October 7, 2003

Mr. Thomas Coutu
Site Vice President
Kewaunee Nuclear Power Plant
Nuclear Management Company, LLC
N490 State Highway 42
Kewaunee, WI 54216

SUBJECT: KEWAUNEE NUCLEAR POWER PLANT - REQUEST FOR ADDITIONAL INFORMATION FOR PROPOSED AMENDMENT REQUEST REGARDING THE APPLICATION FOR STRETCH POWER UPRATE (TAC NO. MB9031)

By letter dated May 22, 2003, the Nuclear Management Company, LLC (NMC or the licensee) submitted a request for a proposed amendment to revise the Kewaunee Nuclear Power Plant Facility Operating License and Technical Specifications to increase the licensed reactor core power level by 6 percent from 1673 megawatts thermal (MWt) to 1772 MWt.

The Nuclear Regulatory Commission staff has reviewed the May 22, 2003, application and finds that the additional information identified in the enclosure is needed.

The information in the enclosure was provided in parts, to Mr. G. Riste (NMC), by e-mails on July 7, 21, August 12 (2 e-mails), 13, 14, 25, September 12, 26, and 29, 2003.

A phone call was held between G. Riste (NMC) and myself on October 2, 2003, to ensure that NRC staff and NMC staff had a common understanding of the information being requested. The phone call established a mutually agreeable response date of November 5, 2003.

Please contact me at (301) 415-1446 if future circumstances should require a change in this response date.

Sincerely,

/RA/

John G. Lamb, Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-305

Enclosure: Request for Additional Information

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION (RAI)

REGARDING PROPOSED STRETCH POWER UPRATE AMENDMENT

KEWAUNEE NUCLEAR POWER PLANT (KNPP)

DOCKET NO. 50-305

Materials & Chemical Engineering Branch (EMCB) - Piping Integrity and Nondestructive Examination Section

Increased power increases the potential for materials degradation of nuclear steam supply system (NSSS)/balance of plant (BOP) piping. With respect to this issue provide the following information:

1) Please discuss the determination made for service adequacy of the materials in the NSSS/BOP piping with increased temperature and pressure due to the power uprate.

2) Please discuss the determination made for service adequacy of the materials in the control rod drive mechanisms taking into consideration Bulletins 2002-01 and 2002-02.

EMCB - Steam Generator (SG) Integrity & Chemical Engineering Section

3) In Section 5.7.10, "Tube Repair Limits (Regulatory Guide 1.121 Analysis)" of Attachment 4 to the application, the licensee indicates that an analysis has been performed to define the structural limits for an assumed uniform thinning in both the axial and circumferential directions. Calculations have also been performed to establish the structural limit for tube straight leg (free span) flaws over an unlimited axial extent and for degradation over limited axial extent at the tube support plate and anti-vibration bar intersections. The licensee does not conclude whether the SG tube repair limits in the technical specifications are still acceptable given the results of the calculation discussed above. Therefore, the staff requests the licensee state and explain whether the current repair limits in the technical specifications remain appropriate for operation under the 6 percent uprated power conditions.

Plant Systems (SPLB) - Fire Protection

4) Although the license amendment request includes a discussion of impact on the ability to reach cold shutdown, the license amendment request does not include any discussion regarding changes to the fire protection (FP) program or other operating conditions that may adversely impact the post-fire safe shutdown capability in accordance with Appendix R. Clarify whether this license amendment request involves changes to the FP program or other operating conditions that may adversely impact the post-fire safe shutdown capability in accordance with Appendix R. Provide the technical justification for changes.

ENCLOSURE

Electrical & Instrumentation and Controls Branch (EEIB) - Electrical Engineering Section

5) Provide details about the grid stability analysis including assumptions, results, and conclusions for the stretch power uprated condition.

6) Provide in detail the effects of the stretch power uprate on the station blackout coping capability. The evaluation should address the capacities of the condensate storage tank, turbine driven auxiliary feedwater pump, station batteries, and backup air supplies for air operated valves for decay heat removal and RCS cooldown during the time period of an SBO.

7) With the stretch power uprate, the megavolt-amperes reactive (MVARS) supplied by the main generator (MG) is reduced which affects the voltages at the plant. Explain the effects on the voltage at the plant and how this affects plant equipment. Explain how you will ensure proper voltages.

