March 28, 2008

Mr. David A. Christian
President and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: KEWAUNEE POWER STATION - ISSUANCE OF AMENDMENT RE: LICENSING BASIS DESIGN CRITERIA ASSOCIATED WITH INTERNAL FLOODING (TAC NO. MD0511)

Dear Mr. Christian:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 197 to Facility Operating License No. DPR-43 for the Kewaunee Power Station. This amendment revises the Updated Safety Analysis Report (USAR) in response to your application dated March 17, 2006, as supplemented on April 17 and September 17, 2007, and February 1 and March 10, 2008.

The amendment revises USAR Appendix B, "Special Design Procedures," to modify the design criteria for internal flooding evaluations. The revisions include modifications to Section B.5, "Protection of Class I Items," and the addition of Section B.11, "Internal Flooding."

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

/RA/

Patrick D. Milano, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosures:
1. Amendment No. 197 to License No. DPR-43
2. Safety Evaluation

cc w/encls: See next page

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DOMINION ENERGY KEWAUNEE, INC.

DOCKET NO. 50-305

KEWAUNEE POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 197
License No. DPR-43

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

A. The application for amendment by Dominion Energy Kewaunee, Inc. dated March 17, 2006, as supplemented on April 17 and September 17, 2007, and February 1 and March 10, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the licensee is authorized to change the design criteria for internal flooding evaluations, as described in the Updated Safety Analysis Report (USAR). Specifically, this amendment modifies the design criteria for these evaluations.

3. Further, paragraph 2.C.(2) of Facility Operating License No. DPR-43 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 197, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance. In the next update of the USAR required by 10 CFR 50.71(c), the licensee will implement this amendment by incorporating into the USAR the revisions as submitted in its March 17, 2006, application, as supplemented on April 17 and September 17, 2007, and February 1 and March 10, 2008, and evaluated in the staff's Safety Evaluation dated March , 2008.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Lois M. James, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Facility Operating License

Date of Issuance: March 28, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 197

FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

Replace the following page of the Facility Operating License No. DPR-43 with the attached revised page. The changed area is identified by a marginal line.

REMOVE	INSERT
Page 3	Page 3

C. This license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR, Chapter 1: (1) Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70, (2) is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and (3) is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not in excess of 1772 megawatts (thermal).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 197, are hereby incorporated in the license. The licensee shall operate the facility In accordance with the Technical Specifications.

(3) Fire Protection

The licensee shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in the licensee's Fire Plan, and as referenced in the Updated Safety Analysis Report, and as approved in the Safety Evaluation Reports, dated November 25, 1977, and December 12, 1978 (and supplement dated February 13, 1981) subject to the following provision:

The licensee may make changes to the approved Fire Protection Program without prior approval of the Commission, only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

(4) Physical Protection

The licensee shall fully implement and maintain in effect all provisions of the Commission approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans, which contain Safeguards Information protected under 10 CFR 73.21, is entitled: ANuclear Management Company Kewaunee Nuclear Power Plant Physical Security Plan (Revision 0)" submitted by letter dated October 18, as supplemented by letter dated October 21, 2004.

(5) Fuel Burnup

The maximum rod average burnup for any rod shall be limited to 60 GWD/MTU until completion of an NRC environmental assessment supporting an increased limit.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO AMENDMENT NO. 197 TO FACILITY OPERATING LICENSE NO. DPR-43

DOMINION ENERGY KEWAUNEE, INC.

KEWAUNEE POWER STATION

DOCKET NO. 50-305

1.0 INTRODUCTION

By application dated March 17, 2006, as supplemented on April 17 and September 17, 2007, and February 1 and March 10, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML060760589, ML071080206, ML072640343, ML080350053, and ML080710399, respectively), Dominion Energy Kewaunee, Inc. (the licensee) requested changes to the Updated Safety Analysis Report (USAR) for the Kewaunee Power Station (KPS). The April 17 and September 17, 2007, and February 1 and March 10, 2008, supplements provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on April 25, 2006 (71 FR 23954).

