Dominion Energy Kewaunee, Inc.
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Dominion®

September 17, 2007

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

Serial No. 06-140C
KPS/LIC/CDS: R6
Docket No. 50-305
License No. DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
RESPONSE TO SECOND NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST 215, "MODIFICATION OF INTERNAL FLOODING DESIGN BASIS"

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) submitted a request for approval of a proposed amendment to the Kewaunee Power Station (KPS) Updated Safety Analysis Report (USAR) (reference 1). The proposed amendment would clarify design criteria associated with internal flooding in the KPS USAR.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted an initial request for additional information (RAI) regarding the proposed amendment. These RAI questions and the associated DEK responses were provided in reference 2.

On August 2, 2007, NRC transmitted a second request for additional information. The RAI questions and DEK responses are provided in Attachment 1. Attachment 2 provides proposed revisions to the KPS USAR pages included in reference 1.

This response does not change the conclusions of the no significant hazards determination. A complete copy of this submittal has been transmitted to the State of Wisconsin as required by 10 CFR 50.91(b)(1).

If you have any questions or require additional information, please contact Mr. Craig Sly at (804) 273-2784.

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NRR

Very truly yours,

Gerald T. Bischof
Vice President - Nuclear Engineering

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Gerald T. Bischof, who is Vice President – Nuclear Support Services of Dominion Energy Kewaunee, Inc. He has affirmed before me that he 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 his knowledge and belief.

Acknowledged before me this 17th day of September, 2007.

My Commission Expires: August 31, 2008.

Margaret B. Bennett
Notary Public

MARGARET B. BENNETT
Notary Public 354302
Commonwealth of Virginia
My Commission Expires Aug 31, 2008

References:

1. Letter from Leslie Hartz (DEK) to Document Control Desk, "License Amendment Request 215 – Modification of Internal Flooding Design Basis," dated March 17, 2006.
2. Letter from E. S. Grecheck (DEK) to Document Control Desk, "Response to NRC Request for Additional Information Regarding License Amendment Request 215, Modification of Internal Flooding Design Basis," dated April 17, 2007.
3. Letter from P. D. Milano to D. A. Christian (DEK), "Kewaunee Power Station – Request for Additional Information Related to Internal Flooding Design-Basis (TAC No. MD0511)," dated August 2, 2007.

Attachments:

1. Response to Second NRC Request for Additional Information Regarding Kewaunee License Amendment Request 215.
2. Proposed Revisions to Marked-up KPS USAR Pages Included in LAR-215.

Commitments made by this letter: None.

cc: Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
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Mr. P. D. Milano
U.S. Nuclear Regulatory Commission
Mail Stop O 8 C2
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NRC Senior Resident Inspector
Kewaunee Power Station

Public Service Commission of Wisconsin
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ATTACHMENT 1

RESPONSE TO SECOND NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 215, "MODIFICATION OF INTERNAL FLOODING DESIGN BASIS"

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

Response to NRC Request for Additional Information Regarding Kewaunee License Amendment Request 215

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) submitted a request for approval of a proposed amendment to the Kewaunee Power Station (KPS) Updated Safety Analysis Report (USAR) (reference 1). The proposed amendment would clarify the design criteria associated with internal flooding in the KPS USAR.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted an initial request for additional information (RAI) regarding the proposed amendment. These RAI questions and the associated DEK responses were provided in reference 2.

On August 2, 2007, the NRC transmitted a second request for additional information (RAI) regarding the proposed amendment (reference 3). Each RAI question and DEK's corresponding response is provided below.

Question 1

Since any non Category I (seismic) equipment may break during a safe shutdown earthquake (SSE), is this considered in the flooding analysis? Please explain the basis.

Question 1 Response

The flood sources considered in the current flooding evaluations include fluid filled non-Class 1 piping unless the piping has been evaluated to withstand the effects of an SSE in combination with both pressure and deadweight loading.

This question was discussed in a July 12, 2007 conference call between DEK and the NRC staff. The revision to the proposed KPS USAR Section B.11.2 text in the April 17, 2007 RAI responses (reference 2) included wording that was intended to simplify the evaluation criteria for piping by applying functional criteria to the evaluation (i.e., the ability to maintain its pressure boundary). Instead, the revised text apparently caused some confusion. Although the approach represents a viable measure for the functional criteria of piping evaluations, it masks the piping classifications and criteria extensively used throughout the USAR. Accordingly, the proposed USAR Section B.11 text has been revised to revert back to the use of piping classes in its criteria and discussions.

A revised mark-up incorporating the above changes is attached.

Question 2

Why are Class II and III structures, systems and components (SSC), which are designed to withstand Uniform Building Code loads, not to be considered as a potential flooding source? Provide the percentage of Class II, III and III* piping systems, whose failure could impact the function of safety-related equipment, that have been evaluated for design-basis earthquake (DBE) loads.*

Question 2 Response

The response to this question is in two parts. Part 1 was discussed in the April 17, 2007 response to Question 8 (reference 2) and addresses the basis for Class II and Class III* equivalence with respect to the Operational Basis Earthquake (OBE) and the applicability of the OBE criteria for assessing non-safety affecting safety SSCs in the original Kewaunee licensing basis. Part 2 discusses the current evaluations that have been performed which demonstrate that significant margin exists between piping system design and the KPS licensing basis for internal flooding.

1. Pipes and tanks that are seismically designed or have been evaluated to withstand a seismic event are deterministically not considered as sources of internal flooding. Accordingly, Class I and Class I* components are not considered as internal flood sources since they have been designed and installed to withstand a design basis earthquake (DBE). In addition, Class II and Class III* piping and components have been designed and installed to withstand an (OBE) as documented in KPS USAR Section B.4.5 and Table B.7-1. Likewise, these pipes are also deterministically not considered to be potential flooding sources.