8) The licensee stated the following:

> “The Main Transformer (MT) is not capable of supporting station operation at full power uprate conditions with the main generator operating in the leading mode with the hotel load supplied by the Reserve Auxiliary Transformer (RAT). Under this operational scenario, the maximum amount of Reactive Power that can be accepted, measured at the MT secondary, is limited to 262 MVARS. Under these power uprate conditions, the MT operates within its 65°C rating.”

Explain the operation of the MT describing what loads it is supplying during startup, shutdown, and normal operation. Explain the operation of the RAT describing what loads it is supplying during startup, shutdown, and normal operation. Explain the interrelation between the MT and the RAT. Explain in detail the effects on operation and equipment if you operate in the leading mode greater than 262 MVARS. Explain in detail how you will control plant operation so you will never exceed the limit of 262 MVARS in the leading mode. Explain in detail any other limitations.

9) The licensee stated the following:

> “The MT has limited capability to support power uprate with the main generator operating in leading mode and the hotel load supplied from the RAT. Uprate generator operation in the underexcited region, when the hotel load is supplied from the Tertiary Auxiliary Transfomer (TAT) and the RAT, reactive load will be limited to 250 MVAR or less in order to avoid overloading the MT at the 65°C rating.”

Explain the operation of the TAT describing what loads it is supplying during startup, shutdown, and normal operation. Explain the interrelation between the MT, the RAT, and TAT. Explain in detail the effects on operation and equipment if you operate in the leading mode greater than 250 MVARS. Explain in detail how you will control plant operation so you will never exceed the limit of 250 MVARS in the leading mode. Explain in detail any other limitations.

10) The licensee stated that the reactor coolant pumps (RCP) and feedwater (FW) pumps voltages are within the operational limits of NEMA MG-1. Explain the effects of operating the RCPs and FW pump motors within the operational limits of NEMA MG-1. Justify the acceptable operation of the RCPs and FW pump motors within the operational limits of NEMA MG-1. Describe your intended operation of the RCPs and FW pump motors with respect to the stretch power uprate. If you intend to operate the RCPs and FW pump motors with reduced voltage grid conditions under the stretch power uprate conditions, please justify the acceptable operation.

11) Explain in detail why transient conditions are not considered for medium-voltage level.

12) The licensee stated the following:

> "All motors are bounded by their value, with the exception of the FW pump motors that are fed from bus 1-1 and 1-2, and the condensate pump motors that are fed by bus 1-3 and 1-4. The table shows that the loading for buses for 1-3 and 1-4 in the existing load flow analysis bound the bus loading for the station at power uprate. However, the existing analysis does not bound bus 1-1 and 1-2, the large motor buses."

Are the condensate pump motors that are fed by bus 1-3 and 1-4 bounded by the existing load flow analysis? If not, justify the acceptable operation of the condensate pump motors under stretch power uprate conditions. Explain the justification to operate bus 1-1 and 1-2 at stretch power uprate conditions when it is not bounded by the existing analysis. Justify the operation of the FW pump motors that are fed from bus 1-1 and 1-2 under stretch power uprate conditions. Provide the load flow analysis for bus 1-1 and 1-2 demonstrating acceptable results under the stretch power uprate conditions.

13) The licensee stated the following:

> "Based on the equipment ratings and the calculated fault currents for the current plant condition, the fault current available, non-safety medium voltage buses 1-1 through 1-4 and their associated circuit breakers are overdutied. This condition was previously evaluated and found acceptable."

Explain the effects on buses 1-1 through 1-4 and their associated circuit breakers if they are overdutied. Explain in detail the justification for this overdutied condition and the acceptance criteria used. Please provide the evaluation that found the overdutied condition acceptable.

14) The licensee stated the following:

> "The station has a spare RAT. The spare, when installed, provides increased fault current. With the spare RAT installed, buses 1-1 and 1-2 are enveloped by the normal case. Buses 1-3 and 1-4 are not enveloped by the normal case. Buses 1-5 and 1-6 are overdutied with the spare RAT feeding the buses. This condition of increased fault current availability was addressed in the fault current analysis that indicates the spare RAT should not be installed "without some

provision for reducing fault current on its low-voltage side"."