The proposed changes would revise USAR Appendix B, "Special Design Procedures," to modify the design criteria for internal flooding evaluations. In Attachment 2 to its letter dated February 1, 2008, as modified by Attachment 3 to its letter dated March 10, 2008, the licensee provided proposed revisions to Appendix B. The revisions included modifications to Section B.5, "Protection of Class I Items," and addition of Section B.11, "Internal Flooding." Following review of these proposed revisions, the Nuclear Regulatory Commission (NRC) staff noted that changes to the KPS USAR would:

- Clarify the scope of equipment that must be protected against postulated failures of piping and vessels.
- Clarify that the application of an additional single failure is limited to safe-shutdown following postulated high-energy line breaks (HELBs).
- Clarify that flooding is assumed coincident with a loss of offsite power if it increases the consequences of the flooding.
- Clarify, consistent with the existing licensing basis for KPS, that redundancy and physical separation may provide adequate protection for certain events, including: pipe failures (other than HELBs), fires, and tornado and internal missiles.

- Clarify that evaluated pipe-breaks are assumed to be the single worst-case break (complete double-ended rupture) within an area based on flood level and that the evaluation includes the effects of spray and dripping on the availability of sensitive equipment.

- Clarify that flooding evaluations assume a 30 minute period for identification and isolation of flooding sources with the exception of a break in the circulating water expansion joints and the rupture of a 20-inch service water header in the turbine building, which have critical operator response times of less than 30 minutes.

- Clarify design criteria for watertight barriers, flood water level alarms, and flood protection instrumentation.

- Clarify the exclusion of ruptures of Class I service water piping and certain dry fire protection system piping as postulated flooding sources.

- Modify the criteria defining the piping and vessels that are postulated to fail to exclude those non-Class I/I* pipe and tanks specifically evaluated to withstand the effects of a design-basis earthquake and those pipe segments 1 inch in diameter or smaller.

2.0 REGULATORY EVALUATION

Part 50 to Title 10 of the *Code of Federal Regulations* (10 CFR Part 50), establishes the fundamental regulatory requirements with respect to the domestic licensing of nuclear production and utilization facilities.

As stated in the KPS USAR, the plant was designed to comply with the original owner's (Wisconsin Public Service Corporation's, WPSC's) understanding of the intent of the Atomic Energy Commission (AEC) General Design Criteria (GDC) for Nuclear Power Plant Construction Permits, as proposed on July 10, 1967. In a letter dated October 2, 1967, the Atomic Industrial Forum (AIF) distributed comments on the July 1967 AEC GDC. This AIF document was adopted as WPSC's understanding of the method for complying with the AEC GDC. In addition, the licensing basis for KPS is based on the AEC safety evaluation dated July 24, 1972. In Section 3.1, "Conformance with AEC General Design Criteria," the staff performed a technical review to assess the plant against the revised General Design Criteria, issued in 1971, and found that a re-analysis of the plant was not required and that the plant design generally conformed to the intent of the criteria.

KPS USAR Section 1.3 provides a list of applicable AEC GDC, as proposed on July 10, 1967. In particular, Criterion 2, "Performance Standards," states that 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, the additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, flooding conditions, winds, ice and other local site effects.

Section 1.3.1, “Overall Plant Requirements,” of the KPS USAR states that those systems and components vital to safe shutdown and isolation of the reactor or whose failure might cause or increase the severity of an accident or result in an uncontrolled release of substantial amounts of radioactivity are designated Class I. In Appendix B to the USAR, Table B.2-1 lists the design classification of major KPS structures, systems, and components (SSCs). USAR, Appendix B, Section B.5, “Protection of Class I Items,” states that Class I items are protected against damage from “[r]upture of a pipe or tank resulting in serious flooding or excessive steam release to the extent that the Class I function is impaired.” This design basis is informed by earlier licensing basis documents related to pipe rupture or failure.

During the initial licensing review for KPS, the Atomic Energy Commission (AEC, a forerunner to the NRC) issued questions to Wisconsin Public Service Corporation (WPSC, a prior licensee) on September 23, 1971, related to postulated failures affecting the emergency core cooling system and essential support systems. Question Q8.16 was focused on a hypothetical rupture of a safety-related service water line either running through or in the immediate vicinity of the diesel generator rooms. The AEC requested an analysis of the effects of such a rupture on the emergency diesel generators (EDGs) and the 4160-V switchgear. On December 15, 1971, WPSC provided the following response as part of Amendment No. 13 to the final safety analysis report (FSAR):

> The rupture of a service water line in an Emergency Diesel Generator Room could result in the loss of the generator or the safeguards bus in that room. Administrative operation from the Control Room of Type I Service Water valving would isolate the break and, if required, realign the Service Water supplies through the intact piping from the operating Service Water Pumps.