   NRC Task Interface Agreement (TIA) 2001-02 (reference 4) was issued by NRC on August 29, 2002 regarding Prairie Island. Issue No. 2 in this TIA specifically discusses the seismic qualification associated with the use of UBC Zone 1 criteria. Prairie Island and Kewaunee were designed by the same Architect Engineering Firm (Pioneer), licensed to the same design basis, and built at the same time using the same piping installation standards. TIA 2001-02 includes statements from the Prairie Island Operating License SER indicating that piping designed to the UBC Zone 1 loadings is essentially designed for the Operational Basis Earthquake (OBE). This equivalence is also applicable to KPS as demonstrated in USAR Table B.7-1, which identifies the UBC loads for the OBE condition of loading. TIA 2001-02 concludes that, "...it is consistent with the plant's licensing basis to use UBC Zone 1 loadings to show that non-Class I SSCs will not adversely affect Class I SSCs during a design-basis event." The Operating License SER's for both Kewaunee and Prairie Island acknowledge the UBC Zone 1 seismic criteria for non-class I SSCs. Accordingly, Class II and Class III* SSCs were not and need not be considered as potential internal flooding sources with respect to the deterministic basis of the original license.

2. As a result of recent internal flooding concerns, many non-Class I/I* pipes have been specifically evaluated by walkdowns and analysis to determine what their status would be following a seismic event. The evaluated non-Class I/I* pipes included Class II, Class III*, and Class III piping systems. To date, all non-Class I/I* pipe segments evaluated have been confirmed to be capable of remaining intact and maintaining their pressure boundary during and following a DBE. This result suggests a significant margin in the piping design at KPS since the analyzed loadings are twice the required OBE loadings identified as the design criteria in TIA 2001-02 and the Kewaunee OL SER. The analyzed non-Class I/I* pipe segments represent 100 percent of the total non-Class I/I* flood source piping in Safeguards Alley (including the Emergency Diesel Generator rooms). It is estimated that approximately 16 percent of the non-Class I/I* piping in areas of the Auxiliary Building that could cause flooding around safety-related equipment have been evaluated.

   During the evaluation to determine the overall flooding risk associated with the Kewaunee Power Station, a walkdown was performed to identify the length of pipe contained in the different rooms and fire zones. Approximately 17,000 linear feet of piping was identified in the Auxiliary Building as potential flooding sources. This data did not separate the pipe into different classes (e.g., Class I, II, III) and therefore the total approximate length of pipe included all classes.

   DEK walked down and analyzed approximately 1100 linear feet of piping categorized as either Class II, Class III or Class III*. Comparing the total linear feet of all classes of piping in the Auxiliary Building potential flood source zones to the linear feet of non-Class I piping analyzed yields that 6.5% of the total linear feet of piping in the Auxiliary Building potential flood source zones was analyzed. Analysis of these pipe runs determined that the ratio of the actual stress to allowable stress ranged from 0.89 to 0.41 with an average ratio of 0.54 and a median ratio of 0.49.

   The Class II, III, and III* pipes that were analyzed are located in the basement area of the Auxiliary Building in the vicinity of the RHR pump pits. This area had a total of 57 pipe segments identified. Of this total, 11 were determined to not be potential flood sources (dry or intermittently wetted lines). Of the remaining 46 segments, 36 were Class I/I* and only 10 were Class II, III, or III* segments. Using the assumption that this area is typical of the distribution for Class I/I* and Non-Class I/I* systems, the Non-Class I/I* systems represent 21% of the total piping segments. For the purpose of conservatively estimating the percentage of non-Class I/I* piping evaluated against total non-Class I/I* piping, this percentage was approximately doubled to 40% of all piping segments in the Auxiliary Building. Applying this adjusted percentage to the estimate of total linear footage of pipe in the Auxiliary Building yields an estimate of approximately 6800 feet of Non-Class I/I* pipe. With this as the denominator, the analyzed Non-Class I/I* pipe segments represent approximately 16% of the estimated Non-Class I/I* potential flooding sources in the Auxiliary Building.

As stated above, non-Class I/I* piping evaluations also included Class III piping segments. Although the USAR defined distinction of Class III piping is that it does not require additional UBC Zone 1 loads, research into the installation of Class III piping at KPS has shown that it was installed no differently than Class II or Class III* piping. All Class II, III, and III* piping installed in the seismic qualified areas of the plant were installed to the requirements of piping code USAS B31.1.0-1967 with applicable N-code cases to ASA B31.1-1955 per the Pioneer piping design and installation specifications. Seismic loading and acceleration factors, which met or exceed the criteria for an OBE (UBC Zone 1) seismic event, were required by these specifications. Furthermore, required QC inspections verified that in these areas of the plant, the piping of any class was installed to these specifications.

Accordingly, it is DEK's position that all piping classes defined in KPS USAR Section B.2.1 would maintain their pressure boundary during the anticipated design basis seismic event designated as the OBE. It is DEK's position that this is the criteria that was deterministically used during original licensing to address the issue of internal flooding.

To be clear, DEK does not contend that Class II, III, and III* piping is seismically qualified or that Class II, III, or III* systems will remain operable after a seismic event. It is our belief, however, that Class III piping, like Class II and Class III* piping will remain intact after an OBE without loss of its pressure boundary function and, "...will not adversely affect Class I SSCs during a design-basis event." Therefore, Class II, III, and III* piping do not represent potential internal flooding sources consistent with the deterministic criteria of the original licensing basis.

Question 3

Item (d) in Section B.11.2 specifies operator actions. Please provide more specific criteria for defining operator actions. For example, please provide information regarding the criteria for evaluating operator actions as described in American National Standards Institute/American Nuclear Society 58.8, "Time Response Design Criteria for Safety Related Operator Actions."

Question 3 Response

The current discussion in the proposed USAR Section B.11.2 regarding operator actions is as follows:

"Operator actions and design features are considered in the evaluation of internal flooding consequences. 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 following verbiage will be added to the existing text:

"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. An expansion joint failure would be alarmed almost immediately in the Control Room. If indications of excessive water on the Turbine Building floor are received, the Control Room operators are instructed by procedure to verify that the Circulating Water pumps have tripped and if necessary manually trip the pumps, thus terminating a flooding event due to an expansion joint failure. The CW pump trip circuitry is not credited in the evaluation of internal flooding resulting from an expansion joint failure. Operator response times of manual action for this scenario have been validated in the plant control room simulator."

