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SUBJECT: Informs that during a telecon NRC notified WPSC that proposed amendment was not acceptable unless conservative adjustments were made.

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C A T E G O R Y 1

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NRC-96-103

WISCONSIN PUSLIC SERVICE CORPORATION

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September 27, 1996

10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Proposed Amendment 139a to the Kewaunee
Nuclear Power Plant Technical Specifications

References:
1) Letter from R. J. Laufer (NRC) to M. L. Marchi dated April 26, 1995.
2) Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC) dated August 24, 1994.
3) Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC) dated April 19, 1995.
4) Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC) dated April 30, 1996.
5) Letter from R. J. Laufer (NRC) to M. L. Marchi dated June 14, 1996.
6) Letter from R. J. Laufer (NRC) to M. L. Marchi dated June 18, 1996.
7) Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC) dated August 12, 1996.
8) Letter from C. R. Steinhardt (WPSC) to Document Control Desk (NRC) dated January 25, 1996.

On April 30, 1996, Wisconsin Public Service Corporation (WPSC) submitted a proposed amendment (PA) (Reference 4) to the Kewaunee Nuclear Power Plant (KNPP) Technical Specifications (TS) requesting a change to the Low Temperature Overpressure Protection (LTOP)

A001/1

requirements for the reactor coolant pressure boundary. Currently, the TS specify the LTOP requirements through the end of operating cycle 21 or 18.40 effective full power years. The proposed change extended the LTOP requirements through the end of operating cycle 33 or 33.41 effective full power years. References 5&6 requested additional information on the proposed amendment. This information was provided to the NRC as Reference 7.

On September 6, 1996, during a telecon the NRC notified WPSC that the proposed amendment was not acceptable unless conservative adjustments were made in the application of margins for the initial reference temperature for the unirradiated material and in the use of a ratio factor for determining the values of reference temperature from the surveillance weld. The NRC also expressed concerns with the neutron fluence assumptions in the proposed amendment. Following several additional telecons with the NRC and evaluation activities by WPSC, WPSC presented an approach using the NRC recommended adjustments and end of life neutron fluence values to the NRC in a telecon on September 19. The NRC was also informed that use of this approach would require changes beyond the original proposed amendment including an increase in the enabling temperature for the LTOP system. The NRC indicated general agreement with the approach presented.

WPSC recognizes the NRC staff mission to ensure safe and conservative nuclear plant operation and the significant flexibility permitted by 10CFR50.61 in establishing material properties and margins. But, WPSC believes that the additional margins required by the staff are unnecessary in meeting the 10CFR50 requirements and are overly conservative. Due to the difficulty in establishing these properties and margins, WPSC has measured the fracture toughness of the unirradiated Kewaunee surveillanee weld as discussed in Attachment 1. This testing demonstrates the substantial safety margin for the reactor vessel at end of life without the need to use the conservative material properties and margins required by the staff. However, to expedite approval of this PA and prevent a delay in plant restart from the current refueling outage, WPSC has agreed to use the NRC staff recommendations for this specific applieation. The attachment to this letter provides proposed amendment 139a to the KNPP TS which reflects the conservative assumptions discussed with the NRC on September 19.

Attachment 1 to this letter contains a description, a safety evaluation, a significant hazards determination and environmental considerations for the proposed changes. Attachment 2 contains the affected TS pages. Attachment 3 contains the temperature and pressure combinations used to create the curve in Figure TS 3.1-4.

As described above, the current Figure TS 3.1-4 is applicable through the end of operating cycle 21 or 18.40 effective full-power years (EFPY). On September 20, the Kewaunee Plant shut down for refueling following cycle 21 at approximately 18.36 EFPY. Plant heatup and exiting cold shutdown are currently scheduled for October 21 with initial criticality the following day. Although the remaining EFPY would provide about two weeks of full power operation and LTOP operability is not explicitly required until the next plant cooldown, continued operation without an approved LTOP evaluation curve is not considered prudent nor in the best interest of public health and safety.

As detailed above WPSC requested this amendment on April 30, 1996, and promptly pursued resolution of the NRC concerns following the September 6 notifieation. Based upon NRC acceptance of previous analyses on this subject, WPSC could not have anticipated these NRC concerns. To meet the outage schedule, WPSC requests that this amendment be processed in an exigent manner.

WPSC will continue to comply with the existing specification until 18.40 EFPY unless we receive and implement this amendment at an earlier date. At the end of 18.40 EFPY, if this amendment has not yet been received, WPSC will administratively ensure implementation of the provisions of the proposed amendment.

In accordance with the requirements of 10 CFR 50.30(b), this submittal has been signed and notarized. A complete copy of this submittal has been transmitted to the State of Wisconsin as required by 10 CFR 50.91(b)(1).

