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INDIANA MICHIGAN POWER

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C0501-03
10 CFR 50.90

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U.S. Nuclear Regulatory Commission
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Donald C. Cook Nuclear Plant Units 1 and 2
TECHNICAL SPECIFICATION CHANGE REQUEST
REFUELING OPERATIONS DECAY TIME

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, proposes to amend Appendix A, Technical Specifications (T/S), of Facility Operating Licenses DPR-58 and DPR-74. I&M proposes to revise T/S 3/4.9.3, "Decay Time," to allow the start of core offload at 100 hours after reactor subcriticality between September 15 and June 15, and 148 hours after reactor subcriticality between June 16 and September 14. The difference in the required decay times is dependent on the time of year due to the lake temperature assumed in the spent fuel pool (SFP) cooling analysis. T/S 3/4.9.3 currently prohibits fuel movement in the reactor pressure vessel until the reactor has been subcritical for at least 168 hours.

I&M has used American Concrete Institute ACI-349-97, "Code Requirements for Nuclear Safety Related Concrete Structures," for the SFP structural evaluation. ACI-318-63, "Building Code Requirements for Reinforced Concrete," which is described in Section 5.2, "Containment Structure," of the CNP Updated Final Safety Analysis Report, does not provide any limitations with respect to maximum short term concrete temperature. Therefore, I&M is requesting approval to use ACI-349-97 to establish acceptability of the peak SFP temperature with respect to the concrete.

I&M also proposes format changes that improve appearance and are not intended to introduce other changes.

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Attachment 1 provides a detailed description and safety analysis to support the proposed changes. Attachments 2A and 2B provide marked up T/S pages for Unit 1 and Unit 2, respectively. Attachments 3A and 3B provide the proposed T/S pages with the changes incorporated for Unit 1 and Unit 2, respectively. Attachment 4 describes the evaluation performed in accordance with 10 CFR 50.92(c), which concludes that no significant hazard is involved. Attachment 5 provides the environmental assessment.

I&M requests approval of the request by October 15, 2001, in order to support the upcoming CNP Unit 2 refueling outage. I&M will implement the amendment within 45 days of issuance.

No previous submittals affect T/S pages that are submitted in this request. If any future submittals affect these T/S pages, then I&M will coordinate changes to the pages with the Nuclear Regulatory Commission Project Manager to ensure proper T/S page control when the associated license amendment requests are approved.

Should you have any questions, please contact Mr. Ronald W. Gaston, Manager of Regulatory Affairs, at (616) 697-5020.

Sincerely,

MW Rencheck

M. W. Rencheck
Vice President Nuclear Engineering

\dmb

Attachments

c: J. E. Dyer
MDEQ - DW & RPD
NRC Resident Inspector
R. Whale

AFFIRMATION

I, Michael W. Rencheck, being duly sworn, state that I am Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

MW Rencheck

M. W. Rencheck
Vice President Nuclear Engineering

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 17 DAY OF MAY, 2001

Jennifer L Kernosky
Notary Public

My Commission Expires 5/26/05

JENNIFER L KERNOSKY
Notary Public, Berrien County, Michigan
My Commission Expires May 26, 2005

ATTACHMENT 1 TO C0501-03

DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

A. Summary of the Proposed Changes

Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, proposes to amend Appendix A, Technical Specifications (T/S), of Facility Operating Licenses DPR-58 and DPR-74. I&M proposes to revise T/S 3/4.9.3, "Decay Time," to allow the start of core offload at 100 hours after reactor subcriticality between September 15 and June 15, and 148 hours after reactor subcriticality between June 16 and September 14. The difference in the required decay times is dependent on the time of year due to the lake temperature assumed in the spent fuel pool (SFP) cooling analysis. T/S 3/4.9.3 currently prohibits fuel movement in the reactor pressure vessel until the reactor has been subcritical for at least 168 hours.

I&M has used American Concrete Institute ACI-349-97, "Code Requirements for Nuclear Safety Related Concrete Structures," for the SFP structural evaluation. ACI-318-63, "Building Code Requirements for Reinforced Concrete," which is described in Section 5.2, "Containment Structure," of the CNP Updated Final Safety Analysis Report (UFSAR), does not provide any limitations with respect to maximum short term concrete temperature. Therefore, I&M is requesting approval to use ACI-349-97 to establish acceptability of the peak SFP temperature with respect to the concrete.

I&M also proposes format changes that improve appearance and are not intended to introduce other changes.

The proposed changes are described in detail in Section E of this attachment. T/S pages that are marked to show the proposed changes are provided in Attachments 2A and 2B for Unit 1 and Unit 2, respectively. The proposed T/S pages, with the changes incorporated, are provided in Attachments 3A and 3B for Unit 1 and Unit 2, respectively.

B. Description of the Current Requirements

T/S 3.9.3 requires that the reactor has been subcritical for at least 168 hours prior to movement of irradiated fuel in the reactor pressure vessel. The action statement requires suspension of all operations involving movement of irradiated fuel in the reactor pressure vessel with a decay time of less than 168 hours. The associated surveillance requirement, T/S Surveillance Requirement 4.9.3, requires verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

C. Bases for the Current Requirements

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is bounded by the decay time assumption used in the accident analyses. The decay time is also used as an input to the SFP cooling system design basis.

The 168-hour decay time was placed in the CNP T/S with Amendments 169 and 152 to DPR-58 and DPR-74, respectively, on January 14, 1993. These amendments were associated with the current SFP racks. Specifically, decay time was increased from 100 to 168 hours to achieve consistency with the SFP cooling thermal-hydraulic analysis performed. The fuel handling accident analysis used to support the SFP re-rack included a 100-hour decay time. I&M did not reanalyze the fuel handling accident (FHA) based on a 168-hour decay time because the existing analysis remained bounding.