For flooding sources in the Auxiliary Building or the Turbine Building other than the Circulating Water expansion joint, specific sump alarms would direct Control Room operators by procedure to dispatch operations personnel to identify and isolate any flooding sources. The significant, high-volume flood sources identified by plant walkdowns were evaluated by tabletop discussion and judged to be achievable within the 30-minute period assumed in the flooding evaluations. The tabletop validations were based on information available in the control room to assist the deployment of operations personnel into the plant to identify flood sources. The validation effort did not consider the use of random searches to locate flooding sources.

A revised mark-up of the proposed USAR incorporating the above changes is attached.

The above stated approach is believed to provide a reasonable basis for the assumed operator actions credited for internal flooding evaluations. With regard to ANS 58.8 (reference 13), the standard did not exist during the original licensing of the plant and likewise has not specifically been considered in this evaluation. In addition, DEK does not believe that this standard is directly applicable to these evaluations. An excerpt from SECY-03-0100 dated June 17, 2003 (reference 12) states:

"The staff is aware of the guidance on operator manual actions contained in ANSI/ANS Standard 58.8 (1994), "Time Response Design Criteria for Safety-Related Operator Actions." This standard contains criteria that establish timing requirements for use in the design of safety-related systems for nuclear power plants. The objective of the criteria is

to determine whether sufficient time exists for operators to perform the required operator manual actions to operate safety-related systems or whether automatic actuation is required. The scope of the standard is 'limited to safety-related operator actions associated with events (DBEs) that result in a reactor trip and is required to be analyzed in safety analysis reports (SARs).' "

Although this SECY paper is related to post-fire manual operator actions, which represent a similar class of actions to those related to internal flooding event recovery, internal flooding does not meet the scope of this standard.

Question 4

The application states that specific evaluations for the Class II and III piping in safeguard alley and the auxiliary building, are capable of withstanding the effects of a DBE without failure. Discuss these evaluations. Does this mean that all pipe/tanks in these areas will remain intact after an SSE?

Question 4 Response

Class II, III, and III* piping in Safeguards Alley and portions of the Auxiliary Building were evaluated to establish that leak tight structural integrity of the piping will be maintained during and after a design basis earthquake (DBE).

1. Safeguards Alley

In the Safeguards Alley, the piping was first segregated by systems. There are seven major systems in this area:

- Service Water
- Heating Steam
- Turbine Drain Pipe
- Hot and Potable Water
- Chemical Injection Piping and
- Miscellaneous Systems

The Fire Protection system is the seventh system and is discussed later in this response.

Each of the first six systems identified above contain multiple subsystems or segments. The scope of these subsystems or segments is rather large. Therefore, an initial screening of the subsystems was performed via a walkdown/evaluation by experienced engineers. The walkdown/evaluations used pre-determined acceptance criteria that were based on the response of actual piping systems to strong motion earthquake (i.e., seismic experience data). After initial screening was completed, several subsystems were selected as bounding and/or worst-case subsystems. These worst-case subsystems were then analyzed in detail for pressure, deadweight, and seismic DBE loading using either manual or computerized methods. The leak tight structural integrity was established by evaluating these subsystems to the 1983 edition of the ASME B&PV Code Section III, Subsection NC/ND and Appendix F for level D loading.

After completion of the bounding case piping subsystem analyses, the worst-case (bounding) supports were selected from all piping segments regardless of whether or not the associated piping subsystems were analyzed as part of the bounding analysis. The structural integrity of these bounding supports was evaluated using Appendix F of the 1983 Edition of the ASME B&PV Section III Code.

The Fire Protection piping subsystems in Safeguards Alley were analyzed separately. This piping was not included in the initial Safeguards Alley subsystem screening process which selected the bounding and/or worst-case subsystems. Instead each segment of the Fire Protection piping system was specifically analyzed using computerized methods. The method used the AUTOPIPE computer code and acceptance criteria was as described below for the Auxiliary Building piping evaluations.

2. Auxiliary Building

A detailed walk-down of the Class II, III, and III* piping subsystems was performed in the Auxiliary Building near or within the newly installed RHR pit flooding barriers to identify any piping with the potential for seismic induced flooding of the RHR pump pits. The piping systems having this flooding potential were specifically analyzed using the AUTOPIPE computer program. Leak tight structural integrity was established by evaluating the piping to the 1983 edition of the ASME B&PV Code Section III, Subsection NC/ND and Appendix F for level D loading.

Class II, III, and III* pipe supports were evaluated for structural integrity based on the loads generated in the above-mentioned pipe stress analyses. Pipe support structural integrity was verified for Level D loading using Appendix F of the 1983 Edition of the ASME B&PV Section III Code. Each model of piping near the RHR pit flood barriers met the requirements of the criteria to maintain the leak-tight structural integrity of the pipe.

From these results, and the results of the Safeguards Alley piping subsystem evaluations, it was judged that the remaining similarly supported Class II, III, and III* lines in the Auxiliary Building would also maintain structural integrity during and after a DBE.

Non-Class I/I* tanks have not been evaluated to maintain their structural integrity during and after a DBE. Accordingly, per the criteria in the proposed USAR Section B.11.2(a), non-Class I/I* tanks are currently considered as potential flood sources.

Details of the load combinations and stress allowable equations that were used for the evaluation of piping and supports inside the Safeguards Alley and the Auxiliary Building are provided below in response to Question 5.

Question 5

Please discuss the use of the Section III Code for evaluation for level D loading and American Society of Mechanical Engineers Section III, Appendix F. Provide the load combinations and stress allowable equations that were used to evaluate Class II, III and III piping systems for DBE loads.*

Question 5 Response

The following ASME Section III Code acceptance criteria were used in the piping evaluations of Class II, III and III* piping in Safeguards Alley and in portions of the Auxiliary Building:

$$B_1 \frac{PD_o}{2t_n} + B_2 \frac{|M_{DWT}|}{Z} \leq \text{The lesser of 1.5Sh or Sy}$$

$$B_1 \frac{PD_o}{2t_n} + B_2 \frac{|M_{DWT}| + |M_{DBE-IN}|}{Z} \leq \text{The lesser of 3Sh or 2Sy}$$

$$i \frac{M_{DBE-SAM}}{Z} \leq 3.0 S_h$$

Where:

B_1, B_2, P, D_o, t_n, Z, S_h, S_y, and *i* are per ND-3650.
M_{DWT} is the resulting moment due to deadweight loads.
$M_{DBE\text{-}IN}$ is the resultant moment due to DBE inertial loads.
$M_{DBE\text{-}SAM}$ is the resultant moment loading due to DBE SAM loads.
S_h = the basic code allowable stress per Table I-7.0 of the ASME BPVC Section III.
S_y = the material yield stress per Table I-2.0 of the ASME BPVC Section III.