This response remains in Section 8.2.3.5, “Reliability Assurance,” of the current KPS USAR. Subsequent to submission of this response, the AEC opened an unresolved item in AEC Inspection Report 050-305/72-04 regarding a hypothetical rupture of a safety-related service water line in the screen-house tunnel area between the diesel generator rooms and the effect of such a rupture on the EDGs and the 4160V switchgear. The licensee subsequently modified the diesel room thresholds and doors to make them more leak resistant and installed a concrete barrier in the pipe trench to prevent significant water ingress into the EDG rooms from this hypothetical rupture. These modifications are also described in Section 8.2.3.5, of the current KPS USAR. Based on these actions, the unresolved item was closed in AEC Inspection Report 050305/73-01.

Following the failure of a circulating water system expansion joint at Quad Cities Station, the AEC addressed issues related to the failure of non-seismic piping systems and the potential flooding of equipment needed for safe shutdown. By letter dated September 26, 1972, the AEC requested that WPSC review the KPS design to determine whether the failure of any non-Category I (non-seismic) equipment could result in a condition, such as flooding, that might adversely affect the performance of safety-related equipment required for safe shutdown of the facility or to limit the consequences of an accident. In its response dated October 31, 1972, the licensee stated that the failure of reactor makeup water and demineralized water lines in the auxiliary building basement could potentially adversely affect the performance of engineered safety systems. However, the licensee also stated that, because of safety system redundancy and design arrangement, the functional purpose of the safety equipment would not be jeopardized.

By letter dated November 7, 1972, the licensee responded to an oral AEC staff request to address random pipe breaks in systems containing high-energy fluids. Sections I through III of the enclosure to that letter provided analyses of postulated breaks in the main steam and main feedwater piping within the auxiliary building, and Section IV of that enclosure described analyses of miscellaneous piping systems that could fail as a result of HELB effects. The analyses of miscellaneous piping systems included evaluations of potential flooding effects from consequential failures of the service water, component cooling, demineralized water, and reactor makeup water systems. For these evaluations, the licensee determined that either the system has too low a volume to endanger engineered safety features or the rate of rise of water level was low enough to allow operator action before affecting safeguards equipment.

To further assess protection from pipe breaks in high-energy systems, the AEC issued a letter to WPSC dated December 15, 1972. This letter was generic in the sense that identical requests for information were sent to all plants operating or under construction, and it is commonly referred to as the Giambusso letter (named after its author, A. Giambusso). The review criteria included with the Giambusso letter are available as Appendix B to Standard Review Plan (NUREG-0800) Branch Technical Position 3-3, “Protection Against Postulated Piping Failures In Fluid Systems Outside Containment,” Revision 3. The Giambusso letter addressed failure of high-energy piping systems; flooding concerns associated with moderate-energy piping systems such as service water were not within the scope of the requested review.

The final analyses of postulated pipe breaks in high-energy systems were largely described in Amendment No. 24 to the Kewaunee Final Safety Evaluation Report, with additional information provided in Amendment Nos. 25, 27, and 28. The AEC staff evaluation of these analyses was documented in Supplement 2 to the Licensing Safety Evaluation Report for the Kewaunee Nuclear Power Plant, dated May 10, 1973. The licensee identified a set of systems capable of bringing the plant to a hot shutdown condition that would be adequately protected from the effects of postulated HELBs, and the licensee asserted the capability to reach cold shutdown in the long term using that equipment. The AEC staff found the identified systems acceptable.

Two generic safety issues were also relevant to the licensing basis for protection against internal flooding. These issues were Unresolved Safety Issue (USI) A-17, “Systems Interactions in Nuclear Power Plants,” and USI A-46, “Seismic Qualification of Equipment in Operating Nuclear Power Plants.” The resolution of USI A-17, as presented in Generic Letter (GL) 89-18, “Resolution of Unresolved Safety Issues A-17, ‘Systems Interactions in Nuclear Power Plants," expected licensees to evaluate the potential for water intrusion and flooding from internal sources in the Individual Plant Examination (IPE) process requested by GL 88-20, “Individual Plant Examination for Severe Accident Vulnerabilities.” The Kewaunee IPE determined that no credible internal flood/spray scenario provided a significant contribution to the overall plant risk, and, therefore, few modifications addressing internal flooding vulnerabilities were implemented. The resolution of USI A-46 involved the verification of seismic adequacy of mechanical and electrical equipment in nuclear power plants, as documented in GL 87-02, “Verification of Seismic Adequacy of Mechanical and Electrical Equipment In Operating Reactors (USI A-46).” The scope of the seismic verification was limited to components whose failure could damage equipment necessary to maintain the plant in a safe shutdown condition for 72 hours.