D. Need for Revision of the Requirement

I&M has determined that the decay time will be a critical path item during future refueling outages. I&M has determined that decay time can be reduced without adversely impacting safety.

E. Description of the Proposed Changes

I&M proposes to revise T/S 3/4.9.3 to allow a 100-hour decay time between September 15 and June 15, and a 148-hour decay time between June 16 and September 14. I&M proposes to revise the action statement to replace "168 hours" with "the required decay time." I&M proposes to revise the surveillance requirement to replace "for at least 168 hours" with "as required." I&M proposes to revise the Bases to describe the SFP cooling system design basis and the lake temperatures associated with each proposed decay time. Information is also added to the Bases to describe how the decay time applicability section will be applied. Administrative changes to paginate the Bases properly with the new text have been made.

I&M is requesting approval to use ACI-349-97 to establish acceptability of the peak SFP temperature with respect to the concrete.

I&M additionally proposes three types of format changes to the revised Unit 1 and Unit 2 pages. The types of changes to be applied are:

(1) Reformat the header to include numbered first and second tier T/S section titles and a full-width single line to separate the header section titles from the page text.

(2) Reformat the footer to include "Page (page number)" center page, "AMENDMENT (past amendment numbers, with strikethrough, and ending with the current amendment number)" on the right side of the page, and a full-width single line to separate the footer from the page text.

(3) Full justify the text and change the font.

F. Bases for the Proposed Changes

The proposed change to T/S 3/4.9.3 allows for a shorter outage duration without compromising safety. I&M has reviewed the licensing basis accident analyses and has determined that the only accident that is impacted by decay time is the FHA. The SFP cooling design basis is also impacted by decay time. Thus, both the FHA and the SFP cooling design basis have been reviewed and analyzed, as necessary, to demonstrate that the 100-hour and 148-hour proposed decay times are acceptable. The details are discussed below.

FHA

The current licensing basis FHA analysis is described in detail in Chapter 14 of the CNP UFSAR. CNP Unit 1 UFSAR Sections 14.2.1.4 and 14.2.1.5 describe a FHA in the auxiliary building and containment, respectively. These sections describe the FHA methodology for both units and include the assumption of a 100-hour decay time. CNP Unit 2 UFSAR Section 14.3.5.3.2 provides the results of the Unit 2 auxiliary building and containment FHA analysis. These analyses demonstrate that the doses from the FHA postulated in the containment and in the auxiliary building are well within the 10 CFR Part 100 limits.

I&M recently reanalyzed the FHA as part of a license amendment request for control room habitability. The request, which would allow the use of an alternate source term, was submitted on June 12, 2000, and supports a 100-hour decay time. Thus, this analysis bounds all of the proposed decay times. This FHA analysis demonstrated a dose of less than 5.0 rem total effective dose equivalent for personnel in the control room for the duration of the accident, which is within the limits of 10 CFR 50.67, "Accident Source Term."

SFP COOLING

Overview

The Nuclear Regulatory Commission (NRC) approved a SFP cooling analysis for CNP in support of the SFP re-rack in Amendments 169 and 152 to DPR-58 and DPR-74, respectively. The analysis included a partial core offload "normal" scenario with a single failure, and a full core offload "abnormal" scenario without a single failure. Since a partial core offload is not bounding as a "normal" case in the design basis analysis, a full core offload has been subsequently analyzed as the new "normal" case for the design basis analysis supporting the proposed changes. This analysis demonstrates that the peak temperature with a full core offload is higher than the value previously approved. However, the new peak temperature is acceptable with respect to the design basis of the SFP structure and associated systems. Details of the evaluation are provided below.

Case Overview

CNP Unit 1 and Unit 2 share a common SFP. The SFP cooling system has two parallel trains each with a pump and heat exchanger. One train is associated with each unit. The planned operating cycles are eighteen months long. The Unit 1 and 2 outages are scheduled such that they are about six months apart.

A comprehensive SFP cooling evaluation was performed to support the proposed lower decay times. The evaluation considered three scenarios, Cases 1a, 1b, and 2, which are presented below. The cases selected are based on those discussed in NUREG-0800, "Standard Review Plan," (SRP) Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System." While CNP was not designed to comply with the SRP, the SRP has been used as a guide in case determination. Cases 1a and 1b are designated as such because they are both normal heat load cases and only differ in decay time and lake temperature assumptions. Case 2 is an abnormal heat load case with back-to-back core offloads. As such, Cases 1a and 1b assume a single failure as discussed in the SRP, whereas Case 2 is not required to assume the single failure. Case 2 assumes both trains are available until offload is completed and a peak SFP temperature occurs. Case 2 also represents the postulated loss of all SFP cooling case. At the time of peak SFP temperature both trains of cooling are assumed to be lost. A SFP time to boil is calculated from the point when both trains of SFP cooling are lost. Following the case descriptions below, key assumptions, case results, and the impact of the results are presented. Finally, the method for validating the time of year associated with bounding the assumed lake temperature in Case 1b is discussed.

Case Descriptions

CASE 1a: A full-core discharge of 193 assemblies after 148 hours of decay time is considered. The previously discharged refueling load of 88 assemblies was assumed to have been discharged five months earlier. Five months represents the normal minimum time between the scheduled 18-month refueling outages. Long-term decay heat from all previously discharged fuel assemblies as well as all future projected fuel assemblies is considered. The single failure considered is the loss of one train of SFP cooling. The design basis lake temperature of 85°F is assumed.

CASE 1b: Same as Case 1a with the following exceptions: a 100 hour decay time and a reduced lake temperature of 77.8°F.