For piping containing cast iron fittings, the following criteria used were:

$$B_1 \frac{PD_o}{2t_n} + B_2 \frac{|M_{DWT}|}{Z} \leq \frac{S_u'}{10}$$

$$B_1 \frac{PD_o}{2t_n} + B_2 \frac{|M_{DWT}| + |M_{DBE-IN}|}{Z} \leq \frac{S_u'}{5}$$

$$i \frac{M_{DBE-SAM}}{Z} \leq 1.5 \frac{S_u'}{10}$$

Where:

B_1, B_2, P, D_o, t_n, Z, and i are per ND-3650
M_{DWT} is the resulting moment due to deadweight loads
M_{DBE-IN} is the resultant moment due to DBE inertial loads
$M_{DBE-SAM}$ is the resultant moment loading due to DBE SAM loads
S'_u = The ultimate capacity of the Cast Iron material per Appendix A of the B31.1.0 Code or per the appropriate ASTM Specification.

Pipe Support Evaluation Criteria – Non-Interface Anchors

The absolute sum load combination method, consistent with the current practice at KNPP was used as follows:

|D| + |TH| + |[|(DBE-IN)| + |(DBE-SAM)|]|

Where:

D = dead weight
TH = thermal expansion load
DBE-IN = design basis earthquake inertia load
DBE-SAM = design basis earthquake anchor movement load

Structural Members:

Bending (F_b): Level A load (per NF-3322.1(d) via NF-3360) increased by the smaller of (2 or 1.167Su/Sy) if $S_u > 1.2 S_y$ or the level A load (per NF-3322.1(d) via NF-3360) increased by 1.4 if $S_u \leq 1.2 S_y$

Tension (F_a): lesser of $.7S_u$ or $1.2\ S_y$

Shear (F_v): lesser of $.42\ S_u$ or $.72\ S_y$

Compressive Load (F_a): 2/3 P_{cr} per F-1334.3

Combined Loads:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_b} + \frac{f_{by}}{F_b} \leq 1$$

Where;

fa = the developed compressive or tensile stress in the member
f_{bx} = the in-plane bending stress developed in the member
f_{by} = the out of plane bending stress developed in the member
F_a = The allowable axial stress (compressive or tensile) per AISC
F_b = The allowable bending stress per AISC

Bolting:

Tension (F_t): lesser of $.7S_u$ or $1.0\ S_y$
Shear (F_v): lesser of $.42\ S_u$ or $.6\ S_y$

Combined Loads:

$$\frac{f_t^2}{F_t^2} + \frac{f_v^2}{F_v^2} \leq 1$$

Fillet Welds:

Shear (F_v): Lesser of $0.42S_u$ or $0.72S_y$

Expansion Anchors:

Typically, the SQUG-GIP methodology with the following shear-tension interaction equation is used:

$$\left(\frac{T_L}{AT_L}\right)^{5/3} + \left(\frac{V_L}{AV_L}\right)^{5/3} \le 1$$

Where:

AT_L = Ultimate Tensile capacity divided by 3
AV_L = Ultimate Shear capacity divided by 3
T_L = The developed tensile load
V_L = The developed shear load

When manufacturer's supplied capacities were used, the factors of safety for ultimate tensile and shear capacities were 2.

Component Standard Supports:

The rated normal load capacity is multiplied by a factor of 2 for the DBE condition.

Question 6

Please explain why the Itemized Flood Guidelines sent to licensees in early 1970's are not included in the Flooding Design Criteria.

Question 6 Response

It was DEK's intent to incorporate the applicable concepts of the AEC Flooding Guidelines into the criteria presented in the proposed KPS USAR Section B.11. The specific guidelines themselves were not included because they were not formally sent to KPS or docketed as part of the licensing basis for Kewaunee.

During a telephone discussion regarding these questions, NRC staff suggested that the proposed USAR Section B.11 be revised to include these guidelines since the applicability of these guidelines to plants licensed in the early 1970s is acknowledged. Additionally, with the specifics of the guidelines identified, the NRC staff suggested that references to MPA B-11 (reference 5) would no longer be necessary. Since MPA B-11 is a somewhat obscure document, DEK agrees and proposes removing references to MPA B11 from the proposed flooding design criteria.

A statement (and discussion) of the seven AEC flooding guidelines and their applicability to KPS has been added to the proposed USAR Section B.11.3, Class I Equipment Protection. This is consistent with the wording and content of the guidelines.

A revised mark-up of the proposed KPS USAR changes is provided in attachment 2.

Question 7

Please clarify whether your proposed internal flooding evaluation criteria will apply (1) only in the analysis of ruptures caused by seismic events, or (2) in the analysis of ruptures caused by any unspecified mechanism (e.g., seismic, random, corrosion, etc.).

Question 7 Response

As stated in the proposed KPS USAR Section B.11.2 (a), "Only non-Class I/I* pipe or tanks are considered to fail unless specifically evaluated to withstand the Design Basis Earthquake (DBE)." The proposed USAR Section B.11 does not specify a "cause" of the failure. The classification of equipment for internal flooding consideration originated in the September 26, 1972, AEC letter to Kewaunee (reference 6). This letter requested the evaluation of "Non-Category I (seismic) equipment" failures. In 1972, this classification was essentially the difference between safety-related and non-safety-related equipment. The primary differences between these two classifications are material records and the seismic criteria for the component. The seismic criteria applied to Category I equipment is what distinguishes the quality and robust nature associated with the component. No specific "cause" for failure was identified in the September 1972 AEC request.