3.0 TECHNICAL EVALUATION

3.1 Determination of Equipment Requiring Protection from Internal Flooding Sources

The proposed change to the KPS USAR clarifies the scope of equipment that must be protected against the effects of postulated failures of non-seismic piping and vessels. In its letter dated March 10, 2008, the licensee stated that equipment to be protected from the effects of flooding includes "Category I equipment needed for safe shutdown of the reactor or to limit the consequences of an accident." The licensee clarified that the term "safe shutdown" in this context means to shutdown and cooldown the reactor to a temperature below 350 °F within 72 hours, as well as ultimately (potentially, after repair of damaged equipment) to place the plant in cold shutdown. Further, the licensee clarified that the term "accident" is meant to consider only the design-basis accidents identified in Chapter 14 of the USAR. Thus, equipment protected from the effects of flooding includes equipment essential for safe shutdown, the credited safety equipment identified in Chapter 14, and the necessary support equipment to keep the credited safety equipment functional. The NRC staff found this clarification to be consistent with the description in the WPSC letter dated October 31, 1972, and therefore, is acceptable.

3.2 Equipment Protection from Effects of Internal Flooding

The licensee proposed clarifications, corrections, and additions to the KPS USAR to better define the design criteria for acceptable protection from internal floods. These criteria include elements defining the severity of the flood event and design features and operator actions that provide acceptable protection from the flood event.

The licensee included a correction to the KPS USAR among the proposed changes to Appendix B of the KPS USAR. The proposed change addresses an error that the licensee stated was introduced during the update of the safety analysis report in 1982. Section B.5 of the current KPS USAR includes the following criterion:

> No single event will cause failure of redundant circuits or Engineered Safety Feature (ESF) components in a manner such that a single failure after the event could prevent the protective functions of the associated ESFs.

In Attachment 1 to its letter dated February 1, 2008, the licensee stated that the above criterion was incorporated in the KPS USAR in error. An additional single failure was considered in mitigation of HELB events, which are among the events described in Section B.5 of the KPS USAR. However, redundancy and physical separation were considered in determining the necessary protection of Class I systems from other events, including internal flooding. Throughout the original licensing process, the safety analysis report contained the following paragraph limiting the equipment that must be provided with protective barriers:

> No protection is required if the factors described under [rupture of a pipe or tank], [effects of discharging fluids from rupture of an adjacent pipe], [fire and operation of fire protection equipment] and [missiles from different sources] cannot affect any Class I systems, or if redundant systems are provided and the physical separation of these systems is sufficient to prevent these factors from damaging both systems. Under [earthquake] and [tornado wind loads], redundancy and

> physical separation may decrease the requirements for protection. If redundancy and physical separation are not used, and if the surrounding building is not designed as a missile barrier, missile protection by shielding is necessary, either by shielding the source itself or by shielding the system.

The above paragraph was included in Amendment No. 7 to the KPS FSAR, which was submitted to the AEC by letter dated January 27, 1971. It is consistent with the following statement from the WPSC letter related to failures in non-seismic piping dated October 31, 1972:

> …because of safety equipment redundancy and design arrangement, the functional purpose of the safety equipment would not be jeopardized in the event of failure of any of these [non-seismic] lines.

Neither of these criteria considers an additional single failure. Thus, the KPS licensing basis includes consideration of redundancy and physical separation in determining the necessary protection from the effects of ruptures in non-seismic piping, but evaluations need not include an additional single failure in determining whether the functional purpose of the safety equipment is maintained following such an internal flooding event. Separation of components performing equivalent safe shutdown or accident mitigation functions in independent flood areas provides reasonable assurance that equipment needed to perform these functions will be available when required. Therefore, the proposed clarification that redundancy and physical separation may be considered in determining the necessary protection of Class I components from ruptures in non-seismic piping and vessels is acceptable. However, the design basis for HELB events continues to include the consideration of an additional single failure, consistent with the design basis for HELBs established during initial licensing of KPS.