Sincerely,

Clark Steinhardt

C. R. Steinhardt
Senior Vice President-Nuclear Power

CAT
Attach.
cc - US NRC - Region III
Senior Resident Inspector, US NRC
Mr. Lanny Smith, PSCW

Subscribed and Sworn to
Before Me This 27th Day
of September 1996

Jeanne M. Ferris
Notary Public, State of Wisconsin

My Commission Expires:
June 13, 1999

ATTACHMENT 1

Letter from C. R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

September 27, 1996

Background
Safety Evaluation
Significant Hazards Determination

BACKGROUND

On March 22, 1993, Wisconsin Public Service Corporation (WPSC) was notified of a potential error in the setpoint development for the low temperature overpressure protection (LTOP) system. Subsequently, WPSC calculated Appendix G limits applicable for a reduced period of neutron fluence and took credit for surveillance capsule data. Recalculated Appendix G limits were developed to ensure continued operation with the existing LTOP setpoint through the end of the next operating cycle (Cycle 20, April 1995). Limiting the analysis to one additional cycle of operation provided sufficient margin to offset the decreased margin associated with resolution of the potential error in the setpoint development. The purpose of that effort, in part, was to develop a short term solution which would allow WPSC to operate the plant for an additional cycle, thereby providing adequate time to consider options for the future. WPSC had planned on using the 1992 Edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code or ASME Code Case N-514 as part of its long term strategy; however, neither of these documents had yet been approved for use by the NRC. At the time, WPSC believed that either the 1992 Edition of the ASME B&PV Code or Code Case N-514 would be needed to qualify the LTOP system for operation through EOC 33 without encountering unacceptable operational restrictions. The Commission approved KNPP's LTOP requirements through the end of operating cycle 20 under Amendment No. 108.

Near the end of operating cycle 20, the NRC had not approved either the 1992 Edition of the ASME Boiler and Pressure Vessel Code nor ASME Code Case N-514. Since application of these documents is part of WPSC's long term strategy and there continued to be anticipation that the NRC was about ready to approve these documents, to maintain as much operational flexibility as possible WPSC decided to again develop Appendix G limits for a limited period of neutron fluence. New Appendix G limits were developed for use through the end of operating cycle 21 (September 1996) with the expectation that once the ASME documents were approved, WPSC would establish new LTOP requirements applicable through end of life. The Commission approved KNPP's LTOP requirements through the end of operating cycle 21 under Amendment No. 120.

On April 30, 1996, WPSC submitted Proposed Amendment (PA) 139 to revise the LTOP requirements through end of operating cycle 33. The material property basis, including chemistry factor and initial reference temperature for the unirradiated material (RT_{NDT}), was the same as that used in the current Technical Specifications. The only technical change made was the use of end of cycle 33 fluence versus end of cycle 21 fluence. During review of PA 139 the NRC notified WPSC by telephone on September 6, 1996, that more conservative material properties must be used in establishing LTOP requirements: initial RT_{NDT} = -56°F, a margin term of 44°F, and a chemistry factor ratio adjustment of 1.18.

Due to the magnitude of change requested by the NRC, WPSC performed an evaluation to determine the impact of the more conservative material property basis and margin on the LTOP system at projected EOL fluence. The evaluation concluded that the existing LTOP relief valve at the existing setpoint is capable of preventing a LTOP transient from exceeding 10CFR50 Appendix G limits. This conclusion is premised on the condition that administrative restrictions (similar to those previously described and accepted in TS Amendment 108) are imposed on reactor coolant pump operation. A second reactor coolant pump shall not be started until reactor coolant temperature is greater than 140°F. This ensures that pressure at the vessel weld of interest is maintained below the Appendix G limits during the limiting mass injection LTOP transient.

PA139a incorporates the use of these more conservative material properties and revises the LTOP requirements approved as TS Amendment 120. WPSC did not use the 1992 Edition of the ASME Boiler and Pressure Vessel Code or ASME Code Case N-514, since neither document has been approved for use at this time. Following regulatory approval of these ASME documents or reevaluation of the initial RT_{NDT} using fracture toughness measurements, WPSC may choose to amend the LTOP specification at a later date to provide greater operating flexibility.