Kewaunee's October 31, 1972, response (reference 7) to the September 26, 1972 AEC letter addressed only piping that was not expected to fail as a result of a seismic event. The implication of a seismically induced failure in the AEC request prompted exclusions based on seismic qualification. Even though Class II and Class III* components were not safety-related, they were excluded from consideration in the October 1972 response because they met the criteria of being qualified to withstand the OBE, and as such were considered sufficiently robust to preclude any adverse interaction with safety-related components. (Refer to the licensing basis discussion of OBE in the response to Question 2 above.) Exclusions based on seismic evaluation were used in 1972 and subsequently formed the basis for exclusions from current deterministic evaluations of internal flooding. Current exclusions from the deterministic internal flooding evaluations, as noted in proposed KPS USAR Section B.11 are conservative because the exclusion by evaluation is based on withstanding a DBE not the original licensing basis requirement of the OBE. Components that are not seismically designed or evaluated (such as expansion joints, rubber boots, non-class piping, etc.) are assumed to fail, and the potential impact of flooding is evaluated even though their failure mechanism is not specifically identified. Random failure of components is only programmatically addressed in the plant probabilistic risk assessment and applies to any station component regardless of its seismic or safety classification. Consideration of random failures was not specifically addressed in the deterministic evaluation of 1972.

Classifying Class II, III, and Class III* piping and components as not subject to seismic failure based on installed robustness with respect to the deterministic evaluation for internal flooding does not exclude their consideration from plant flooding risk assessments. Random failure of these components have been considered in the risk assessment evaluations for the station. For risk assessment purposes, component failures are considered regardless of the system classification or any particular failure mechanism (seismic, corrosion, material flaw, design error, etc.). Therefore, the impact of any pipe failure on plant safety, regardless of failure mechanism, is still considered and quantified according to risk even if the pipe was not considered in the deterministic flooding evaluation as a flooding initiator.

The original AEC/NRC generic issue for deterministic internal flooding evaluations (Multi-plant Generic Issue B-11, reference 5) was associated and consolidated by the NRC with system interaction concerns identified in Unresolved Safety Issue (USI) A-17. Generic Letter 89-18 (reference 8), along with NUREG-1174 (reference 9), closed the internal flooding portion of USI A-17 to the IPE evaluations performed in the 1990s. The IPEEE evaluations (per Generic Letter 88-20, reference 10) were based on probabilistic risk assessments. The current plant risk assessment evaluation is more complex and sophisticated than the risk assessment provided in response to GL 88-20 and provides an integral part of the overall assessment of station safety.

The deterministic evaluation of internal flooding scenarios demonstrates the compliance with the original licensing basis. The deterministic evaluation of component failures was limited to those components that could not withstand a DBE and was evaluated with respect to the ability to maintain safe shutdown of the plant. The impact of the failures assumed in the deterministic evaluation (as well as failures that are not) is encompassed in the probabilistic risk assessments for the plant.

Question 8

The NRC staff has identified the following two examples where postulated failures of seismically-qualified piping systems had been discussed with respect to flooding effects:

A. *By letter dated November 7, 1972, Kewaunee responded to an oral NRC 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. The analyses of miscellaneous piping systems included evaluations of potential flooding effects from failures of the service water, component cooling, demineralized water, reactor makeup water system, waste disposal and spent fuel pool cooling. 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.*

B. *In a letter to Wisconsin Public Service Corporation from the Atomic Energy Commission (AEC) staff dated September 23, 1971, the AEC staff asked a question (Kewaunee Final Safety Analysis Report (FSAR) Question 8.16) regarding the potential failure of service water piping in proximity to the emergency diesel generator rooms. This question requested that Kewaunee provide an analysis of the effect of a rupture of one of the service water lines on the emergency power systems. The response to FSAR Question 8.16 was included with Amendment No. 13 to the Application for Construction Permit and Operating License for the Kewaunee Power Station, issued December 15, 1971. The response stated that the rupture of a service water pipe in an emergency diesel generator room could result in loss of the generator or safeguards electrical bus in that room. In addition, the response stated that operation of service water valves from the control room would isolate the break and, if required, operators would realign service water supplies through intact piping.*

The proposed changes to the internal flooding evaluation criteria appear to focus on postulated failures of non-seismic piping and tanks. Please discuss how the above licensing basis information has been incorporated into the proposed evaluation criteria for internal flooding.

Question 8 Response

Although the two examples of postulated failures identified in this question do involve internal flooding consequences and are part of the original licensing basis, they are separately considered and independent of the deterministic internal flooding evaluation requested by the NRC letter of September 26, 1972 (reference 6) and addressed in the proposed license amendment. Each example is a specific and separate scenario with regards to the plant licensing basis and as such was separately dispositioned in the original license basis and is not incorporated into the proposed evaluation criteria for internal flooding. The evaluation criteria addressed by the proposed USAR Section B.11 is focused on the failure of non-seismic piping and tanks consistent with the request made in the September 26, 1972 AEC letter (reference 6). The subsequent response to the AEC request dated October 31, 1972 (reference 7) provided the results of the deterministic assessments made at that time. The proposed USAR Section B.11 is intended to clearly define the appropriate evaluation criteria for internal flooding deterministic evaluations consistent with that portion of the original licensing basis. The proposed internal flooding evaluation criteria does not apply to flooding from HELB scenarios or postulated ruptures of Class I systems, which is the basis of the evaluations referenced by the two examples. This statement of non-applicability is included in the text of proposed USAR Section B.11.1.

Regarding the first example, high-energy line breaks are evaluated for plant impact as a design basis event with its own licensing basis and specific evaluation criteria. Flooding due to a high-energy line break, either from the initiating break or consequential damage of non-high-energy lines, was considered in the HELB evaluations submitted to the staff via FSAR Amendments 24, 27, and 28 and documented in USAR Section 10A. The November 7, 1972 letter (discussed in Question 8A above) was clearly identified as a "Preliminary" response to oral staff questions regarding high-energy line breaks. The evaluations submitted in the FSAR amendments represented the final evaluation for HELB and the basis for AEC staff acceptance of the evaluation as documented in Supplement 2 of the Kewaunee Safety Evaluation Report (reference 11).