As part of the internal flooding design basis, the licensee specified that flooding is assumed coincident with a loss of offsite power, if the loss of power increases the consequences of the flooding, and that the evaluation includes the effects of spray and dripping on the availability of sensitive equipment. These are conservative assumptions that result in appropriate evaluations of protection against potential flooding sources. Therefore, the NRC staff finds these assumptions acceptable for the evaluation of postulated internal flooding sources.

Also, the licensee specified that evaluated pipe-breaks are assumed to be the single worst-case break (complete double-ended rupture) within an area based on flood level. This assumption is consistent with current NRC guidance contained in Standard Review Plan (NUREG-0800) Section 3.4.1, “Internal Flood Protection for Onsite Equipment Failures,” Rev. 3. Therefore, this assumption is acceptable.

The licensee considered operator actions and plant design features in evaluating the adequacy of protection provided from the effects of internal flooding. The design features include level sensing devices to alert operators to take action, check valves to prevent backflow through pipes, barriers to protect safety-related equipment (including existing walls, doors, dikes, etc.), and circulating water pump trips to minimize flood sources. Operator actions in response to control room indications are the primary means of identification and termination of flooding sources.

The licensee specified that flooding evaluations assume a 30-minute period for identification and isolation of flooding sources, with the exception of the break in the circulating water expansion joints and the rupture of a 20-inch service water header in the turbine building. The licensee determined the critical operator response times for a break in the circulating water expansion joints and the rupture of the 20-inch non-seismic service water header in the turbine building to be 7.5 minutes and 23 minutes, respectively. The licensee used the plant simulator to validate that operators can accomplish specified control room operator actions within the time limits required to mitigate these events. For flooding sources in the Turbine Building (other than the circulating water expansion joint or the 20" service water header) and sources in the Auxiliary Building, specific sump alarms would direct operators by procedure to dispatch operations personnel to identify and isolate any flooding sources. The licensee evaluated significant, high-volume flood sources identified by plant walk-downs and through tabletop discussions and judged that isolation of the source was achievable within the 30-minute period assumed in the flooding evaluations. The NRC staff found the licensee provided a reasonable basis supporting completion of necessary operator actions within the specified time.

The licensee also specified design criteria for watertight barriers, flood water level alarms, and flood protection instrumentation. The credited watertight barriers must maintain their watertight integrity following a design-basis earthquake, but they are not considered safety-related. Plant areas containing a postulated internal flood source whose rupture could affect equipment requiring protection from internal floods must have water level sensors that alarm in the control room. The licensee described that the circulating water pumps are equipped with a high water level trip, but this flood protection instrumentation is not credited in the internal flooding analysis. The NRC staff found the specified design criteria acceptable for these flood protection design features.

3.3 Identification of Postulated Internal Flood Sources

Postulated internal flooding sources that are considered in the current licensing basis for KPS included all non-Class I/I* piping whose rupture could affect Class I systems. In the letters dated February 1 and March 10, 2008, the licensee proposed a clarification relative to postulated breaks in Class 1 service water piping in the diesel generator rooms and consideration of postulated breaks in the dry, pre-action fire protection system piping in safeguards alley. In addition, the licensee proposed to modify the criteria defining postulated internal flooding sources to exclude piping less than 1 inch in diameter and certain non-Class I/I* piping that have reasonable assurance to sustain the combined effects of a design-basis earthquake (DBE) and both pressure and deadweight loading without a loss of pressure boundary function.

The licensee contended that a rupture of the Class I service water piping in or near the EDG rooms was not considered sufficiently credible to include as a design-basis event at the time of licensing of KPS. However, a hypothetical rupture of the service water system piping was considered with respect to the redundancy of emergency core cooling support systems (e.g., service water and electrical power). The design basis with respect to this postulated rupture is included in Section 8.2.3.5, “Reliability Assurance,” of the KPS USAR. This USAR Section describes modifications to reduce the potential for flooding from a single rupture in the Class I service water piping that could simultaneously affect safety-related equipment in both EDG rooms. The USAR also describes that a rupture within one EDG room could damage the safeguards bus or generator in that room, and operation of valves from the control room could