CASE 2: A full-core discharge of 193 assemblies after 100 hours of decay time is considered. The previously discharged refueling load of 88 assemblies was assumed to have been discharged 30 days earlier. The 30 days bounds the 36 days discussed in the SRP. Long-term decay heat from all previously discharged fuel assemblies as well as all future projected fuel assemblies is considered. The design basis lake temperature of 85°F is assumed. Both SFP cooling trains are assumed to be lost at a time when the peak SFP temperature exists so as to minimize SFP time to boil.

Decay Heat Methodology Discussion

Since decay heat decreases with time, it is desirable to perform a time-dependent analysis of the decay heat loads and the SFP water heat-up, so that more accurate results can be determined. I&M considered three methodologies the NRC has accepted: (1) NUREG-0800, Section 9.2.5, Branch Technical Position (BTP) ASB 9-2, "Residual Decay Energy for Light-Water Reactors for Long-Term Cooling," (2) Oak Ridge National Laboratory, Computer Code Collection, ORIGEN2, "Isotope Generation and Depletion Code Matrix Exponential Method," and (3) ANSI/ANS-5.1-1979, "American National Standard for Decay Heat Power in Light Water Reactors." The BTP is the most conservative methodology, in part due to simplifying assumptions used to establish the methodology. The BTP method could be readily used in a time-dependent analysis, whereas ORIGEN2 is not suited to a time-dependent analysis. I&M combined the BTP and ORIGEN2 methodologies to calculate time-dependent decay heat loads that are expected to be equivalent to ORIGEN2 results.

The new decay heat methodology uses the BTP equations, so that time-dependent decay heat loads can be calculated, and adjustment factors to reduce BTP decay heat loads to decay heat loads that are equivalent to ORIGEN2 results. The adjustment factors are based on benchmark cases for CNP spent fuel. The adjusted decay heat values used in the SFP analysis are presented in Exhibit 1, 2, and 3, for the three different cases.

Comparisons between the methodologies indicate that time after shutdown is the variable that has the most significant effect on the decay heat results. For decay heat values calculated for shorter decay times, 1 day to 1 year, the accuracy of a given methodology is relatively constant. For longer decay times the decay heat results of the two methodologies become less similar as time after shutdown increases. The time period considered in the time-dependent SFP analysis is small relative to the total decay time for longer-term discharges. Therefore, a time-dependent decay heat calculation has a negligible effect on the longer-term decay heat loads. I&M has performed a time-dependent SFP cooling analysis using decay heat values calculated from the BTP methodology with adjustment factors. I&M concludes this represents the same level of accuracy as ORIGEN2 in calculating decay heat.

I&M used three benchmark cases to establish the adjustment factors between the BTP and ORIGEN2 methodologies. These cases are (1) last full core offload, (2) permanent discharge preceding the last full core offload, and (3) all remaining discharges. For the first benchmark case, the times after shutdown for each fuel assembly are on the order of days. The ORIGEN2 results are 94.87% of the BTP results. For the second benchmark case, the times after shutdown for each fuel assembly are on the order of months. The ORIGEN2 results are 97.77% of the BTP results. For the third benchmark case, the times after shutdown for each fuel assembly are on the order of years. The ORIGEN2 decay heat results are 81.12% of the BTP results.

The benchmark cases use input parameters representative of CNP fuel. Therefore, the resulting adjustment factors are applicable to the decay heat load calculations for CNP spent fuel. The SFP cooling analysis uses the BTP method with the CNP adjustment factors for decay heat load. Actual or bounding values are used for the four inputs required for the BTP method: power level, number of assemblies, decay time and burnup. The bounding values may differ from the representative values used in the benchmark cases. If bounding values had been used in the benchmark cases, the adjustment factors could be impacted. However, I&M concludes using bounding input parameters for this analysis more than compensates for this potential impact to the adjustment factors. Using bounding parameters is conservative compared to using the nominal inputs in the BTP and SRP analysis methods. Therefore, I&M considers the new methodology to yield decay heat results that are consistent with ORIGEN2. I&M concludes the methodology presented reflects valid decay heat results.

Defining Decay Heat Loads

The long-term spent fuel discharges assumed in the analysis include all but the last two refueling offloads (the final full core offload and the permanently discharged assemblies preceding the last full core offload). The actual CNP history and projected future discharged fuel assemblies were used to establish the long-term discharges. Eighty-four fuel assemblies are assumed to be discharged for all future refueling outages, with the exception of the last discharge preceding the last full core offload. Eighty-eight fuel assemblies are assumed to be discharged during the last discharge preceding the last full core offload. The number of assemblies in the last full core offload is 193. These assemblies are assumed to begin being offloaded after the 100-hour or 148-hour decay time being considered. The offload is assumed to transfer all 193 fuel assemblies from the core into the SFP within 138.6 hours from subcriticality and 186.6 hours from subcriticality, respectively.

The thermal power levels are assumed at 102% of rated thermal power. T/S 1.3 defines rated thermal power as 3250 MWt and 3411 MWt for Unit 1 and Unit 2, respectively. It is conservative to evaluate the last full core offload as a Unit 2 offload, since Unit 2 has a higher power level than Unit 1.

Table 1 presents the assumptions made with respect to fuel assemblies offloaded and burn-up of the offloaded assemblies. With the exception of the last two refueling loads, a value of 1223 effective full power days (EFPD) is assumed for future discharges. This is conservative as it is based on a 97% capacity factor for an 18-month (549-day) cycle length resulting in 532.5 EFPD per cycle. This is more conservative than the nominal value stated in the BTP ASB 9-2. The 1223 EFPD value is obtained based on loading assumptions. If 84 fresh assemblies are loaded each cycle, then 84 will be once burned and 25 will be twice burned, to equal 193 total assemblies. This means that 25 of the 84 discharged assemblies will have three cycles of operation and 59 of the 84 discharged assemblies will have two cycles of operation.