Regarding the second example, the subject pipe failure of the FSAR Question 8.16 was a Class I, seismically designed Service Water system pipe. The rupture was, therefore, a postulated scenario involving a hypothetical break. Question 8.16 was a specific question of interest during the licensing review of the Kewaunee emergency electrical system. The question was prompted by the proximity of the large Service Water line to the emergency electrical systems. The question was evaluated and the consequences identified. The evaluation results are as stated in the above Question 8B and in USAR Section 8.2.3.5. The consideration of this Class I Service Water line rupture was a unique configuration concern that was questioned and addressed during the original licensing of the plant. It was not presented (nor perceived) as a design basis criteria for application to the entire facility.

The impact of Class I pipe failures, such as the postulated Service Water line rupture in FSAR Question 8.16, have been evaluated and are presently being addressed through the plant probabilistic risk assessment. These risk evaluations are performed to assess the potential safety implications of various plant component failures regardless of deterministic failure mechanisms. These evaluations include piping and apply to any critical area or system within the facility. The current probability assessments for Kewaunee have identified several high risk scenarios involving Class I piping systems. As a result, the plant is implementing various plant modifications to ensure the risk associated with the failure is reduced to acceptable levels. The overall improvement associated with the completed and planned plant modifications have been previously presented to the NRC at several informational management meetings.

Deterministic evaluations performed as part of the licensing review process in the early 1970's remain part of the plant licensing basis within the framework of assumptions and criteria used at the time. However, plant probabilistic risk assessments now evaluate and address the risk associated with the concerns that were previously addressed by deterministic evaluations in a discrete manner.

In order to provide appropriate cross-reference of USAR subjects, a reference to the USAR Section 8.2.3.5 that discusses the postulated Service Water line break near the Emergency Diesel Generator rooms has been added to the text of the proposed USAR Section B.11. A revised mark-up incorporating this change is attached.

References:

1. Letter from Leslie Hartz (DEK) to Document Control Desk, "License Amendment Request 215 – Modification of Internal Flooding Design Basis," dated March 17, 2006.
2. Letter from E. S. Grecheck (DEK) to Document Control Desk, "Response to NRC Request for Additional Information Regarding License Amendment Request 215, Modification of Internal Flooding Design Basis," dated April 17, 2007.
3. Letter from P. D. Milano to D. A. Christian (DEK), "Kewaunee Power Station – Request for Additional Information Related to Internal Flooding Design-Basis (TAC No. MD0511)," dated August 2, 2007.
4. Memorandum from L. B. Marsh (NRC) to J. A. Grobe (NRC), "Response to Task Interface Agreement (TIA 2001-02) and Task Interface Agreement (TIA 2001-04) Regarding Evaluation of Service Water System Design Basis Requirements at Prairie Island (TAC NOS. MB1402, MB1403, MB1855, and MB1856)," dated August 29, 2002 (ADAMS Accession No. ML022140006).
5. Multi-Plant Generic Issue B-11, "Susceptibility of Safety Related Systems to Flooding Caused by Failure of Non-Class 1 Systems."
6. Letter from R. C. DeYoung (AEC) to E. W. James (WPSC), dated September 26, 1972.
7. Letter from E. W. James (WPSC) to R.C. DeYoung (NRC), "WPS Review of Non-Category I (Seismic Equipment)," dated October 31, 1972.
8. Generic Letter 89-18, "Resolution of Unresolved Safety Issue A-17, Systems Interactions in Nuclear Power Plants," dated September 6, 1989.
9. NUREG-1174, "Evaluation of Systems Interactions in Nuclear Power Plants, Technical Findings Related to Unresolved Safely Issue A-17," dated May 1, 1989.
10. Generic Letter 88-20, "Individual Plant Examinations for Severe Accident Vulnerabilities – 10 CFR 50.54 (f)," dated November 23, 1988 (and Supplements 1-5).
11. "Supplement No. 2 to the Safety Evaluation by the Directorate of Licensing U. S. Atomic Energy Commission in the Matter of Wisconsin Public Service Corporation, Wisconsin Power and Light Company and Madison Gas and Electric Company, Kewaunee Nuclear Plant, Kewaunee County, Wisconsin, Docket No. 50-305," dated May 10, 1973.
12. SECY 03-0100, "Rulemaking Plan on Post-Fire Manual Operator Actions," dated June 17, 2003.
13. ANSI/ANS Standard 58.8, "Time Response Design Criteria for Safety Related Operator Actions," 1994.

ATTACHMENT 2

RESPONSE TO SECOND NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST 215, "MODIFICATION OF INTERNAL FLOODING DESIGN BASIS"

PROPOSED REVISIONS TO MARKED-UP KEWAUNEE USAR PAGES INCLUDED IN LAR 215

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

B.11 INTERNAL FLOODING

B.11.1 GENERAL DISCUSSION

Internal flooding can occur as a result 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 tanks. In these cases, cubicles or dikes contain liquids due to failure of non-seismic components 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 in a service water line in the vicinity of the diesel generator rooms. Section 8.2.3.5 discusses the impact of this postulated rupture. The postulated rupture of a high-energy line (HELB) that also includes flooding consequences was addressed by FSAR Amendment Nos. 24, 27, and 28 that 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, re-constitution of the design criteria for internal flooding was initiated in support of several internal flood protection modifications. When the operating license for Kewaunee was issued, the AEC was pursuing the issue of internal flooding for previously licensed plants. ~~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 failure of a non-class 1 component~~pipe or tank~~ that is below the criteria for high-energy systems~~. as a result of a seismic event.~~ The HELB design criteria is addressed specifically in Section 10A.

B.11.2 FLOODING DESIGN CRITERIA

The plant must withstand the consequences of an internal flooding event in such a manner that it retains the capability to achieve and maintain the reactor in a safe shutdown condition. Toward this end, the design criteria for internal flooding evaluations are:

(a) ~~Only pipe and tanks not capable of maintaining their pressure boundary during a seismic event are considered to fail.~~ Only non-Class I/I* pipe or tanks are considered to fail unless specifically 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) The effects of water spraying, dripping, or splashing on sensitive equipment are to be considered in the assessment of available equipment.