isolate the rupture and route service water through intact piping. In the attachment to its letter dated March 10, 2008, the licensee identified that, for a hypothetical rupture in nearly all Class I service water piping segments, one complete train of safety-related equipment would remain operable with emergency power and service water cooling available per design. However, a rupture in a certain segment of the Class I service water piping could damage safety-related electrical equipment in one train and isolation of the rupture would preclude service water cooling to some safety-related equipment in the opposite train. The NRC staff found the described capability to mitigate these ruptures in Class I service water piping to be consistent with the KPS design basis as defined in Section 8.2.3.5 of the KPS USAR, and, therefore, acceptable. Nevertheless, the NRC staff understands from discussions during the December 6, 2007, public meeting between the NRC staff and licensee representatives that the licensee is evaluating modifications to preclude spray from a single service water train and the subsequent isolation of that spray affecting redundant trains of safety-related equipment.

The licensee proposed excluding the fire protection system piping in an area of the plant containing numerous safety-related components (i.e., safeguards alley) from consideration as a postulated flooding source. The licensee described that this portion of the fire protection system is of a dry, pre-action design. Two independent actuations must occur to fill the line with water: detection of a fire in the area by a sensor that opens the pre-action solenoid valve and fusing of a sprinkler head to relieve supervisory air pressure from the fire protection line, which allows the pneumatically actuated release of the pre-action valve. The licensee also described that this fire protection piping was seismically supported. Thus, this fire protection piping is an unlikely source of flooding due to pipe rupture, and the NRC staff found exclusion of this piping from consideration as a flooding source to be appropriate.

- Modify the criteria defining the piping and vessels that are postulated to fail to exclude those non-Class I/I* pipe and tanks specifically evaluated to withstand the effects of a design-basis earthquake and those pipe segments 1 inch in diameter or smaller.

The proposed revision to USAR Section B.11 applies to internal flooding resulting from the failure of a non-Class I/I* component that falls below the criteria specified for high-energy systems. Appendix 10A of the USAR addresses the evaluation of HELBs at KPS. The current NRC staff guidance for evaluating pipe ruptures is discussed in SRP Sections 3.6.1 and 3.6.2. The NRC staff guidance in SRP Branch Technical Position (BTP) 3-4 defines leakage cracks at locations that exceed the specified stress criteria, but does not specify full circumferential breaks for non-high-energy lines. These criteria are applicable to normal operating plant conditions, which would include operating basis earthquake (OBE) loads but not DBE loads. SRP BTP 3-3 specifies that full circumferential breaks should be postulated in non-seismic piping. Non-seismic piping is piping that has not been designed to maintain its pressure boundary integrity during and after a DBE.

USAR Section B.2.1 defines the nuclear safety classification of structures and components at KPS. Table B.7-1 of the USAR indicates that Class I and Class I* components were designed to withstand DBE loads. Table B.7-1 further indicates that Class II and Class III* components were only designed to withstand Uniform Building Code (UBC) earthquake loads and that Class III components were not designed to withstand any earthquake loads. However, the licensee indicated that some Class III piping was installed using the same specification that was used for the Class II and III* piping. During the December 6, 2007, meeting with the staff, the licensee stated that the seismic parameters in the specification exceeded the UBC criteria.

The proposed amendment indicates that non-Class I/I* pipes and tanks are considered to fail unless specifically evaluated to withstand the DBE. In addition, only failures in piping exceeding 1 inch in diameter were considered. The NRC staff finds these criteria are consistent with the current guidance in BTP 3-4 regarding postulation of full circumferential breaks in non-high-energy piping systems and is acceptable. The staff notes that the KPS USAR criteria did not specify postulation of non-high-energy system leakage cracks for either Category I/I* or non-Category I/I* piping. However, during the December 6, 2007, meeting, the licensee indicated that water spray and minor leaks from flood sources were addressed by a zone approach. The zone approach credits the evaluations performed for fire protection. The NRC staff concludes that the water spray and minor leakage criteria are consistent with the KPS USAR criteria.