WPSC notified the NRC in reference 8 that WPSC was actively involved in PWR Owners Groups' programs to measure the fracture toughness of the unirradiated weld material. The WOG Materials Subcommittee recently completed fracture toughness testing of the unirradiated Kewaunee surveillance weld heat IP3571 metal. Both 1/2T Compact Tension (CT) and pre-cracked Charpy Impact three point slow bend specimens were used in the WOG program. The measured values of T_o for the unirradiated 1/2T CT specimens and pre-cracked Charpy specimens were -124°F and -148°F, respectively. WPSC's objective is to use T_o as a basis to determine a new initial reference temperature to perform the PTS evaluation, construct heatup and cooldown limit curves, and establish LTOP requirements for EOC 33 and possible future life extension. $T_{o\,1/2T\,CT}$ supports a Kewaunee specific adjusted initial reference temperature value of -110°F as shown in Figure 1 of this attachment. As permitted by 50.61(a)(5), the technical basis and a new TS PA reflecting this approach will be submitted to the NRC in the near future since the existing heatup and cooldown curves expire at EOC 22.

Regulatory Requirements for Fracture Toughness and Pressure - Temperature (P/T) Limitations

10 CFR 50.60(a) states that the reactor coolant pressure boundary must meet the fracture toughness and material surveillance program requirements set forth in Appendices G and H to 10 CFR Part 50. For low temperature overpressure protection, these regulatory requirements are as follows:

1) 10 CFR 50, Appendix G.IV.A: Pressure retaining components of the reactor coolant pressure boundary must meet the requirements of the ASME Code, supplemented as follows for fracture toughness during system hydrostatic tests and any condition of normal operation, including anticipated operational occurrences.

2) 10 CFR 50, Appendix G.V.A: The effects of neutron radiation on the reference temperature and upper shelf energy of the reactor vessel beltline materials, including welds, are to be predicted from the results of pertinent radiation effects studies in addition to the results of the surveillance program of 10 CFR 50 Appendix H.

3) 10 CFR 50, Appendix G.IV.A.2.a: Pressure-temperature limits and minimum temperature requirements for the reactor vessel are given in Table 3, and are defined by the operating condition (i.e., hydrostatic pressure and leak tests, or normal operation including anticipated operational occurrences), the vessel pressure, whether or not fuel is in the vessel, and whether the core is critical.

4) 10 CFR 50, Appendix G.IV.A.2.b: The pressure-temperature limits identified as "ASME Appendix G limits" in Table 3 require that the limits must be at least as conservative as limits obtained by following the methods of analysis and the margins of safety of Appendix G of Section XI of the ASME Code.

5) 10 CFR 50, Appendix G.IV.A.2.c: The minimum temperature requirements given in Table 3 pertain to the controlling material, which is either the material in the closure flange or the material in the beltline region with the highest reference temperature. As specified in Table 3, the minimum temperature requirements and the controlling material depend on the operating condition (i.e., hydrostatic pressure and leak tests, or normal operation including anticipated operational occurrences), the vessel pressure, whether fuel is in the vessel, and whether the core is critical.

10 CFR 50.61 identifies the general procedures acceptable to the NRC staff for calculating the effects of neutron radiation embrittlement of the low-alloy steels currently used for light-water-cooled reactor vessels. 10 CFR 50.61 describes two methods acceptable to the NRC staff to evaluate the predictions of radiation embrittlement needed to implement Appendices G and H to 10 CFR Part 50. Paragraph (c)(2)(ii)(A) of 10 CFR 50.61 requires that licensees determine a material-specific value of chemistry factor when the surveillance data is deemed credible according to the criteria of paragraph (c)(2)(I) of 10 CFR 50.61. Additionally, Paragraph (c)(2)(ii)(B) specifies if the chemical content of the surveillance weld differs from the average for the weld wire heat number associated with the vessel weld, then the measured values of ΔRT_{NDT} be adjusted for differences in copper and nickel content by multiplying them by the ratio of the chemistry factor for the vessel material to that of the surveillance weld.

<u>Calculation of Appendix G Pressure Limitations for Low Temperature Operation Using 10 CFR 50.61, Paragraph (c)(2)(ii)(A)</u>

The maximum allowable pressures for the reactor vessel beltline weld, corresponding to isothermal events during low temperature operations (i.e < or = to 355°F), have been recalculated (at discrete points of interest) using the approved methodology described in 10 CFR 50.61, Paragraph (c)(2)(ii)(A). The recalculation used:

1) Neutron fluence values based on projected operating hours for existing core design through the end of operating cycle 33 (as documented in WCAP-14279, "Analysis of Capsule S from the Wisconsin Public Service Corporation Kewaunee Nuclear Plant Reactor Vessel Radiation Surveillance Program"),

2) Chemistry factor obtained from surveillance capsule data, adjusted to reflect a Chemistry factor ratio of 1.18, based on the methodology of 50.61(c)(2).

3) An initial RT_{NDT} of -56°F.

4) Margin term of 44°F

Calculation C10886, Revision 1 was performed to establish the maximum allowable pressure to protect the reactor vessel from LTOP events through EOC 33. The resulting P/T limitation curve is reflected in proposed Figure TS 3.1-4. The recalculated pressure-temperature points are provided in Attachment 3.