The maximum EFPD for the last two refueling loads is assumed to be 665.7 EFPD per cycle. The value of 665.7 EFPD per cycle translates into a total value for exposure of 1521 EFPD for the second to last refueling load and 1128 EFPD for the final offload. This is conservative as it assumes a 97% capacity factor and a cycle length of 22.5 months, 18 months multiplied by 1.25, which is based on the provision in T/S 4.0.2 for allowable surveillance interval extensions.

Table 1
CNP Historical and Projected Core Offload Data

Unit	Cycle	Fuel Assemblies	Average EFPD	Shutdown Date	Days After Shutdown	Power [MWt]
1	1	63	511.3	1/10/77	13399	3250
1	2	64	784.6	4/26/78	12928	3250
1	3	66	915.0	4/20/79	12569	3250
2	1	71	430.2	11/12/79	12363	3411
1	4	65	812.4	6/18/80	12144	3250
2	2	92	732.6	4/2/81	11856	3411
1	5	64	795.9	6/19/81	11778	3250
1	6	64	800.1	8/4/82	11367	3250
2	3	81	834.0	12/14/82	11235	3411
1	7	66	796.3	8/18/83	10988	3250
2	4	91	890.0	4/18/84	10744	3411
1	8	94	762.7	5/3/85	10364	3250
2	5	89	856.0	4/5/86	10027	3411
1	9	80	933.7	7/28/87	9548	3250
2	6	72	896.0	5/25/88	9246	3411
1	10	80	1029.6	4/7/89	8929	3250
2	7	85	914.0	7/26/90	8454	3411
1	11	80	1055.0	11/8/90	8349	3250
2	8	76	967.0	3/15/92	7856	3411
1	12	80	1076.0	7/9/92	7740	3250
1	13	80	1049.0	2/23/94	7146	3250
2	9	75	1005.4	9/18/94	6939	3411
1	14	84	1002.0	8/18/95	6605	3250
2	10	82	1055.0	4/3/96	6376	3411
1	15	84	1010.5	3/11/97	6034	3250
2	11	84	1042.0	9/9/97	5852	3411
1	16	60*	1287.0	9/9/97	5852	3250
2	12	84	1223.0	11/3/01	4336	3411
1	17	84	1223.0	5/3/02	4155	3250
2	13	84	1223.0	3/28/03	3826	3411
1	18	84	1223.0	10/3/03	3637	3250
2	14	84	1223.0	10/1/04	3273	3411
1	19	84	1223.0	4/1/05	3091	3250
2	15	84	1223.0	3/31/06	2727	3411
1	20	84	1223.0	10/6/06	2538	3250
2	16	84	1223.0	9/28/07	2181	3411
1	21	84	1223.0	4/4/08	1992	3250
2	17	84	1223.0	4/3/09	1628	3411
1	22	84	1223.0	10/2/09	1446	3250
2	18	84	1223.0	10/8/10	1075	3411
1	23	84	1223.0	4/8/11	893	3250
2	19	84	1223.0	3/29/12	537	3411
1	24	88	1521	—	Varies	3250
2	20	193	1128	—	Varies	3411

* Forty-eight assemblies were actually offloaded, but 60 were assumed so that the total number of offloaded assemblies equals the full capacity of the SFP (3613 assemblies).

Heat Exchanger and Heat Transfer Assumptions

The only assumed heat removal from the SFP water is through the SFP heat exchangers. Heat transfer to the concrete and air was conservatively excluded to maximize the SFP temperature. Evaporative heat transfer was similarly excluded. Thus, all heat transfer for the SFP is assumed to be through the SFP heat exchangers, which are cooled by component cooling water (CCW).

The worst case single active failure assumed in Cases 1a and 1b is one train of SFP cooling, which is the loss of one pump and its associated heat exchanger. This represents the worst case single active failure of the SFP cooling system, but does not include events that would temporarily terminate the operation of both SFP cooling trains. Events which would result in the loss of both SFP cooling trains, such as a loss of offsite power, are considered in Case 2.

The design values for SFP and CCW cooling system flow rates, overall heat transfer coefficient, and surface area have been used in the analysis. The CCW temperature to the SFP heat exchanger varies with SFP heat load. This CCW supply temperature has been determined based on loads on the system at full power operation. The pump heat from the SFP skimmer pump and the SFP cooling system pumps have been accounted for as appropriate.

The CCW system is cooled by the essential service water system, which has been assumed in Cases 1a and 2 to have a maximum design basis temperature of 86°F, which is one degree higher than the design basis maximum lake temperature of 85°F. The maximum lake temperature in Case 1b is assumed to be 77.8°F.

Results of SFP Peak Temperature Calculations and Time to Boil

The results of Cases 1a and 1b demonstrate that, during a full core offload with a single failure of one train of SFP cooling, the remaining train of SFP cooling provides sufficient cooling to limit the peak SFP bulk temperature to 180°F. The results of Case 2 demonstrate that, with an abnormal decay heat load and no single failure, the maximum SFP bulk temperature is 142°F and the minimum time to boil following a loss of all SFP cooling is 5.8 hours. These results have been concluded to be acceptable by the evaluations presented in the following sections.

Impact of Results on Support Structure Design Basis

The concrete, liner and associated structural elements have been analyzed up to a peak SFP temperature of 185°F. This bounds the 180°F peak SFP cooling analysis temperature. The analysis demonstrates that the leak-tightness and integrity of the liner, concrete and associated structural elements will be maintained during the peak predicted normal temperature scenario.