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 of time, if necessary, for cold shutdown equipment repairs.

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

The failure of a pipe or tank is assumed as a result of DBE seismic loads. 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. The consequences of lesser breaks resulting in dripping or spray are also considered. 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) and portions of the Auxiliary Building have demonstrated that the Class II and Class III piping in these areas are capable of withstanding the effects of a DBE without failure. The piping in these areas was installed to the same standards used throughout the station for Class II, III, and III* piping ~~and, therefore, is typical of all station piping~~.

Operator actions and design features are considered in the evaluation of internal flooding consequences. 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.

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. An expansion joint failure would be alarmed almost immediately in the Control Room. If indications of excessive water in the Turbine Building are received, the Control Room operators are instructed by procedure to verify that the

Circulating Water pumps have tripped and, if necessary, manually trip the pumps thus terminating an expansion joint failure flooding event. The CW pump trip circuitry is not credited in the evaluation of internal flooding resulting from an expansion joint failure. Operator response times for manual actions have been validated in the plant control room simulator.

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.

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 to the extent that the Class I function is 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 drain line check valves, flooding barriers, level alarms, and a circulating water pump trip. These measures provide additional protection to the original plant design against flood damage. The criteria for protection of Class I equipment has not changed, however, the means by which to comply with the criteria has become more effective.

The following guidelines specify the design considerations for evaluation and protection from internal flooding events.based on the AEC guidelines for internal flooding which were available shortly after Kewaunee was licensed. These guidelines were not formally docketed for Kewaunee and are not requirements. They do represent the regulatory position regarding internal flooding which was generally held during the time when the Operating License was issued for Kewaunee. Accordingly, a brief discussion addressing these guidelines is provided. It is noted that these guidelines were associated and consolidated by the NRC with system interaction concerns identified in Unresolved Safety Issue (USI) A-17. Generic Letter 89-18 (reference 34), along with NUREG-1174 (reference 35), closed the internal flooding portion of USI A-17 to the IPEEE evaluations performed in the 1990s. The IPEEE evaluations (per Generic Letter 88-20, reference 36) were based on probabilistic risk assessments.~~The AEC flooding guidelines developed in response to Multi-Plant Generic Issue B-11 do not specify that flood protection equipment needs is to be safety related. Flood protection equipments 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.~~

Guideline - Separation for Redundancy: A single failure of non-Class I system components or pipes shall not result in loss of a system important to safety. Redundant safety equipment shall be separated and protected to assure operability in the event a non-Class I system or component fails.

Discussion - Redundancy of equipment (or alternate means for accomplishing the same shutdown function) is the basis utilized in the internal flooding evaluation for assessing safe shutdown capability when components identified in the safe shutdown list were compromised due to flooding.

Guideline - Access Doors and Alarms: Watertight barriers for protection from flooding of equipment important to safety shall have all access doors or hatches fitted with reliable switches and circuits that provide and alarm in the Control Room when the access is open.

Discussion - There are no watertight access doors or hatches associated with flooding barriers in-place for protection from internal flood events. Watertight doors installed for the purpose of protection from external flooding are not addressed by this guideline.

Guideline - Sealed Water Passages: Passages or piping and other penetrations through walls of a room containing equipment important to safety shall be sealed against water leakage from any postulated failure of non-Class I water systems. The seals shall be designed for the DBE, including seismically induced wave action or water inside the affected compartment during the DBE.

Discussion – Flooding evaluations utilize walk downs in each plant area to characterize flow paths in and out of each area, including penetrations. Qualification of penetration seals to the DBE was not considered,. However, with the exception of the fire seals, specific flood protection features due to penetration seals was not credited. Penetrations with fire seals were considered as sealed against any significant leakage, in or out of the area. Due to large fire zones in the Auxiliary Building and low flood water levels, the number of credited fire seals is small. Also, no flood zone in the Auxiliary Building was considered "sealed" against water leakage.

Guideline - Class I Watertight Structures: Walls, doors, panels, or other compartment closure designed to protect equipment important to safety from damage due to flooding from non-Class I system rupture shall be designed for the DBE, including seismically induced wave action of water inside the affected compartment during the DBE.

Discussion - The watertight structures designed to protect equipment important to safety from the consequences of an internal flooding event are the flood barriers at doors #4, #6, #8, #11, #15, #16, and #401; and the blowout panel in the room for the TDAFW pump. Flood barriers were also installed at doors #12 and #13, but are associated with flooding from a HELB scenario. Each of these barriers was designed as Class I structures in order to withstand the effects of a DBE.

Guideline - Water Level Alarms and Trips: Rooms containing non-Class I system components and pipes whose rupture could result in flood damage to equipment important to safety shall have level alarms and pump trips (where necessary) that alarm in the Control Room and limit flooding to within the design flood volume. Redundancy of switches is required. Critical pump (i.e., high volume flow, such as condenser circulating water pumps) trip circuits should meet IEEE 279 criteria.

Discussion - The original plant design had a single non-safety level alarm in the Turbine Building sump which alarmed in the Control Room. Additional level indicators and Control Room alarms have been installed in the Turbine Building and, in general, comply with the requirements of IEEE 279. This guideline also has been implemented with respect to the Circulating Water pump trip circuits with a 2 of 3 Circulating Water pump trip logic using the installed level indicators.

Additionally, level switches are installed in various areas located in Safeguards Alley and the Auxiliary Building. These level indicator/alarms are considered as defense-in-depth components and are not specifically installed in accordance with the criteria of IEEE-279.

Guideline - Class I equipment should be located or protected such that rupture of a non-Class I system connected to a tower containing water or body of water (river, lake, etc.) will not result in failure of the equipment from flooding.

Discussion - This guideline applies to the Circulating Water and Service Water systems since both take their supply directly from Lake Michigan. The guideline, however, is basically a restatement of the design basis function of USAR B.5.a to protect Class I equipment that has a Class I function.