<u>Description of Proposed Changes to Section TS 3.1. and Figure TS 3.1-4</u>

This proposed change will modify the limiting conditions for operation for reactor coolant temperature and pressure as follows:

1) TS 3.1.a.1.C has been revised to increase the required reactor coolant system temperature for starting a reactor coolant pump consistent with the design basis for the LTOP system.

2) TS 3.1.b.1.C and TS 3.1.b.4 have been modified to incorporate a LTOP enabling temperature through EOC 33 or 33.41 EFPY.

3) Figure TS 3.1-4 has been modified to define 10 CFR 50 Appendix G pressure temperature limitations for LTOP evaluation through the end of operating cycle (EOC) 33. This is equivalent to 33.41 effective full power years.

4) Existing TS 3.1.b.1 is modified to reflect applicability of Figure TS 3.1-4 through the end of operating cycle 33 or 33.41 effective full power years.

5) Basis Section 3.1 has been revised accordingly.

6) The List of Figures has been changed to reflect the revised title of Figure TS 3.1-4 indicating the new expiration date of EOC 33.

Safety Evaluation for Proposed Changes to Section TS 3.1 and Figure TS 3.1-4

The proposed TS and Figure revisions provide criteria for operation of the LTOP system and evaluation of LTOP events whenever one or more of the RCS cold leg temperatures are less than or equal to the LTOP enabling temperature. The LTOP enabling temperature based on Figure TS 3.1-4 is 355°F and satisfies the BTP RSB 5-2 guidance of RT_{NDT} + 90°F. The LTOP relief valve setpoint remains unchanged at ≤500 psig. The proposed TS and Figure revisions are based on 10 CFR 50 Appendix G pressure-temperature (P/T) limitations for a period of neutron irradiation through end of operating cycle 33. The enabling temperature and material property basis, including chemistry factor, initial reference temperature for the unirradiated material (RT_{NDT}), and margin terms, used for this PA are more conservative than that used in the current TS. The new EOC 33 $RT_{NDT1/4T}$ of 264.64°F versus 212.99°F (derived from the material property basis used in the current TS) reflects the additional conservatism used in this PA. The constant pressure limit value from 163°F to 180°F shown on the curve in Figure TS 3.1-4 reflects the material properties in the closure flange region and high stress caused by bolt preload.

The P/T limits reflected in proposed Figure TS 3.1-4 are based on the following criteria:

1) An initial RT_{NDT} value of -56°F. Drop weight testing of Kewaunee surveillance material was performed by the Westinghouse Electric Corporation and documented in WCAP 14042, Revision 1, dated January 1995 with a resultant initial RT_{NDT} of -50°F. Testing of sister plant surveillance material resulted in an initial RT_{NDT} of -30°F. The mean value for all Linde 1092 weld heats is -50.7°F. Industry activities to measure fracture toughness support an adjusted RT_{NDT} of -110°F based on T_o 1/2T CT of -86.7°C as shown in Figure 1 of this attachment. Use of the generic value of -56°F (for welds made with Linde 1092 flux) with a larger margin term (44°F vs. 28°F) was deemed conservative and acceptable for this evaluation.

2) Paragraph (c)(2)(ii)(A) of 10 CFR 50.61. This paragraph requires that licensees determine a material-specific value of chemistry factor when the plant specific surveillance data is deemed credible according to the criteria of paragraph (c)(2)(I) of 10 CFR 50.61. Reference 3 documents WPSC's evaluation which concludes that the KNPP surveillance capsule data satisfy the credibility criteria. The calculated material-specific chemistry factor value is 190.6°F (based on KNPP surveillance capsule data from capsules V, R, P, and S). Adjustment of this chemistry factor has been accomplished by multiplying by 1.18, the ratio of the best estimate chemistry factor for heat IP3571 to the chemistry factor for the Kewaunee surveillance weld. This results in an adjusted chemistry factor value of 224.9°F.

3) Neutron fluence (E > 1 MEV) projections through end of operating cycle 33. The neutron exposure projections utilized for calculation of the reference temperature were multiplied by a factor of 1.11 to adjust for biases observed between cycle specific calculations and the results of neutron dosimetry for the four surveillance capsules removed from the KNPP reactor. The factor of 1.11 was derived by taking the average of the measured to calculated (M/C) flux ratios obtained from the dosimetry results of capsules V, R, P, and S removed from the KNPP reactor vessel. The use of predicted fluence values through the end of operating cycle 33 was appropriately considered within the calculations in accordance with standard industry methodology previously docketed under WCAP-13227, "Evaluation of Pressurized Thermal Shock For Kewaunee," dated March 1992 and WCAP-14279, "Analysis of Capsule S from the Wisconsin Public Service Corporation Kewaunee Nuclear Plant Reactor Vessel Radiation Surveillance Program," dated March 1995.