I&M has used American Concrete Institute ACI-349-97, "Code Requirements for Nuclear Safety Related Concrete Structures," for the SFP structural evaluation. ACI-318-63, "Building Code Requirements for Reinforced Concrete," which is described in Section 5.2, "Containment

Structure," of the CNP UFSAR, does not provide any limitations with respect to maximum short term concrete temperature. ACI-349-97 Appendix A, "Thermal Considerations," has established two temperature limits. The first limit is that for normal operation or any other long period. That limit specifies that the concrete temperature shall not exceed 150°F except for local areas, such as around penetrations, which are allowed to have increased temperatures not to exceed 200°F. The second temperature limitation is for an accident or any other short-term period. That limit specifies that the temperature shall not exceed 350°F for the surface. The 350°F limit would apply to the SFP concrete walls and floor when they would be exposed to elevated temperatures, such as during this end of fuel pool full core discharge, including cooling single failure and high lake water temperature.

It is reasonable to apply the ACI 349-97 to this short-term temperature loading as an unusual event. This position is consistent with that discussed in a memo regarding resolution of spent fuel storage pool action plan issues from J. M. Taylor (NRC) to Chairman Jackson, et al., dated July 26, 1996. Section 3.2.1, "Structural Considerations," of the Spent Fuel Pool Action Plan Status Report discusses the application of ACI 349 when evaluating concrete structures such as the SFP. This report states that, "...during a rise in the SFP bulk temperature due to temporary loss of forced cooling, the low thermal diffusivity of concrete and the large thermal capacity of the SFP concrete cause the temperature distribution within the concrete structure to change slowly after a rise in the temperature. Evaporative cooling of the pool limits the maximum temperature attainable at the concrete surface following a temporary loss of forced cooling. Thus, the concrete material properties will not be affected due to a temporary rise in SFP bulk temperature above 150°F."

The calculation for the temperature effect on the SFP liner demonstrates that, under the increased temperature condition, the liner maintains its leak tightness for the load combinations expected to act on it. The SFP concrete element calculations demonstrate structural integrity during the peak SFP water temperature event. The 1/2" diameter Nelson stud concrete embedments have been evaluated. I&M has determined that they will not fail and defeat the leak tightness of the SFP liner. While the stainless steel liner plate will buckle, the ultimate strain levels of either the weld material or the plate itself will not be exceeded. The integrity of the weld material is retained. Thus, at a SFP temperature of 180°F, the liner plate will not fail and will remain leak tight. Additionally, the steel stress on the 1/2" diameter Nelson stud and the concrete stress surrounding the headed stud embedment remain within their allowable values.

Impact of Results on Auxiliary Building Ventilation

The function of the fuel handling area ventilation system is to maintain a negative pressure in the area so that radioactive material is not released. The increase in peak SFP temperature from 159.5°F to 180°F would result in a slight increase in air temperature above the pool. The fuel handling area ventilation system is made up of ductwork, fans, roughing filters, high efficiency particulate adsorber filters, charcoal filters, and dampers. Temperatures in the range described above do not impact the ductwork, dampers and fans due to metal construction. The fan motors are outside of the air stream. The various filters and damper actuators are designed to withstand temperatures of this magnitude.

Open stairwells allow free communication between the fuel handling area and other portions of the auxiliary building. However, because of the large volumes and mixing with other air streams, the impact of the higher fuel handling area temperature on the areas containing equipment important to safety is negligible. Based on the evaluation performed, it has been concluded that a peak SFP temperature of 180°F, with assumed humidity levels of almost 100%, will not have an adverse impact on the auxiliary building ventilation system including the fuel handling ventilation system.

Operator Response

The SFP time to boil was reviewed to verify that operators could provide SFP make-up water prior to initiation of boiling. While multiple sources for SFP make-up exist, the preferred source of makeup water, as listed in the abnormal operating procedure for loss of SFP cooling, is the demineralized water system. Providing make-up water to the SFP from the demineralized water system requires unlocking and opening one manually operated valve located in the SFP area of the auxiliary building. System manipulations could be made to adjust flow to the SFP to counteract any loss of inventory. Based on existing plant alarm response and abnormal operating procedures, it is reasonable to assume that the operators would be able to align make-up water to the SFP in the 5.8 hours from the loss of all SFP cooling to the time at which boiling would occur.

Lake Temperature Adjustment

The lake temperature required to support the 100-hour decay time is 77.8°F. This assumed temperature is lower than the design basis 85°F. Thus, the 100-hour decay time cannot be used at all times during the year. To determine when it would be appropriate and valid to assume the lower lake temperature, Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," was used as a guide. Consistent with the text in Regulatory Guide 1.27, 30 years of historical lake temperature data from 1968 through 1998 were used. Using these data, a maximum temperature profile demonstrated that, for the entire 30-year time period evaluated, the lake has never exceeded 77°F from September 12 through June 23. These dates bound the September 15 through June 15 dates proposed for the specification. Thus, if core offload is initiated within that selected time frame, the lake temperature expected during the offload would support the higher heat load associated with decay heat rate at 100 hours after subcriticality. Otherwise, from June 16 through September 14, a minimum decay time of 148 hours, which is associated with the design basis lake temperature of 85°F, will be required.

CONCLUSION

I&M evaluated the impacted analyses, and the results demonstrate that the proposed decay times meet required limits and acceptance criteria. The FHA analysis is unaffected, as it currently bounds a 100-hour decay time. The SFP cooling analysis demonstrates a time to boil of 5.8 hours that is effectively equivalent to the current design basis time to boil of 5.74 hours. The SFP cooling analysis produces a SFP peak temperature that is higher than the current design basis value. However, that is expected in light of the shorter decay times and the assumption of full core offload being assumed as the normal case. The new SFP peak temperature meets all required acceptance criteria as presented.

The proposed changes to the Bases are consistent with the accident analysis assumptions described above. The remaining changes are administrative and are not intended to change the requirements.