The proposed amendment indicates that some non-Class I/I* pipes have been excluded from consideration as a flood source based on an evaluation to verify that the pipes have reasonable assurance to sustain the combined effects of pressure, deadweight and DBE without loss of pressure boundary function. In its April 17 and September 17, 2007, responses to the staff requests for additional information, the licensee indicated that Class II and Class III* were not considered to be potential flooding sources because they were designed to withstand UBC earthquake loads. While the NRC staff agrees that design of the piping using UBC earthquake loads would provide some level of protection against pipe ruptures during an earthquake, the staff does not agree that design using UBC earthquake loads provides sufficient assurance that the piping will not fail due to the larger loads that would occur during a DBE.

The licensee also indicated that several non-Class I/I* piping segments had been specifically evaluated by walkdowns and analyses to determine their capability to withstand a DBE. According to the licensee, all non-Class I/I* pipe segments evaluated were confirmed to remain intact and maintain their pressure boundary during and after a DBE. The licensee's evaluation of the non-Class I/I* piping segments provides confirmation that the UBC designed piping has adequate margin to withstand DBE loads as long as the analyzed segments bound the configuration and DBE load inputs of the affected piping.

In its September 17, 2007, letter, the licensee indicated that the analyzed piping represent 100 percent of the non-Class I/I* potential flood source piping in Safeguards Alley (including the EDG rooms). In addition, the licensee estimated that approximately 16 percent of the non-Class I/I* piping that represented potential flooding sources in the areas of the Auxiliary Building had been evaluated for DBE loads. In its February 1, 2008, submittal, the licensee clarified that bounding cases were evaluated for the piping in the Safeguards Alley. The piping runs were selected based on walkdowns performed using screening criteria to identify the bounding cases. The licensee indicated that screening criteria were not used to identify bounding configurations for the remaining piping in the Auxiliary Building. However, the licensee indicated that bounding Auxiliary Building seismic spectra were used in the evaluations of the piping in the Auxiliary Building. The licensee indicated that all piping segments and piping supports met the acceptance criteria with no modifications required as a result of the analyses.

The NRC staff finds that the licensee analyzed a reasonable sample of the non-Class I/I* piping to demonstrate that the piping designed to UBC loads can maintain pressure boundary integrity under DBE load conditions. The licensee used bounding DBE loads for the evaluation of all piping segments and bounding configurations for the piping in the Safeguards Alley.

The licensee provided the acceptance criteria used for the evaluation non-Class I/I* piping for the DBE loads in its September 17, 2007, submittal. The criteria is based on the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Service Level D limits for Class 2 and 3 components. Level D limits are typically used for the evaluation of low probability load combinations that include the DBE. The NRC staff finds ASME Code Level D limits provide an adequate basis to demonstrate pressure boundary integrity of the ductile steel non-Class I/I* piping subject to DBE loads.

The ASME Code Level D limits provide an adequate basis to demonstrate pressure boundary integrity of the ductile steel non-Class I/I* piping subject to DBE loads provided that there is no significant degradation of the piping. The NRC staff requested that the licensee describe its programs applicable to the non-Class I/I* piping to preclude significant degradation of the affected piping. In its February 1, 2008, response, the licensee identified that its Flow Accelerated Corrosion (FAC) Inspection Program, Service Water Program, and Boric Acid Corrosion Control Program (BACC) monitor corrosion in several of the affected systems. The licensee indicted that there has been no significant corrosion detected in the non-Class I/I* systems evaluated to maintain pressure boundary integrity during the DBE. The NRC staff concludes that the licensee's programs provide assurance that significant degradation will not occur in the affected piping covered by these programs. However, the programs listed did not cover all of the non-Class I/I* systems that are potential flooding sources. The staff concluded that the licensee should implement a program to verify that there is no significant degradation in the systems that are potential flooding sources that are not covered by these programs. In its March 10, 2008, response, the licensee indicated that it will implement a monitoring program that addresses all non-Class I/I* piping that is a potential flooding source as part of license renewal. The licensee further indicated that the program will be fully implemented by the end of 2009. The NRC staff finds this commitment acceptable.