Compliance with 10 CFR 50.61 is an acceptable approach for evaluating predictions of radiation embrittlement needed to implement Appendices G and H to 10 CFR Part 50. These limits meet the NRC acceptance criteria for the LTOP setpoint and system design as described in NRC Safety Evaluation Report (SER) to WPSC dated September 6, 1985 which concluded that "the spectrum of postulated pressure transients would be mitigated...such that the temperature pressure limits of Appendix G to 10 CFR 50 are maintained."

TS 3.1.a.1.C, TS 3.1.b.1.C, and TS 3.1.b.4 have been modified to incorporate a LTOP enabling temperature applicable to EOC 33 or 33.41 EFPY. The text of existing TS 3.1.b.1 has been modified to reflect the use of proposed Figure TS 3.1-4 through the end of operating cycle 33 or 33.41 effective full power years. Compliance with the revised enabling temperature and P/T limits of proposed Figure TS 3.1-4 assures prevention of non-ductile failure applicable to low temperature overpressurization events. Application of this curve is limited to the evaluation of LTOP events whenever one or more of the RCS cold leg temperatures are less than or equal to the LTOP enabling temperature of 355°F.

The use of Figures TS 3.1-1 and 3.1-2 is not changed. These curves are to be complied with during reactor coolant system heatup and cooldown evolutions.

Significant Hazards Determination for Proposed Changes to Section TS 3.1 and Figure TS 3.1-4

The proposed change was reviewed in accordance with the provisions of 10 CFR 50.92 to show no significant hazards exist. The proposed change will not:

1) Involve a significant increase in the probability or consequences of an accident previously evaluated.

   The LTOP setpoint, revised enabling temperature, and revised P/T limits reflected in proposed Figure TS 3.1-4 ensure that the Appendix G pressure/temperature limits are not exceeded, and therefore, help ensure that RCS integrity is maintained. The changes do not modify the reactor coolant system pressure boundary, nor make any physical changes to the facility design, material, construction standards, or setpoints. The LTOP valve setpoint remains at ≤500 psig. The LTOP enabling temperature based on Figure TS 3.1-4 is 355°F and is consistent with BTP RSB 5-2 guidance of RT_{NDT} + 90°F. The revised enabling temperature is greater than the 338°F value in the current TS. A higher enabling temperature ensures that the LTOP system is available for the prevention of non-ductile failure over a larger operating window. The probability of a LTOP event occurring is independent of the pressure-temperature limits for the RCS pressure boundary and enabling temperature. Therefore, the probability of a LTOP event is not increased.

   The calculation of pressure temperature limits in accordance with approved regulatory methods provides assurance that reactor pressure vessel fracture toughness requirements are met and the integrity of the RCS pressure boundary is maintained. Similar methodology was used in calculations to support approved amendment 120 to the Kewaunee Technical Specifications dated April 26, 1995. The material property bases, including chemistry factor, initial reference temperature for the unirradiated material (RT_{NDT}), and margin terms, used for this PA are more conservative than that used in the current TS.

   The PT limits reflected in proposed Figure TS 3.1-4 are based on the following criteria:

   a) An initial RT_{NDT} value of -56°F. Drop weight testing of Kewaunee surveillance material was performed by the Westinghouse Electric Corporation and documented in WCAP 14042, Revision 1, dated January 1995 with a resultant initial RT_{NDT} of -50°F. Testing of sister plant surveillance material resulted in an initial RT_{NDT} of -30°F. The mean value for all Linde 1092 weld heats is -50.7°F. Therefore, use of the generic value of -56°F (for welds made with Linde 1092 flux) with a larger margin term was deemed conservative and acceptable for this evaluation.

b) Paragraph (c)(2)(ii)(A) of 10 CFR 50.61. Paragraph (c)(2)(ii)(A) of 10 CFR 50.61 requires that licensees determine a material-specific value of chemistry factor when the surveillance data is deemed credible according to the criteria of paragraph (c)(2)(I) of 10 CFR 50.61. Reference 3 documents WPSC's evaluation which concludes that the KNPP surveillance capsule data satisfy the credibility criteria. The calculated material-specific chemistry factor value is 190.6°F (based on KNPP surveillance capsule data from capsules V, R, P, and S). Adjustment of this chemistry factor has been accomplished by multiplying by 1.18, the ratio of the best estimate chemistry factor for heat IP3571 to the chemistry factor for the Kewaunee surveillance weld. This results in a chemistry factor value of 224.9°F.

c) Neutron fluence (E>1 MeV) projections through end of operating cycle 33. The use of predicted fluence values through the end of operating cycle 33 is appropriately considered within the calculations in accordance with standard industry methodology previously docketed under WCAP 13227 and WCAP 14279. The neutron exposure projections utilized for calculation of the reference temperature were multiplied by a factor of 1.11 to adjust for biases observed between cycle specific calculations and the results of neutron dosimetry for the four surveillance capsules removed from the KNPP reactor. The factor of 1.11 was derived by taking the average of the measured to calculation (M/C) flux ratios obtained from the dosimetry results of capsules V, R, P, and S removed from the KNPP reactor vessel. The resulting effect of using predicted fluence values through the end of cycle 33 instead of cycle 21 is to require the evaluation of LTOP transients to more limiting requirements.

Additional conservatism from a more conservative material property basis and higher projected fluence values is readily illustrated by the increase in magnitude of EOC $RT_{NDT1/4T}$ from 212.94°F (derived from the material property basis used in the current TS) to 264.46°F used for this PA. The proposed PT limits are shifted to a lower pressure and higher temperature, which is more conservative.

The changes do not adversely affect the integrity of the RCS such that its function in the control of radiological consequences is affected. In addition, the changes do not affect any fission barrier. The changes do not degrade or prevent the response of the LTOP relief valve or other safety-related systems to previously evaluated accidents. In addition, the changes do not alter any assumption previously made in the radiological consequence evaluations nor affect the mitigation of the radiological consequences of an accident previously evaluated. Therefore, the consequences of an accident previously evaluated will not be increased.

Thus, operation of KNPP in accordance with the PA does not involve a significant increase in the probability or consequences of any accident previously evaluated.

2) Create the possibility of a new or different type of accident from an accident previously evaluated.

The enabling temperature and Appendix G pressure temperature limitations were prepared using methods derived from the ASME Boiler and Pressure Vessel Code and the criteria set forth in NRC Regulatory Standard Review Plan 5.3.2. The changes do not cause the initiation of any accident nor create any new credible limiting failure for safety-related systems and components. The changes do not result in any event previously deemed incredible being made credible. As such, it does not create the possibility of an accident different than previously evaluated.

The changes do not have any adverse effect on the ability of the safety-related systems to perform their intended safety functions. Since the enabling temperature is higher, the LTOP system is available for prevention of non-ductile failure over a wider operating window. The new LTOP operating window (i.e., ≤355°F) is within the existing operating band for the residual heat removal system; operating procedures allow the LTOP system to be placed into service at <400°F. The proposed changes do not make physical changes to the plant or create new failure modes. Therefore, it will not create the possibility of a malfunction of equipment important to safety different than previously evaluated. Thus, the PA does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The use of Paragraph (c)(2)(ii)(A) of 10 CFR 50.61, chemistry factor ratio of 1.18, initial reference temperature of -56°F, and fluence values through EOC 33 does not modify the reactor coolant system pressure boundary, nor make any physical changes to the LTOP setpoint or system design. Proposed Figure T.S 3.1-4 was prepared in accordance with regulatory requirements and requires evaluation of LTOP events to the more conservative material property basis and more limiting requirements of neutron exposure projections of 33.41 EFPY instead of 18.40 EFPY.

Therefore, the PA does not create the possibility of a new or different type of accident from an accident previously evaluated.

3) Involve a significant reduction in the margin of safety.

The Appendix G pressure temperature limitations were prepared using methods derived from the ASME Boiler and Pressure Vessel Code and the criteria set forth in NRC Regulatory Standard Review Plan 5.3.2. These documents along with the calculational limitations specified in 10 CFR 50.61 are an acceptable method for implementing the requirements of 10 CFR 50 Appendices G and H. Inherent conservatism in the P/T limits resulting from these documents include:

a. An assumed defect in the reactor vessel wall with a depth equal to 1/4 of the thickness of the vessel wall (1/4T) and a length equal to 1-1/2 times the thickness of the vessel wall.

b. Assumed reference flaw oriented in both longitudinal and circumferential directions and limiting material property. At KNPP, the only weld in the core region is oriented in the circumferential direction.

c. A factor of safety of 2 is applied to the membrane stress intensity factor.

d. The limiting toughness is based upon a reference value (K_{IR}) which is a lower bound on the dynamic crack initiation or arrest toughness.

e. A 2-sigma margin term is applied in determining the adjusted reference temperature (ART) that is used to calculate the limiting toughness.

Similar methodology was used in calculations to support approved amendment 120 dated April 26, 1995. Beyond the conservatism described above, WPSC has incorporated the following additional margin in preparing this PA:

a. The reactor coolant pump starting restrictions of TS 3.1.a.1.c reflect the more limiting LTOP enabling temperature of 355°F consistent with the design basis for the LTOP system.

b. The LTOP enabling temperature based on Figure TS 3.1-4 is 355°F and is more conservative than the 338°F value in the current TS.

c. The calculated material-specific chemistry factor value of 190.6°F (based upon KNPP surveillance capsule data from capsules V, R, P, and S) has been multiplied by 1.18 yielding an adjusted chemistry factor value of 224.9°F to account for chemical composition differences between the best estimate value for weld heat IP3571 and the Kewaunee surveillance weld material.

d. The neutron exposure projections were multiplied by a factor of 1.11 to adjust for biases observed between cycle specific calculations and the results of neutron dosimetry for the four surveillance capsules removed from the KNPP reactor. The factor of 1.11 was derived by taking the average of the measured to calculation (M/C) flux ratios obtained from the dosimetry results of capsules V, R, P, and S removed from the KNPP reactor vessel.

Additional conservatisms beyond that described above but not used in development of the proposed TS and Figure include:

a) A 2 inch diameter spring loaded safety valve set at 480 psig located in the LTOP system. At 500 psig, the LTOP relief valve setpoint, the relieving capacity of this smaller valve is 230 gpm.

b) The actual LTOP relief valve capacity is at least 10% greater than the capacity used in the design and setpoint analyses. This is in accordance with the requirements of Section III NC-7000.

c) Assumptions in the overpressure transient analyses are conservative relative to the actual Kewaunee reactor coolant system (RCS) and operating practices:

1. The RCS was assumed to be rigid with respect to metal expansion.

2. No credit was taken for the shrinkage effect caused by low temperature safety injection water added to higher temperature reactor coolant.

3. No credit was taken for the reduction in reactor coolant bulk modulus at RCS temperatures above 100°F (constant bulk modulus at all RCS temperatures).

4. The entire volume of water of the steam generator secondary was assumed available for heat transfer to the primary. In reality, the liquid immediately adjacent and above the tube bundle would be the primary source of energy in the transient.

5. The overall steam generator heat transfer coefficient, U, was assumed to be the free convective heat transfer coefficient of the secondary, h_{sec}. The forced convective heat transfer coefficient of the primary, h_{pri} and the tube metal resistance have been ignored thus resulting in a conservative (high) coefficient.

6. The reactor coolant pump start time assumed in the heat input analysis was 9-10 seconds; whereas, the Kewaunee pump startup time is 25-30 seconds.

An alternative methodology to the safety margins required by Appendix G to 10CFR Part 50 has been developed by the ASME Working Group on Operating Plant Criteria. This methodology is contained in ASME Code Case N-514. The Code Case N-514 provides criteria to determine pressure limits during LTOP events that avoid certain unnecessary operational restrictions, provide adequate margins against failure of the reactor pressure vessel, and reduce the potential for unnecessary activation of the relief valve used for LTOP. Specifically, the ASME Code Case N-514 allows determination of the setpoint for LTOP events such that the maximum pressure in the vessel would not exceed 110% of the P/T limits of the existing ASME Appendix G; and redefines the enabling temperature at a coolant temperature less than 200°F or a reactor vessel metal temperature less than RT_{NDT} + 50°F, whichever is greater. Code Case N-514, "Low Temperature Overpressure Protection," has been approved by the ASME Code Committee but not yet approved for use in Regulatory Guide 1.147. The content of this code case has been incorporated into Appendix G of Section XI of the ASME Code and published in the 1993 Addenda to Section XI. It is expected that the next revision of 10 CFR 50.55a will endorse the 1993 Addenda and Appendix G of Section XI. As stated above, this PA uses Appendix G limits and an enabling temperature corresponding to a reactor vessel metal temperature less than RT_{NDT} + 90°F, which is more conservative than the alternative methodology contained in Code Case N-514.

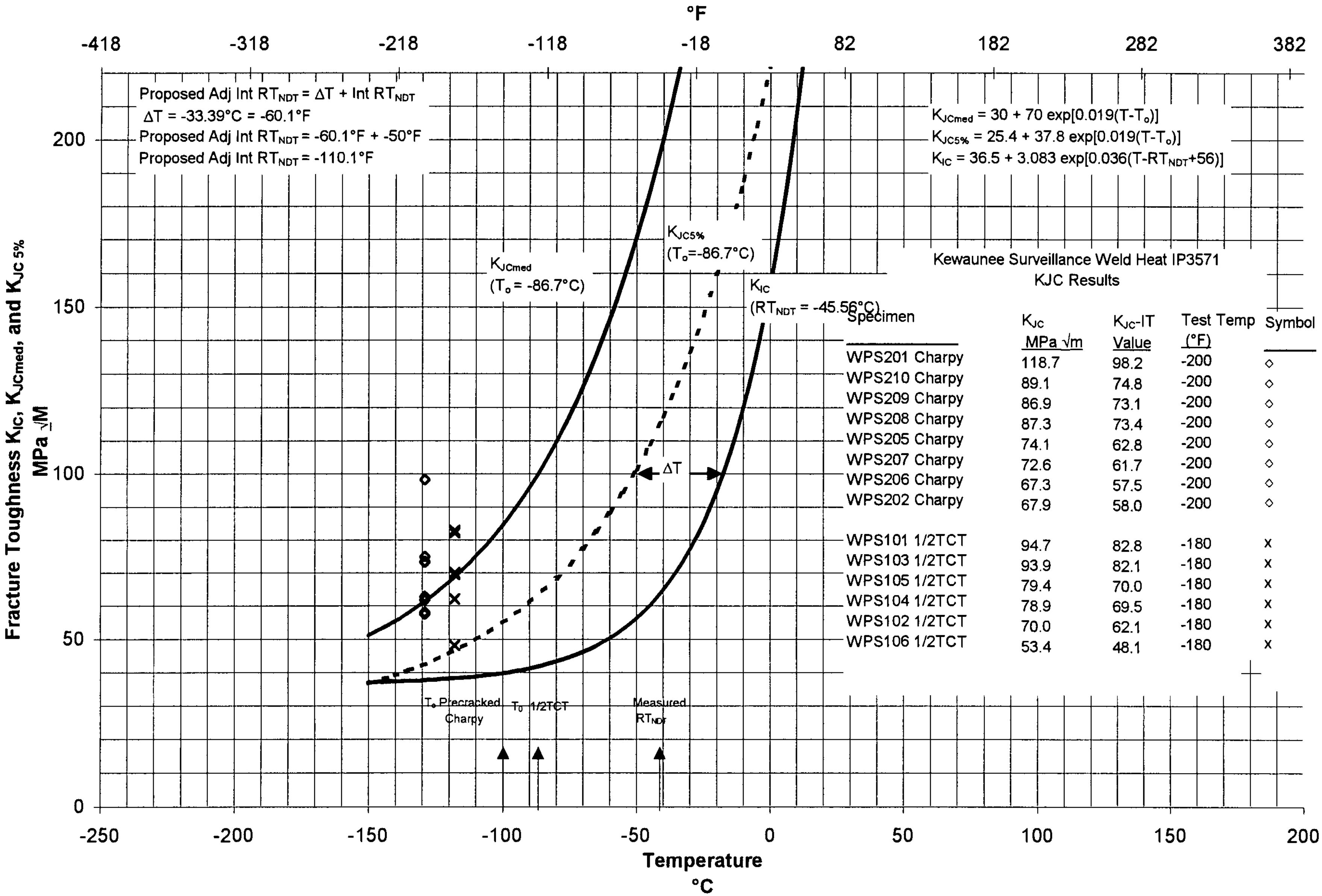
The revised calculations meet the NRC acceptance criteria for the LTOP setpoint and system design as described in NRC Safety Evaluation Report (SER) dated September 6, 1985 which concluded that "the spectrum of postulated pressure transients would be mitigated...such that the temperature pressure limits of Appendix G to 10 CFR 50 are maintained."

Use of the methodology set forth in the ASME Boiler and Pressure Vessel Code, NRC Regulatory Standard Review Plan 5.3.2., 10 CFR 50.61, and 10 CFR 50 Appendices G and H with the above additional margins ensures that proper limits and safety factors are maintained. Thus, the PA does not involve a significant reduction in the margin of safety.

Environmental Considerations

This PA involves a change to a requirement with respect to the use of a facility component located within the restricted area, as defined in 10 CFR Part 20. WPSC has determined that the PA involves no significant hazards considerations and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. Accordingly, this PA 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 this PA.

Figure 1



Specimen	K_{JC} MPa √m	K_{JC}-IT Value	Test Temp (°F)	Symbol
WPS201 Charpy	118.7	98.2	-200	◇
WPS210 Charpy	89.1	74.8	-200	◇
WPS209 Charpy	86.9	73.1	-200	◇
WPS208 Charpy	87.3	73.4	-200	◇
WPS205 Charpy	74.1	62.8	-200	◇
WPS207 Charpy	72.6	61.7	-200	◇
WPS206 Charpy	67.3	57.5	-200	◇
WPS202 Charpy	67.9	58.0	-200	◇
WPS101 1/2TCT	94.7	82.8	-180	x
WPS103 1/2TCT	93.9	82.1	-180	x
WPS105 1/2TCT	79.4	70.0	-180	x
WPS104 1/2TCT	78.9	69.5	-180	x
WPS102 1/2TCT	70.0	62.1	-180	x
WPS106 1/2TCT	53.4	48.1	-180	x