The proposed changes are not consistent with the NUREG-1431, "Standard Technical Specifications," which do not include a decay time specification. However, it is not appropriate to relocate the CNP requirement because it continues to meet 10 CFR 50.36, Criterion 2, for inclusion in the T/S.

Finally, generic industry issues and experience related to spent fuel handling and storage have been reviewed. Conditions that could affect CNP are documented and tracked through the corrective action process.

Exhibit 1
Case 1a

Time After 148 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
0.0	119.6	94.7	0	0.00	3.27	11.18	14.45
0.2	119.6	94.7	1	0.18	3.27	11.18	14.64
0.4	119.6	94.7	2	0.37	3.27	11.18	14.82
0.6	119.6	94.7	3	0.55	3.27	11.18	15.00
0.8	119.6	94.7	4	0.73	3.27	11.18	15.19
1.0	119.7	94.7	5	0.92	3.27	11.18	15.37
1.2	119.7	94.7	6	1.10	3.27	11.18	15.55
1.4	119.8	94.7	7	1.28	3.27	11.18	15.73
1.6	119.8	94.7	8	1.47	3.27	11.18	15.92
1.8	119.9	94.7	9	1.65	3.27	11.18	16.10
2.0	119.9	94.7	10	1.83	3.27	11.18	16.28
2.2	120.0	94.7	11	2.01	3.27	11.18	16.46
2.4	120.1	94.7	12	2.19	3.27	11.18	16.64
2.6	120.2	94.7	13	2.37	3.27	11.18	16.83
2.8	120.3	94.8	14	2.56	3.27	11.18	17.01
3.0	120.3	94.8	15	2.74	3.27	11.18	17.19
3.2	120.5	94.8	16	2.92	3.27	11.18	17.37
3.4	120.6	94.8	17	3.10	3.27	11.18	17.55
3.6	120.7	94.8	18	3.28	3.27	11.18	17.73
3.8	120.8	94.8	19	3.46	3.27	11.18	17.91
4.0	120.9	94.8	20	3.64	3.27	11.18	18.09
4.2	121.0	94.9	21	3.82	3.27	11.18	18.27
4.4	121.2	94.9	22	4.00	3.27	11.18	18.45
4.6	121.3	94.9	23	4.18	3.27	11.18	18.63
4.8	121.5	94.9	24	4.36	3.27	11.18	18.81
5.0	121.6	94.9	25	4.54	3.27	11.18	18.99
5.2	121.8	95.0	26	4.72	3.27	11.18	19.16
5.4	121.9	95.0	27	4.89	3.27	11.18	19.34
5.6	122.1	95.0	28	5.07	3.27	11.18	19.52
5.8	122.2	95.0	29	5.25	3.27	11.18	19.70
6.0	122.4	95.0	30	5.43	3.27	11.18	19.88
6.2	122.6	95.1	31	5.61	3.27	11.18	20.06

Exhibit 1

Case 1 a

Time After 148 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
6.4	122.8	95.1	32	5.78	3.27	11.18	20.23
6.6	122.9	95.1	33	5.96	3.27	11.18	20.41
6.8	123.1	95.1	34	6.14	3.27	11.18	20.59
7.0	123.3	95.2	35	6.32	3.27	11.18	20.76
7.2	123.5	95.2	36	6.49	3.27	11.18	20.94
7.4	123.7	95.2	37	6.67	3.27	11.18	21.12
7.6	123.9	95.2	38	6.85	3.27	11.18	21.29
7.8	124.1	95.3	39	7.02	3.27	11.18	21.47
8.0	124.3	95.3	40	7.20	3.27	11.18	21.65
8.2	124.5	95.3	41	7.38	3.27	11.18	21.82
8.4	124.7	95.4	42	7.55	3.27	11.18	22.00
8.6	125.0	95.4	43	7.73	3.27	11.18	22.17
8.8	125.2	95.4	44	7.90	3.27	11.18	22.35
9.0	125.4	95.4	45	8.08	3.27	11.18	22.53
9.2	125.6	95.5	46	8.25	3.27	11.18	22.70
9.4	125.8	95.5	47	8.43	3.27	11.18	22.87
9.6	126.1	95.5	48	8.60	3.27	11.18	23.05
9.8	126.3	95.6	49	8.78	3.27	11.18	23.22
10.0	126.5	95.6	50	8.95	3.27	11.18	23.40
10.2	126.8	95.6	51	9.13	3.27	11.18	23.57
10.4	127.0	95.7	52	9.30	3.27	11.18	23.75
10.6	127.2	95.7	53	9.47	3.27	11.18	23.92
10.8	127.5	95.7	54	9.65	3.27	11.18	24.09
11.0	127.7	95.8	55	9.82	3.27	11.18	24.27
11.2	128.0	95.8	56	9.99	3.27	11.18	24.44
11.4	128.2	95.8	57	10.17	3.27	11.18	24.61
11.6	128.5	95.9	58	10.34	3.27	11.18	24.79
11.8	128.7	95.9	59	10.51	3.27	11.18	24.96
12.0	129.0	95.9	60	10.69	3.27	11.18	25.13
12.2	129.2	96.0	61	10.86	3.27	11.18	25.30
12.4	129.5	96.0	62	11.03	3.27	11.18	25.48
12.6	129.8	96.0	63	11.20	3.27	11.18	25.65
12.8	130.0	96.1	64	11.37	3.26	11.18	25.82
13.0	130.3	96.1	65	11.55	3.26	11.18	25.99
13.2	130.5	96.1	66	11.72	3.26	11.18	26.16
13.4	130.8	96.2	67	11.89	3.26	11.18	26.33
13.6	131.1	96.2	68	12.06	3.26	11.18	26.51
13.8	131.4	96.2	69	12.23	3.26	11.18	26.68
14.0	131.6	96.3	70	12.40	3.26	11.18	26.85

Exhibit 1

Case 1 a

Time After 148 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
14.2	131.9	96.3	71	12.57	3.26	11.18	27.02
14.4	132.2	96.4	72	12.74	3.26	11.18	27.19
14.6	132.4	96.4	73	12.91	3.26	11.18	27.36
14.8	132.7	96.4	74	13.08	3.26	11.18	27.53
15.0	133.0	96.5	75	13.25	3.26	11.18	27.70
15.2	133.3	96.5	76	13.42	3.26	11.18	27.87
15.4	133.6	96.5	77	13.59	3.26	11.18	28.04
15.6	133.8	96.6	78	13.76	3.26	11.18	28.21
15.8	134.1	96.6	79	13.93	3.26	11.18	28.38
16.0	134.4	96.7	80	14.10	3.26	11.18	28.55
16.2	134.7	96.7	81	14.27	3.26	11.18	28.71
16.4	135.0	96.7	82	14.44	3.26	11.18	28.88
16.6	135.3	96.8	83	14.61	3.26	11.18	29.05
16.8	135.6	96.8	84	14.78	3.26	11.18	29.22
17.0	135.8	96.9	85	14.95	3.26	11.18	29.39
17.2	136.1	96.9	86	15.11	3.26	11.18	29.56
17.4	136.4	96.9	87	15.28	3.26	11.18	29.73
17.6	136.7	97.0	88	15.45	3.26	11.18	29.89
17.8	137.0	97.0	89	15.62	3.26	11.18	30.06
18.0	137.3	97.1	90	15.79	3.26	11.18	30.23
18.2	137.6	97.1	91	15.95	3.26	11.18	30.40
18.4	137.9	97.1	92	16.12	3.26	11.18	30.56
18.6	138.2	97.2	93	16.29	3.26	11.18	30.73
18.8	138.5	97.2	94	16.46	3.26	11.18	30.90
19.0	138.8	97.3	95	16.62	3.26	11.18	31.06
19.2	139.1	97.3	96	16.79	3.26	11.18	31.23
19.4	139.4	97.3	97	16.96	3.26	11.18	31.40
19.6	139.7	97.4	98	17.12	3.26	11.18	31.56
19.8	140.0	97.4	99	17.29	3.26	11.18	31.73
20.0	140.3	97.5	100	17.45	3.26	11.18	31.89
20.2	140.6	97.5	101	17.62	3.26	11.18	32.06
20.4	140.9	97.5	102	17.79	3.26	11.18	32.23
20.6	141.2	97.6	103	17.95	3.26	11.18	32.39
20.8	141.5	97.6	104	18.12	3.26	11.18	32.56
21.0	141.8	97.7	105	18.28	3.26	11.18	32.72
21.2	142.1	97.7	106	18.45	3.26	11.18	32.89
21.4	142.4	97.7	107	18.61	3.26	11.18	33.05
21.6	142.7	97.8	108	18.78	3.26	11.18	33.22
21.8	143.0	97.8	109	18.94	3.26	11.18	33.38

Exhibit 1

Case 1 a

Time After 148 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
22.0	143.3	97.9	110	19.11	3.26	11.18	33.55
22.2	143.6	97.9	111	19.27	3.26	11.18	33.71
22.4	143.9	98.0	112	19.43	3.26	11.18	33.87
22.6	144.2	98.0	113	19.60	3.26	11.18	34.04
22.8	144.5	98.0	114	19.76	3.26	11.18	34.20
23.0	144.8	98.1	115	19.93	3.26	11.18	34.37
23.2	145.1	98.1	116	20.09	3.26	11.18	34.53
23.4	145.4	98.2	117	20.25	3.26	11.18	34.69
23.6	145.7	98.2	118	20.42	3.26	11.18	34.86
23.8	146.1	98.2	119	20.58	3.26	11.18	35.02
24.0	146.4	98.3	120	20.74	3.26	11.18	35.18
24.2	146.7	98.3	121	20.91	3.26	11.18	35.34
24.4	147.0	98.4	122	21.07	3.26	11.18	35.51
24.6	147.3	98.4	123	21.23	3.26	11.18	35.67
24.8	147.6	98.5	124	21.39	3.26	11.18	35.83
25.0	147.9	98.5	125	21.56	3.26	11.18	35.99
25.2	148.2	98.5	126	21.72	3.26	11.18	36.16
25.4	148.5	98.6	127	21.88	3.26	11.18	36.32
25.6	148.8	98.6	128	22.04	3.26	11.18	36.48
25.8	149.1	98.7	129	22.20	3.26	11.18	36.64
26.0	149.5	98.7	130	22.37	3.26	11.18	36.80
26.2	149.8	98.8	131	22.53	3.26	11.18	36.96
26.4	150.1	98.8	132	22.69	3.26	11.18	37.13
26.6	150.4	98.8	133	22.85	3.26	11.18	37.29
26.8	150.7	98.9	134	23.01	3.26	11.18	37.45
27.0	151.0	98.9	135	23.17	3.26	11.18	37.61
27.2	151.3	99.0	136	23.33	3.26	11.18	37.77
27.4	151.6	99.0	137	23.49	3.26	11.18	37.93
27.6	151.9	99.0	138	23.65	3.26	11.18	38.09
27.8	152.2	99.1	139	23.81	3.26	11.18	38.25
28.0	152.6	99.1	140	23.98	3.26	11.18	38.41
28.2	152.9	99.2	141	24.14	3.26	11.18	38.57
28.4	153.2	99.2	142	24.30	3.26	11.18	38.73
28.6	153.5	99.3	143	24.46	3.26	11.18	38.89
28.8	153.8	99.3	144	24.61	3.26	11.18	39.05
29.0	154.1	99.3	145	24.77	3.26	11.18	39.21
29.2	154.4	99.4	146	24.93	3.26	11.18	39.37
29.4	154.7	99.4	147	25.09	3.26	11.18	39.53
29.6	155.1	99.5	148	25.25	3.25	11.18	39.69