Do you plan to operate with the spare RAT feeding the buses under the stretch power uprate? If so, justify the acceptable operation of buses 1-5 and 1-6 in an overdutied condition and explain the provisions for reducing fault current on the spare RAT's low-voltage side. Explain your intended operation under the stretch power uprate.

15) The licensee stated the following:

> "The increased load resulting from the increased motor loads on buses 1-1 through 1-4 will reduce bus voltage from its current operating value at power uprate. This reduction in the actual pre-fault voltage will result in a decrease in fault current available at the power uprate condition with respect to the current operating point."

Explain the relationship between the startup current and voltages at the stretch power uprate conditions. Explain the relationship between the fault currents and fault voltages at the stretch power uprate conditions. Justify the acceptable operation at the stretch power uprate condition with respect to the reduction in the actual pre-fault voltage and the decrease in the fault current available.

16) The licensee stated that the RCPs, FW pumps and condensate pumps will operate above rating. Explain operation above rated horsepower and its impact in motor overheating and degradation of the windings. Provide justification for operating the RCPs, FW pumps and condensate pumps above rating. Also, explain how the relay operation is affected and justify its acceptable operation.

17) The licensee stated the following:

> "The EQ equipment inside containment will be evaluated to demonstrate the affected equipment is qualified for the EQ long-term temperature."

Provide evaluations that demonstrate the affected equipment is qualified for the EQ long-term temperature.

18) The licensee stated the following:

> "For those components where the thermal lag temperatures exceeded the equipment qualification temperature, the EQ equipment required for HELB outside containment will be evaluated to demonstrate the affected equipment is qualified for the EQ thermal lag temperatures."

Provide evaluations that demonstrate the EQ equipment required for HELB outside containment is qualified for the EQ thermal lag temperatures.

<u>Reactor Systems Branch</u>

REFERENCES: 1. Letter from T. Coutu, Nuclear Management Company, LLC (NMC), to USNRC, "License Amendment Request 195, Application For Stretch Power Uprate For Kewaunee Nuclear Power Plant," Docket No. 50-305, License No. DPR-43, dated May 22, 2003.

2. Letter from T. Coutu, Nuclear Management Company, LLC (NMC), to USNRC, "NMC Responses to NRC Request for Additional Information Concerning License Amendment Request No. 187 to the Kewaunee Nuclear Power Plant Technical Specifications (TAC No. MB5718)," Docket No. 50-305, License No. DPR-43, dated February 27, 2003.

19) The licensee's submittal (Reference 1) states that the FW control valves were modified to accommodate higher feedwater flow rates. Was this modification and the higher feedwater flow considered in the updated safety analysis report (USAR) Chapter 14 accident and transient analyses reviewed by the staff in the Reload Transition Safety Report (RTSR) for KNPP License Amendment Request (LAR) No. 187? Provide technical justification if not considered.

20) Section 2.2 of the licensee's submittal letter (Reference 1) provides a general discussion of the Loss of Normal Feedwater Analysis performed to support the stretch power uprate. Based on this reanalysis, the licensee must implement new technical specification (TS) requirements for auxiliary feedwater (AFW) train operability. Because AFW is relied upon to mitigate other Chapter 14 accidents and transients, please discuss the impacts that the proposed AFW TS change will have on any other potentially effected USAR Chapter 14 events.

21) The licensee's submittal letter (Reference 1) states that the full power ΔT_0 inputs to the overtemperature delta T and the overpower delta T setpoints will be changed to the predicted values based on best estimate evaluations for the stretch uprated power (1772 MWt) condition.

a. Please provide a more specific discussion regarding the actual changes being made. Include the exact changes being made.

b. Provide a reference or discuss the methodology used to determine the predicted values.

c. Identify those USAR Chapter 14 transients which credit these trips and discuss how the proposed change impacts the analyses. Discuss the impacts on specific acceptance criteria for these events.

d. Does this proposed TS change invalidate the USAR Chapter 14 analyses as reviewed by the staff in the RTSR for KNPP LAR No. 187?

22) The licensee proposes to change the TS 2.1.c safety limit for peak fuel centerline temperature from $< 4700\ ^\circ F$ to $< 5080\ ^\circ F$ (and decreasing by $58\ ^\circ F$ per 10,000 MWD/MTU of burnup). Please provide a Reference to the Nuclear Regulatory Commission (NRC) approval (i.e., topical report safety evaluation report) for this proposed limit and provide the technical justification for its application to KNPP and

Framatome fuel. Are any adjustments to the proposed safety limit necessary to account for burnable poisons? If so, provide the values for the adjustment necessary and the technical basis for the values.

23) The licensee proposes to change TS 2.3.a.3.A wording for f(ΔI) from "An even function" to "A function" and states that this is an editorial change. Please discuss why the TS is currently worded as "an even function" and provide justification for the proposed wording change.

24) Commitment No. 1 of the licensee's submittal letter (Reference 1) states that an evaluation of the thermal and hydraulic safety analyses for the Framatome aircraft nuclear propulsion (ANP) fuel demonstrates that the departure from nucleate boiling ratio (DNBR) design basis is met for the Framatome fuel in Cycle 26, and the licensee commits to revise and update all documents for the stretch power uprate to address Framatome fuel DNBR design basis.

    a. Please list the documents for which this commitment applies.

    b. During the review of KNPP LAR No. 187 (Westinghouse 422 Vantage+ fuel transition), the staff requested that the licensee provide Framatome/ANP Non-loss-of-coolant accident (non-LOCA) transient and accident analyses discussions and results (Reference 2, Attachment 3 Request for Additional Information (RAI), Question 29). The licensee's response stated that for the current and management update and retrieval mockup reactor uprate power levels, adequate DNBR margin will exist for the Framatome/ANP fuel. However, to support the stretch power uprate, the licensee stated that the existing DNBR margin is not adequate to offset the power increase effects. In response to the staff's RAI, the licensee stated that the thermal-hydraulic analyses for the Framatome ANP fuel will be generated during the reload safety evaluation process and will be documented in the Reload Safety Evaluation report and in the Stretch Power uprating submittal. Please provide this information.

25) Reference 1, Attachment 4, Section 2 discusses the NSSS parameter values used for the power uprate analysis.

    a. In determining the NSSS parameter values, the licensee considers Westinghouse 422V+ fuel only, and states that it is not appropriate to consider any transition core effects. Because the upcoming cycle consists of the first 422V+ transition core, please provide the technical basis for this statement.

    b. Table 2.1-1 provides a listing of the NSSS parameter values used in the power uprate analyses. The values used appear to be consistent with those used in the 422V+ fuel transition amendment (RTSR). However, the licensee states in Section 2.1.2 that the T_{AVG} range was narrowed slightly from the previous range, and the NSSS and reactor power are not bounded by the values used in the RTSR analyses. Please clarify this inconsistency and verify that the USAR Chapter 14 transients and accidents as reviewed by the staff for the RTSR remain bounding for the stretch power uprate.

26) Reference 1, Attachment 4, Section 5.2.5.3, addresses core bypass flow. The licensee determined that the current core bypass flow limit of 7.0 percent of total vessel flow can be maintained at the uprated power conditions. Please discuss the methodology used to reach this conclusion.

27) Reference 1, Attachment 4, Section 5.3, “Fuel Assemblies” addresses structural integrity of the Westinghouse 422V+ fuel assemblies and concludes that adequate grid load margin exists such that core coolable geometry and control rod insertion requirements are satisfied. The staff requested additional information regarding this aspect as part of the fuel transition amendment request (Reference 2, Attachment 3 RAI’s, Question 13) and the issue was resolved in the KNPP letter to the staff dated April 2, 2003 (Letter No. NRC-03-037). Are the conclusions reached in Section 5.3 based on the same analyses and consistent with those described in NMC Letter No. NRC-03-037? Please provide clarification.

28) Reference 1, Attachment 4, Section 6.2.2, discusses the anticipated transients without scram (ATWS) analyses performed to support the stretch power uprate.

a. Please discuss which power levels and moderator temperature coefficient (MTC) values were analyzed, and which produced the limiting results for both the reactor coolant system (RCS) pressure and SG pressure cases.

b. Please list the analytical codes and methods used for the ATWS analyses. Provide technical justification if not consistent with those listed in KNPP USAR Section 14.1.11.

c. Please discuss the analysis assumptions with regard to the physical plant configuration. For example, did the analyses consider SG tube plugging, and what levels? How many power-operated relief valves were assumed to be available? What level of AFW was assumed available? Was any control rod insertion credited? Provide this discussion for both the RCS Pressure and SG Pressure cases.

d. It appears that the licensee reanalyzed the loss of normal feedwater flow ATWS event only. Is this the limiting ATWS event for KNPP for both RCS pressure and SG pressure?

e. The licensee’s core operating limit report (COLR) contains a requirement that, “The reactor will have a MTC no less negative than -8 pcm/°F for 95 percent of the cycle time at full power.” Please discuss the administrative controls in place that ensure this operational requirement is satisfied. Also, what controls are in place to ensure this requirement in the COLR is not changed and the basis for the ATWS rule is preserved?

29) Reference 1, Attachment 4, Section 7.1 discusses the core thermal-hydraulic design. To accommodate the stretch power uprate conditions, the licensee modified certain aspects of the DNBR margin calculations.

a. The RTSR analyses included a 2.6 percent rod bow DNBR penalty. For the stretch uprate, the licensee reduces the rod bow penalty from 2.6 percent to 0 percent for Cycle 26 by evaluating the $F_{\Delta H}$ burndown DNBR credit during the entire cycle. Please provide the technical justification for this change in the rod bow penalty. Include descriptions of the $F_{\Delta H}$ burndown DNBR credit and the analyses performed to quantify $F_{\Delta H}$ burndown DNBR credit, and provide a reference to the NRC-approved methodology applied. Also, provide the results of the analyses which demonstrate that the necessary rod bow penalty is offset by the $F_{\Delta H}$ burndown DNBR credit for Cycle 26.

b. The staff currently accepts that rod bow penalty be limited to fuel burnup of 24,000 MWD/MTU because of burndown effects. Is the approach being applied to eliminate or offset the 2.6 percent rod bow penalty, in essence, double accounting for this $F_{\Delta H}$ burndown DNBR credit? Please clarify.

c. Does the COLR need to be revised to reflect any changes in $F_{\Delta H}$?

d. The licensee calculated a transition core penalty of 2.5 percent for Cycle 26. Figure 4-5 of the licensee's RTSR submittal (Attachment 4, Westinghouse report) provided a figure of transition core penalty as a function of the amount of 422V+ fuel loaded in the core. RAI No. 24 of the RTSR LAR No. 187 questioned the linear relationship of this figure, and in their response, the licensee stated that an additional penalty was taken to account for variance in the curve fitting and that the results will be presented in the stretch uprate submittal. Please provide a corresponding figure to Figure 4-5 of the RTSR submittal which incorporates the additional transition core configurations evaluated for the stretch power uprate to justify a 2.5 percent transition core penalty. Provide the fraction of 422V+ fuel assemblies to be loaded in the KNPP core for each transition operating cycle.

e. The licensee is reducing the design limit DNBR value from 1.24 to 1.23 by taking into account the latest calculated instrumentation uncertainties, and references WCAP-15591, Revision 1. This same WCAP and revision were used for the RTSR (LAR No. 187) analyses to calculate a 1.24 design limit. Please provide clarification regarding the latest uncertainties and that these latest uncertainties were not already credited in the RTSR limit of 1.24.

f. Note 1 of Table 7.1-2 states that enough DNBR margin was retained to cover rod bow, instrumentation bias and transition core penalties for the W-3 DNBR correlation. Please provide a corresponding DNBR margin summary table for the W-3 correlation.

30) Reference 1, Attachment 4, Section 7.3 discusses fuel rod design and performance. In this section, the licensee states that pending approval of Addendum 1 to WCAP-10125 by the NRC, subsequent re-evaluation of the stress values will be performed to confirm the proposed clad stress criterion is met. Please verify that this evaluation was performed and documented in a letter dated March 21, 2003 (letter no. NRC-03-032), and that the conclusions remain valid for the stretch power uprate conditions.

31) In Table 5.1-3 of the submittal the peak vessel fluence for 33 effective full-power years of operation are listed as $3.56x10^{19}$ n/cm^2 vs $3.34x10^{19}$ n/cm^2 in WCAP-14279 Rev. 1. Apparently, the $3.34x10^{19}$ n/cm^2 was derived from the $3.49x10^{19}$ n/cm^2 value in WCAP-14279. It seems that the $3.56x10^{19}$ n/cm^2 value was derived from WCAP-14279 Rev. 1 by rationing for the uprate. However, the original value seems to have been derived using the FERRET code which has not been approved. Please justify the use of the $3.56x10^{19}$ n/cm^2 value.

32) Please provide copies of References 14 - 17 (Page 6-8, WCAP-8339, WCAP-8471-P-A, WCAP-8471-A, NSID-TB-86-08, and CLC-NS-309)

33) Please provide justification for assuming a saturation pressure of 35 psia in boric acid accumulation calculations in light of the anticipated behavior of long-term containment pressure.

34) Is it possible for some small-break LOCA sequences to cause a loss of natural circulation in the RCS for an extended time so that boric acid is accumulating in the core? Please address the question from the viewpoint of two cases: (1) with an RCS pressure higher than the residual heat removal (RHR) shutoff head pressure; and (2) with an RCS pressure lower than the RHR shutoff head pressure.

35) This question was deleted since it was a repeat of Question Number 6 regarding Station Blackout.

36) To support the results of the loss of normal feedwater transient, please provide the following:

a. Transient curves of AFW flow rate and SG water level.

b. Discuss the need for time delay of AFW flow to SGs while the plant is operated below 15 percent rated power.

c. The results of a loss of normal feedwater transient which maximizes the RCS peak pressure.

d. The results of a loss of normal feedwater transient assuming that the AFW flow is delivered within one minute following the event to show the effect of overcooling at the beginning of the transient.

e. Discuss the provisions made in plant emergency operating procedures (EOPs) for controlling AFW at the beginning of the event to prevent excess cooldown during this event.

f. Discuss the mechanism of turning around the peak RCS pressure prior to the AFW flow delivering to SGs.

g. Since a loss of normal feedwater transient require AFW flow from two pumps, explain why other heat up transients and/or a SBLOCA are not effected.

37) Provide the basis for assuming an initial pressurizer water level at 48 percent of span. Do TS at KNPP support this assumption?

38) The proposed TS 3.4-3 will permit the following changes to the AFW system when plant is operated at a power level below 15 percent of rated power: (a) AFW pump control switches located in the control room may be placed in the “pull out” position, (b) valves AFW-2A and AFW-2B may be in a throttled or closed position, and (c) valves AFW-10A and AFW-10B may be in the closed position. Please provide a discussion on this plant operational configuration relative to compliance with the ATWS rule in 10 CFR 50.62.

39) The proposed change to the TS basis (on page TS B3.4-3) indicates that a main steamline break (MSLB) accident as well as a loss of normal feedwater transient at 1772 MWt would require AFW flow from two AFW pumps. Please explain the reason why the existing MSLB analysis (assuming only one AFW pump feeding SGs) are still valid at KNPP at the power uprate conditions.

40) Provide the results of a steam generator tube rupture (SGTR) thermal-hydraulic analysis using the event scenario consistent with EOPs. Assuming concurrent loss of offsite power and a stuck atmospheric dump valve (ADV) at the failed SG. Provide transient curves of primary and secondary system pressures and temperature, AFW flow rate, SG water levels, primary leak-rate, steam release rate from the SG safety valves and ADVs, etc. This information is needed to confirm that the estimated release of contaminated steam is conservative for the staff assessment of the radiological consequences.

41) Provide the results of a SGTR thermal-hydraulic analysis to demonstrate that the SG will not be overfilled by AFW flow during this event.

42) Please provide a tabulation of all computer codes and methodologies used in the re-analyses including staff approval status, conditions and limitations, and how the conditions and limitations are satisfied for application at KNPP.

43) Provide a tabulation of the thermal design parameters compare to values assumed in safety analyses to demonstrate that proper conservativeness are available for the safety analyses assumptions.

44) Describe changes of NSSS design transients for KNPP operating at 1772 MWt.

Probabilistic Safety Assessment Branch - Heating, Ventilation, and Air Conditioning (HVAC)

45) Provide additional information regarding the potential impact of the stretch power uprate (SPU) on those HVAC systems discussed in the Standard Review Plan sections 6.4, 6.5.1, 9.4.1, 9.4.2 and 9.4.5. This should include a discussion of the impact, if any,

during both normal and post-accident operations resulting from increases in heat loads due to SPU and the bases for your determination of system acceptability post-SPU.

Plant Systems - BOP

46) Regulatory Application: Please provide a discussion of the regulatory bases that are applicable to the power uprate request for the ultimate heat sink.

47) Ultimate Heat Sink

(a) From the standpoint of the proposed power uprate, provide a full description and details of the ultimate heat sink capability for KNPP.

(b) Confirm that the existing design-basis ultimate heat sink temperature limit remains valid based on post licensing data trends (e.g., air and water temperatures, wind speed, water volume).

48) In reference to the spent fuel pool cooling system (Attachment 4, Section 8.3.8), please explain how you meet the following for the power uprate:

a. Demonstrate adequate SFP cooling capacity by either performing a bounding evaluation or committing to a method of performing outage-specific evaluations.

b. If a bounding calculation was performed, demonstrate adequate SFP cooling capacity for two scenarios: (1) full cooling capability and (2) a single-failure of an active cooling system component.

c. For full cooling capability evaluation, demonstrate that the following analysis conditions are met: (1) decay heat load is calculated based on bounding estimates of offload size, decay time, power history, and inventory of previously discharged assemblies; (2) heat removal capability is based on bounding estimates of ultimate heat sink temperature, cooling system flow rates, and heat exchanger performance (e.g., fouling and tube plugging margin); (3) alternate heat removal paths (e.g., evaporative cooling) must be appropriately validated and based on bounding input parameter values (e.g., air temperature, relative humidity, and ventilation flow rate); (4) actual bulk SFP temperature must remain below 140 °F - calculated SFP temperatures up to approximately 150 °F are acceptable when justified by conservative methods or assumptions; and (5) with appropriate administrative controls to verify that analysis inputs bound actual conditions, a set of bounding analyses may be prepared to support operational flexibility.

d. For single active failure evaluation, demonstrate that the following analysis conditions are met: (1) decay heat load is calculated based on a bounding estimate of offload size, decay time, power history, and inventory of previously discharged assemblies; (2) heat removal capability is based on a bounding estimate of ultimate heat sink temperature, heat exchanger performance (e.g., fouling and tube plugging margin), and cooling system flow rates assuming the limiting single-failure with regard to heat removal capability; (3) alternate heat removal paths (e.g., evaporative cooling) must be appropriately validated and based on bounding input parameter values (e.g., air temperature, relative humidity, and ventilation flow rate); (4) calculated bulk SFP temperature must remain below the design temperature of the SFP structure and liner, and calculated peak storage cell temperature must remain below the storage rack design temperature; (5) for plants where a single-failure results in a complete loss of forced cooling, the analysis should demonstrate that the loss of cooling would be identified and forced cooling would be restored before the bounding decay heat load would cause the SFP temperature to reach its design limit; and (6) with appropriate administrative controls to verify that analysis inputs bound actual conditions, a set of bounding analyses may be prepared to support operational flexibility.

e. If you choose to define a method to calculate operational limits prior to every offload using the anticipated actual conditions at the time of the offload, demonstrate that the following cycle-specific conditions are met: (1) define the method to calculate decay heat load based on decay time, power history, and inventory of previous fuel discharges; (2) define the method to calculate cooling system heat removal capacity based on ultimate heat sink temperature, cooling system flow rates, and heat exchanger performance parameters; (3) define the method for calculating alternate heat removal capability (e.g., evaporative cooling) and provide validation of the method; (4) using the methods defined to calculate heat load and heat removal capability, define the method to determine the limiting value of the variable operational parameter (typically, decay time) such that bulk SFP temperature will remain below 140 °F with full cooling capability; (5) using the methods defined to calculate heat load and heat removal capability, define the method to determine the limiting value of the variable operational parameter (typically, decay time) such that bulk SFP temperature will be maintained below the SFP structure design temperature assuming a single-failure affecting the forced cooling system (this may be a heat balance analysis if cooling is degraded or a heatup rate analysis if forced cooling is completely lost and subsequently recovered using redundant components); and (6) describe administrative controls that will be implemented each offload to ensure the cycle-specific analysis inputs and results bound actual conditions prior to fuel movement.

f. Following a loss-of-SFP cooling event, demonstrate the ability to provide two sources of make-up water prior to the occurrence of boiling in the pool. Assuming the worst single-active failure occurred, demonstrate the licensee has a process to determine the time to boil assuming the initial pool temperature is the peak temperature from a planned offload.

g. Demonstrate that at least one make-up source has a capacity that is equal to or greater than the calculated boil-off rate so that the SFP level can be maintained.

49) In Attachment 4, Section 4.2.4.1.1, “Main Steam System, Steam Generator Safety Valves,” it is stated that:

The KNPP has 10 safety valves with a total capacity of 7.66×10^6 lbs/hr, which provide about 107.3 percent of the current maximum design full-load steam flow of 7.14×10^6 lb/hr. Based on the proposed range of NSSS design parameters approved for the power uprate, the installed safety valves provide about 98.6 percent of the maximum design steam flow of 7.77×10^6 lbs/hr.

Further, in the same section, it is stated that:

The plant safety analysis for the power uprate presented in Section 6.2, which summarizes non-LOCA event analysis documented in RTSR confirms that the installed safety valve capacity of 7.66 x 10^6 lbs/hr is adequate for overpressure protection.

Please expand on the above statements and provide clarification/justification on the adequacy for overpressure protection.

EEIB - Instrumentation & Control Section

50) Please provide the calculations and supporting setpoint methodology document, WCAP-15821 used to determine the reactor trip setpoints given in WCAP-16040-P, Table 6.8-2. The detail should be sufficient to allow the staff to understand the values used, assumptions made, and formulae used.

51) Please provide KNPP General Nuclear Procedure 04.06.01, Plant Setpoint Accuracy Calculation Procedure.

52) Please discuss the instrumentation and control recommendations mentioned in regulatory commitment 6 and NMC staff disposition.

Mechanical & Civil Engineering Branch

53) In reference to Section 5.7.2, provide a summary of the results relating to the evaluation of SG, for the current rated and the power uprate conditions. The summary should include stresses, cumulative usage reactors (CUFs) and code allowables at limiting locations in the SG shell and the internal components including the manhole, U-bent tubes and divider plate. Also, provide an example to illustrate how you arrive at the calculated CUF value for the secondary side pressure boundary components following the power uprate.

54) In Section 8.4 of the submittal, you stated that an assessment of the BOP piping and supports (including main steam, condensate and feedwater, auxiliary feedwater and SG blowdown systems piping, etc.) was performed for an power uprate at 1772 MWt. You concluded that the piping and pipe supports remain in compliance with the USAS B31.1, “Power Piping Code.”

    In page 8-95 of your submittal, you concluded that the existing main steam piping remains acceptable for the power uprate condition based on the results of analysis with the higher flow rate resulting from the power uprate. Provide a summary of stresses, CUFs and code allowable limits for the critical locations in the main steam piping and support system at the current rated and the power uprate conditions.

55) In reference to Section 8.4, provide a technical basis for not evaluating the piping and support systems where the increase in temperature, pressure and flow rate are less than 5 percent of the current rated design-basis condition. Your justifications provided on page 8-94 are qualitative and nonspecific. For instance, you stated that these increases are somewhat offset by conservatism in analytical methods used. You also indicated that conservatism may include the enveloping of multiple thermal operating conditions. We can not draw a conclusion from these undefined qualitative statements. The technical justifications should be based on specific quantitative assessments or intuitively conservative deduction in order for us to accept your conclusions.

56) In reference to Section 8.4, provide a summary of your evaluation for the BOP piping and supports including calculated maximum stresses and CUFs at critical locations of each evaluated piping system for the power uprate condition, code allowable limits, and the Code and Code edition used in the evaluation for the power uprate. If different from the Code of record, provide your justification.

57) In reference to Section 8.7, discuss the functionality of safety-related mechanical components (i.e., all safety-related valves and pumps, including air-operated and power-operated valves) affected by the power uprate to ensure that the performance specifications and TS requirements (e.g., flow rate, close and open times) will be met for the proposed power uprate. Confirm that safety-related motor-operated valves (MOVs) in your Generic Letter (GL) 89-10 MOV program at KNPP will be capable of performing their intended function(s) following the power uprate including such affected parameters as fluid flow, temperature, pressure and differential pressure, and ambient temperature conditions. Identify mechanical components for which functionality at the uprated power level could not be confirmed. Also, discuss effects of the proposed power uprate on the pressure locking and thermal binding of safety-related power-operated gate valves for GL 95-07 and on the evaluation of overpressurization of isolated piping segments for GL 96-06.

Kewaunee Nuclear Power Plant

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