Guideline - The safety analysis shall consider simultaneous loss of offsite power with the rupture of a non-Class I system component of pipe.

Discussion - This guideline is specifically addressed by the design criteria in Section B11.2 (e).

These flooding guidelines do not specify that flood protection equipment is to 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

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. Equipment required for the safe shutdown of the reactor must be protected from the flood consequences consistent with Section B.5.a.

REFERENCES - APPENDIX B

1. Morris, Hansen, Holley, Biggs, Namyet, and Minami, "Structural Design for Dynamic Loads", McGraw-Hill Co., Inc., New York, 1959

2. RA Wiesemann, RE Tome, R. Salvatori, "Ultimate Strength Criteria to Ensure No Loss of Function of Piping and Vessels Under Earthquake Loading", WCAP 5890 Rev 1, October 1967.

3. George W. Housner, "Vibration of Structures Induced by Seismic Waves", Shock and Vibration Handbook, Volume III, McGraw-Hill, Inc., New York, 1961

4. E. L. Vogeding, "Topical Report, Seismic Testing of Electrical and Control Equipment", WCAP 7817, December 1971

5. "Report Covering the Effects of a High Pressure Turbine Rotor Fracture and Low Pressure Turbine Disc Fractures at Design Overspeed", Westinghouse LTD, Report B, E & M.

6. RC Gwaltney, "Missile Generation and Protection in Light-Water-Cooled Power Reactor Plants", ORNL-NSIC-22, September 1968.

7. J. N. Fox, "Likelihood and Consequences of Turbine Overspeed at the Point Beach Nuclear Plant", WCAP 7525, August 1970

8. John A. Blume & Associates, Engineers, "Kewaunee Nuclear Power Plant-Earthquake Analysis of the Reactor-Auxiliary-Turbine Building, JAB-PS-01, February 16, 1971" (submitted as part of Amendment No. 9 to this license application)

9. John A. Blume & Associates, Engineers, "Kewaunee Nuclear Power Plant-Earthquake Analysis: Reactor-Auxiliary-Turbine Building Response Acceleration Spectra", JAB-PS-03, February 16, 1971 (submitted as Amendment No. 9 to this license application)

10. "Methodology for Calculating the Probability of a Missile Generation from Rupture of a Low Pressure Turbine Disc" - Revision 1, dated July 1980, Westinghouse

11. "Results of Probability Analyses of Disc Rupture and Missile Generation"-Revision 0, dated August 1980, Westinghouse

12. "WPS Kewaunee Missile Probabilities/Probability of Disc Rupture and Missile Generation Due to Stress Corrosion" - Letter to DC Hintz from Philip E. Mescher dated August 9, 1982 (Letter #PM-229-82)

13. NRC Safety Evaluation Report - Letter to ER Mathews from SA Varga dated October 26, 1981 (K-81-174)

14. Supplement No. 1 to Generic Letter (GL) 87-02 which transmits Supplemental Safety Evaluation Report No. 2 (SSER No. 2) on SQUG Generic Implementation Procedure, Revision 2 as corrected on February 14, 1992 (GIP-2), dated May 22, 1992

15. Letter from H. L. Thompson (NRC) to Licensees, Letter No. K-85-132 dated June 28, 1985

16. NRC SER, SA Varga (NRC) to CW Giesler (WPS), Letter No. K-84-61 dated March 16, 1984

17. Letter from C. R. Steinhardt (WPSC) to the NRC Document Control Desk, dated September 17, 1992

18. Letter from C. R. Steinhardt (WPSC) to the NRC Document Control Desk, dated February 18, 1993

19. Seismic Qualification Utility Group (SQUG), "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Power Plant Equipment", Revision 2 as corrected February 14, 1992

20. Letter from C. R. Steinhardt (WPSC) to the NRC Document Control Desk, Letter No. NRC-89-56, dated May 05, 1989, "Criteria for Determining Continued Operability of Safety Related Piping Systems"

21. Letter from C. R. Steinhardt (WPSC) to the NRC Document Control Desk, Letter No. NRC-96-016, dated February 13, 1996, "Response to Generic Letter 95-07"

22. Letter from C. R. Steinhardt (WPSC) to the NRC Document Control Desk, Letter No. NRC-96-071 dated July 18, 1996, "Response to Request for Additional Information - Generic Letter 95-07"

23. NRC Safety Evaluation Report of Licensee Response to Generic Letter 95-07, A Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves", Letter to ML Marchi (WPSC) from R. J. Laufer (NRC), dated January 13, 1998 (K-98-008)

24. Letter from WO Long (NRC) to ML Marchi (WPSC), "Kewaunee Nuclear Power Plant-Safety Evaluation Report for USI A-46 Program Implementation", Letter No. K-98-47, dated April 14, 1998

25. Seismic Qualification Utility Group (SQUG), "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Power Plant Equipment", Revision 3, May 16, 1997

26. Supplemental Safety Evaluation Report No. 3 (SSER No. 3) on the Review of Revision 3 to the Generic Implementation Procedure for Seismic Verification of Nuclear Power Plant Equipment updated May 16, 1977, (GIP-3), (TAC No. M93624)

27. FSAR Amendment 17 dated May 12, 1972 from E. W. James (WPS) to P. A. Morris (AEC).

28. FSAR Amendment 24 dated January 24, 1973 from E. W. James (WPS) to J. F. O'Leary (AEC).

29. FSAR Amendment 27 dated March 16, 1973 from E. W. James (WPS) to J. F. O'Leary (AEC).

30. FSAR Amendment 28 dated April 13, 1973 from E. W. James (WPS) to J. F. O'Leary (AEC).

31. "Safety Evaluation of Kewaunee Nuclear Power Plant, Supplement 2" dated July 24, 1972.

32. NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Reactors (LWR Edition) dated July 1981.

33. Letter October 31, 1972 to R. C. DeYoung (NRC) from E. W. James (WPS).

34. ~~Letter dated October 31, 1974 from the AEC to Surry Power Station. This letter contains the guidelines for the evaluation of internal flooding based on MPA B011 (Multi-Plant Generic Issue B-11).~~