The licensee's submittal indicated that some of the non-Class I/I* piping in the Auxiliary Building contains cast iron fittings. Experience has shown that cast iron is subject to failure during earthquakes. The licensee established criteria to evaluate the cast iron fittings. The criteria, which is based on ASME Code equations, separates primary and secondary (seismic anchor motion) loads. Primary loads can cause collapse of the piping if the applied load exceeds the moment capacity of the piping. Deformations of the piping due to seismic anchor motions are limited by the applied displacement at the anchors. These applied deformations can cause local yielding, but not collapse of the piping. The secondary loads are controlled by the ASME equations to prevent excessive distortion or eventual fatigue failure of the piping. The ASME Code allows the separation of primary and secondary loads for piping evaluations because the ASME Code requires use of ductile material, which can undergo significant yielding without failure. Since cast iron is not a ductile material, the NRC staff did not agree with the separation of primary and secondary loads in the evaluation. The staff requested that the licensee provide a technical justification for the criteria used to evaluate cast iron piping. In its February 1, 2008, response, the licensee indicated that only two cast iron valves had been identified in the systems that were evaluated, both in the Safeguard Alley flood zone. The licensee indicated that it would replace both of these valves. The licensee also indicated that it would replace any additional cast iron valves identified in systems that are potential flooding sources in the future. In its March 10, 2008, response, the licensee committed to perform additional record reviews and walkdowns to identify any remaining cast iron valves in the non-Class I/I* piping systems of concern by June 2, 2008. The NRC staff finds this commitment acceptable.

The licensee also provided the acceptance criteria for the piping supports. Most of the criteria is in accordance with the ASME Code Level D limits specified for linear supports. The NRC staff finds the criteria acceptable. However, the licensee indicated that a factor of safety of 2 was used to evaluate concrete expansion anchor bolts for non-Class I/I* pipe supports. The NRC staff has only accepted the factor of safety of 2 for use in operability assessments. The factor of safety of 2, based on average test capacity, does not provide adequate margin for long-term acceptance criteria. In its February 1, 2008, submittal, the licensee indicated that the Seismic Qualification Utility Group (SQUG), Generic Implementation Procedure (GIP) criteria with a factor of safety of 3 was met for all anchor bolts. The use of the SQUG-GIP methodology was previously accepted by the staff for the evaluation of equipment covered by the resolution of Generic Letter 87-02, and is acceptable to the NRC staff for the evaluation of the non-Class I/I* supports.

In its September 17, 2007, submittal, the licensee indicated that an allowable of twice the manufacturer's normal load capacity was used to evaluate component standard supports for non-Class I/I* piping. This may not be acceptable if the load capacity is based on buckling considerations. The NRC staff requested that the licensee assure that buckling concerns have been adequately addressed by the acceptance criteria used for pipe supports. In its February 1, 2008, response, the licensee indicated that the support stress is limited to 2/3 of critical buckling stress for linear components and 1/2 of the critical buckling stress for plate and shell supports. These criteria are the same as the criteria specified in the ASME Code for support design and are acceptable to the NRC staff.

3.4 Summary

The NRC staff reviewed proposed changes to the KPS USAR and supporting information against the current licensing basis and NRC staff review guidance contained in the Standard Review Plan (NUREG-0800). The staff found that proposed clarifications to the design criteria for protection from internal flooding were consistent with the existing licensing basis or current NRC staff position. The staff also found that the modifications to the criteria defining postulated internal flooding sources were adequately justified and provided reasonable assurance that essential equipment would be protected from credible internal flooding sources. On the basis of its evaluation and the pending KPS implementation of the commitments discussed therein, the NRC staff concludes that there is reasonable assurance that the non-Class I/I* piping evaluated for UBC loads or installed using the same standards as used for the UBC designed piping will not rupture during a DBE.

4.0 REGULATORY COMMITMENTS

The licensee has made the following regulatory commitments:

1. Dominion Energy Kewaunee will ensure that all non-Class 1/1* piping that is excluded as a potential flooding source is covered by a program that provides reasonable, documented, and periodic assurance that there is no significant corrosion. Internal monitoring has not been fully implemented at KPS. Implementation of this process will occur by the end of 2009.

2. Dominion Energy Kewaunee commits to perform appropriate record reviews and walkdowns to identify any additional cast iron valves that may be present in non-Class 1/1* piping evaluated to maintain its pressure boundary during a DBE. These walkdowns and reviews will be completed by June 2, 2008.

The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitments are best provided by the licensee's administrative processes, including its commitment management program. The above regulatory commitments do not warrant the creation of regulatory requirements (items requiring prior NRC approval of subsequent changes).

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Wisconsin State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or changes a surveillance requirement. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (71 FR 23954). Accordingly, this 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 need be prepared in connection with the issuance of this amendment.

7.0 CONCLUSION

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

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Date: