that safety related SSCs will not be affected by a potential failure of a non-safety related SSC. The change does not affect any accident initiators or the facility accident analysis. Thus, the probability and the consequences of an accident remain unchanged.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed change to incorporate design criteria consistent with existing functional requirements into the USAR does not change the design function or operation of any safety related SSCs. The proposed change documents design criteria in use and therefore does not involve a physical change to the facility. The change, therefore, does not create the possibility of a new or different kind of accident due to credible new failure mechanisms, malfunctions, or accident initiators not considered in the design and licensing bases.

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

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

Response: No.

This proposed change does not affect any margin of safety as established in the Kewaunee USAR because it documents the design criteria presently used and is consistent with the functional requirements in the USAR. This proposed change provides added administrative assurance that safety related SSCs will not be affected by a potential failure of a non-safety related SSC due to a postulated internal flooding event. The proposed change adds criteria for the evaluation of internal flooding events that are more detailed than the existing functional requirements in the USAR. Therefore, the protection and subsequent availability of safety related SSCs is maintained consistent with previously assumed accident mitigation capabilities.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, DEK concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

5.2 Applicable Regulatory Requirements/Criteria

The US Atomic Energy Commission (AEC) issued their Safety Evaluation (SE) of the Kewaunee Power Station (KPS) on July 24, 1972 with supplements dated December 18, 1972 and May 10, 1973. In the AEC’s SE, Section 3.1, “Conformance with AEC General Design Criteria,” described the conclusions the AEC reached associated with the General Design Criteria in effect at the time. The AEC stated:

The Kewaunee plant was designed and constructed to meet the intent of the AEC's General Design Criteria, as originally proposed in July 1967. Construction of the plant was about 50% complete and the Final Safety Analysis Report (Amendment No. 7) had been filed with the Commission before publication of the revised General Design Criteria in February 1971 and the present version of the criteria in July 1971. As a result, we did not require the applicant to reanalyze the plant or resubmit the FSAR. However, our technical review did assess the plant against the General Design Criteria now in effect and we are satisfied that the plant design generally conforms to the intent of these criteria.

Thus, the appropriate design criteria are listed below from the Kewaunee Final Safety Analysis (Amendment 7), which has been updated and now titled the Updated Safety Analysis Report (USAR).

USAR Section B.5 - PROTECTION OF CLASS I ITEMS

“Criterion: No single event will cause failure of redundant circuits or Engineered Safety Feature components in a manner such that a single failure after the event could prevent the protective functions of the associated Engineered Safety Features.”

The criteria for protection of Class I equipment in USAR Section B.5.a states that Class I items are protected against damage from the rupture of a pipe or tank resulting in serious flooding. This protection ensures that the Class I function is not impaired.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the

Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed amendment is confined to (i) changes to surety, insurance, and/or indemnity requirements, or (ii) changes to record keeping, reporting, or administrative procedures or requirements. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(10). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

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- ¹ AEC KNPP Safety Evaluation dated May 28, 1968, page 3.
 - ² Letter from P. A. Morris (AEC) to E.W. James (WPSC), dated February 24, 1969.
 - ³ Letter from R.C. DeYoung (AEC) to E.W. James (WPSC), dated September 26, 1972.
 - ⁴ Letter from E.W. James (WPSC) to R.C. DeYoung (NRC), dated October 31, 1972.

Attachment 2

**LICENSE AMENDMENT REQUEST-215
MODIFICATION OF INTERNAL FLOODING DESIGN BASIS**

Updated Safety Analysis Report

Section B.11 Affected Pages

Kewaunee Power Station

Dominion Energy Kewaunee, Inc.

B.11 INTERNAL FLOODING

B.11.1 GENERAL DISCUSSION

Internal flooding can occur because of a rupture of a pipe or tank in a system containing or connected to a large volume of water. This section does not address flooding from other liquids such as chemicals or diesel fuel that are stored in non-seismic qualified tanks, since failure of these non-seismic components are contained by cubicles or dikes or spillage occurs remote from any safety related equipment.

Internal flooding resulting from sources outside containment (other than natural phenomenon) was addressed in the original licensing process for Kewaunee. Amendment 17 to the FSAR addressed internal flooding from a postulated rupture of a service water line in the vicinity of the diesel generator rooms. The postulated rupture of a high energy line (HELB) that also includes flooding consequences was addressed by FSAR Amendment Nos. 24, 27, and 28 which added Appendix 10A to the FSAR. Appendix 10A provided detailed design criteria and assessments of potential HELB events. Although the rupture of a service water pipe was addressed in the FSAR, the general criteria for the evaluation of internal flooding from a rupture of a pipe or tank was not captured in the FSAR.

In 2005, a re-constitution of the design criteria for internal flooding was initiated in support of several internal flood protection modifications. During the period the operating license for Kewaunee was issued, the AEC was pursuing resolution of the issue of internal flooding for previously licensed plants via the Multi-Plant Generic Issue B-11, "Susceptibility of Safety Related Systems to Flooding Caused by the Failure of Non-Class I Systems." The AEC developed a set of guidelines for internal flooding protection. These guidelines were not sent to Kewaunee for consideration; however, the guidelines have been considered in the re-constitution of the internal flooding design criteria.

This section applies only to internal flooding resulting from the rupture of a pipe or tank below the criteria for high-energy systems. The HELB design criteria are addressed specifically in Section 10A.

B.11.2 FLOODING DESIGN CRITERIA

The design criteria for internal flooding evaluations are:

- a. Only non-Class I/I* pipe or tanks are considered to fail and, of these, individual items may be determined not to fail if evaluated to withstand the Design Basis Earthquake (DBE).
- b. Only failures in piping and branch runs exceeding 1 inch are considered.
- c. Pipe and tank failures assume the single most limiting failure in an area as determined by maximum flood level calculated in an area.
- d. Operator actions and design features are considered, but an additional single failure is not.

- e. Flooding is assumed coincident with the loss of offsite power if it increases the consequences of a flood.
- f. Protected equipment is sufficient to achieve and maintain safe shutdown requirements.

Some non-Class I/I* pipes have been excluded from consideration as a flood source based on seismic evaluations to verify that the pipe would have reasonable assurance to sustain the combined effects of a design basis earthquake and deadweight loading without leaking. This assurance is obtained from experience based evaluations and/or by bounding evaluations. Criteria from the ASME Section III Code for evaluation for level D loading or from ASME Section III Appendix F can be used to establish reasonable assurance against leakage from a pressure boundary.

The consideration of only non-Class I/I* pipe or tank failures is consistent with the original AEC flooding guidance developed as part of Multi-Plant Generic Issue B-11 (MPA B011). Likewise, the assumption that only one such failure is assumed is also consistent with AEC flooding guidelines.

Multiple pipe or tank failures are not considered in the analysis for a pipe or tank rupture because the potential interactions, such as pipe whip or jet impingement, are not applicable for lines that are not defined as high-energy lines. As discussed in Section 10A, high-energy lines would consider additional failures as a consequence of the initial rupture, if warranted. Multiple failures resulting from seismic loadings are also not considered as credible because of the robust design of non-Class I/I* piping. Specific evaluations of non-Class I/I* piping in the Class I portion of the Turbine Building basement (Safeguards Alley) have demonstrated that the Class II and Class III piping in this area are capable of withstanding the effects of a DBE without failure. The piping in this area was installed to the same standards as the station as a whole and, therefore, is typical of all station piping. However, it is not possible to ensure that all non-Class I/I* tanks and piping would remain intact during a DBE without additional evaluation. Accordingly, a non-Class I/I* pipe or tank that has not been specifically seismically evaluated is assumed to fail as a result of DBE seismic loads. However, only one pipe or tank component is assumed to fail. The failure is conservatively assumed to be the worst case (complete double-ended rupture for pipe and complete structural failure for a tank) with respect to flooding potential in each area evaluated.

Operator actions and design features are considered in the evaluation of internal flooding consequences. Operator actions in response to control room indications are the primary means of identification and termination of flooding sources. The design features include, but are not limited to, level sensing devices which alert operators to take action, check valves to prevent backflow through pipes, barriers to protect safety-related equipment (including existing walls, flood doors, dikes, etc.), equipment elevation and circulating water pump trips on high water level in the turbine building to minimize flood sources. Other design features such as sump pump capability, height of equipment from floor level, and the ability of doors and other structures to limit flooding may also be considered on a case-by-case basis.

The NRC guidelines for internal flooding (MPA B011) do not require an additional single failure to be considered coincident with an internal flood. Single failure criteria are typically established for specified plant systems, in accordance with applicable codes and standards, and within specific safety analyses in the KPS current licensing basis (e.g., HELB) and are discussed in the USAR. Beyond these specific requirements, single failure assumptions are not required.

Loss of offsite power (LOOP) is assumed unless the LOOP results in less limiting consequence. Design features that rely on electric power to operate (such as sump pumps) are only credited for flood protection if they are powered by site emergency power sources.

An internal flooding event is not assumed to occur coincident with any other design basis event described in Chapter 14 of the USAR. However, if flooding is a result of a design basis event (e.g., a HELB outside containment, App. R fire, etc.) the consequences of the flooding are considered in the evaluation of plant's ability to achieve and maintain safe shutdown.

Safe shutdown following an internal flood is defined as hot shutdown. The reactor can be maintained in the hot shutdown condition for an extended period, if necessary, for cold shutdown equipment repairs.

B.11.3 CLASS I EQUIPMENT PROTECTION

The criteria for Class I equipment protection is stated in Section B.5.a. It states that Class I items are protected against damage from the rupture of a pipe or tank resulting in serious flooding. This protection ensures that the Class I function is not impaired. Consistent with the AEC flooding guidelines, the Class I functions required following the rupture of a pipe or tank which results in internal flooding are those functions necessary to achieve and maintain safe shutdown of the reactor. For internal flooding, safe shutdown is defined as hot shutdown. The ability to achieve and maintain safe shutdown demonstrates the effectiveness of the plant design and flood protection measures to protect necessary Class I equipment.

The installed flood protection measures include, but are not limited to: drain line check valves, flooding barriers, level alarms, and a circulating water pump trip. Other design features such as sump pump capability, height of equipment from floor level, and the ability of doors and other structures to limit flooding flow rates from room-to-room may also be considered on a case-by-case basis. These measures provide additional protection to the original plant design against flood damage.

The AEC flooding guidelines developed in response to Multi-Plant Generic Issue B-11 do not specify or imply that flood protection equipment should be safety related. Flood protection equipment is not intended to mitigate any aspect of a design basis accident. Therefore, consistent with the Kewaunee quality classification criteria, such equipment does not meet the criteria to be classified as safety related.

B.11.4 CONCLUSION

Equipment required for the safe shutdown of the reactor must be protected from the flood consequences consistent with Section B.5.a. The ability to cope with internal flooding from the rupture of a pipe or tank is determined per the criteria provided in B.11.2 above.