Exhibit 1

Case 1 a

Time After 148 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
29.8	155.4	99.5	149	25.41	3.25	11.18	39.85
30.0	155.7	99.6	150	25.57	3.25	11.18	40.00
30.2	156.0	99.6	151	25.73	3.25	11.18	40.16
30.4	156.3	99.6	152	25.89	3.25	11.18	40.32
30.6	156.6	99.7	153	26.05	3.25	11.18	40.48
30.8	156.9	99.7	154	26.20	3.25	11.18	40.64
31.0	157.2	99.8	155	26.36	3.25	11.18	40.80
31.2	157.5	99.8	156	26.52	3.25	11.18	40.95
31.4	157.9	99.9	157	26.68	3.25	11.18	41.11
31.6	158.2	99.9	158	26.84	3.25	11.18	41.27
31.8	158.5	99.9	159	26.99	3.25	11.18	41.43
32.0	158.8	100.0	160	27.15	3.25	11.18	41.59
32.2	159.1	100.0	161	27.31	3.25	11.18	41.74
32.4	159.4	100.1	162	27.47	3.25	11.18	41.90
32.6	159.7	100.1	163	27.62	3.25	11.18	42.06
32.8	160.0	100.2	164	27.78	3.25	11.18	42.21
33.0	160.3	100.2	165	27.94	3.25	11.18	42.37
33.2	160.7	100.2	166	28.09	3.25	11.18	42.53
33.4	161.0	100.3	167	28.25	3.25	11.18	42.68
33.6	161.3	100.3	168	28.41	3.25	11.18	42.84
33.8	161.6	100.4	169	28.56	3.25	11.18	43.00
34.0	161.9	100.4	170	28.72	3.25	11.18	43.15
34.2	162.2	100.5	171	28.88	3.25	11.18	43.31
34.4	162.5	100.5	172	29.03	3.25	11.18	43.46
34.6	162.8	100.5	173	29.19	3.25	11.18	43.62
34.8	163.1	100.6	174	29.34	3.25	11.18	43.78
35.0	163.4	100.6	175	29.50	3.25	11.18	43.93
35.2	163.8	100.7	176	29.66	3.25	11.18	44.09
35.4	164.1	100.7	177	29.81	3.25	11.18	44.24
35.6	164.4	100.8	178	29.97	3.25	11.18	44.40
35.8	164.7	100.8	179	30.12	3.25	11.18	44.55
36.0	165.0	100.8	180	30.28	3.25	11.18	44.71
36.2	165.3	100.9	181	30.43	3.25	11.18	44.86
36.4	165.6	100.9	182	30.59	3.25	11.18	45.02
36.6	165.9	101.0	183	30.74	3.25	11.18	45.17
36.8	166.2	101.0	184	30.90	3.25	11.18	45.33
37.0	166.5	101.1	185	31.05	3.25	11.18	45.48
37.2	166.9	101.1	186	31.20	3.25	11.18	45.63
37.4	167.2	101.1	187	31.36	3.25	11.18	45.79

Exhibit 1

Case 1 a

Time After 148 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
37.6	167.5	101.2	188	31.51	3.25	11.18	45.94
37.8	167.8	101.2	189	31.67	3.25	11.18	46.10
38.0	168.1	101.3	190	31.82	3.25	11.18	46.25
38.2	168.4	101.3	191	31.97	3.25	11.18	46.40
38.4	168.7	101.3	192	32.13	3.25	11.18	46.56
38.6	169.0	101.4	193	32.28	3.25	11.18	46.71
38.8	169.3	101.4	193	32.27	3.25	11.18	46.70
39.0	169.6	101.5	193	32.25	3.25	11.18	46.68
40.0	171.0	101.7	193	32.18	3.25	11.18	46.61
41.0	172.2	101.8	193	32.12	3.25	11.18	46.54
42.0	173.3	102.0	193	32.05	3.25	11.18	46.48
43.0	174.3	102.1	193	31.98	3.25	11.18	46.41
44.0	175.1	102.2	193	31.92	3.25	11.18	46.34
45.0	175.9	102.4	193	31.85	3.25	11.18	46.28
46.0	176.5	102.4	193	31.78	3.25	11.18	46.21
47.0	177.1	102.5	193	31.72	3.24	11.18	46.14
48.0	177.6	102.6	193	31.66	3.24	11.18	46.08
49.0	178.0	102.6	193	31.59	3.24	11.18	46.02
50.0	178.4	102.7	193	31.53	3.24	11.18	45.95
51.0	178.7	102.7	193	31.47	3.24	11.18	45.89
52.0	178.9	102.8	193	31.40	3.24	11.18	45.83
53.0	179.2	102.8	193	31.34	3.24	11.18	45.76
54.0	179.4	102.8	193	31.28	3.24	11.18	45.70
55.0	179.5	102.9	193	31.22	3.24	11.18	45.64
56.0	179.6	102.9	193	31.16	3.24	11.18	45.58
57.0	179.7	102.9	193	31.10	3.24	11.18	45.52
58.0	179.8	102.9	193	31.04	3.24	11.18	45.46
59.0	179.9	102.9	193	30.98	3.24	11.18	45.40
60.0	179.9	102.9	193	30.93	3.24	11.18	45.34

Exhibit 2

Case 1b

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
0.0	112.5	87.5	0	0.00	3.30	11.18	14.48
0.2	112.5	87.5	1	0.22	3.30	11.18	14.70
0.4	112.5	87.5	2	0.43	3.30	11.18	14.92
0.6	112.5	87.5	3	0.65	3.30	11.18	15.13
0.8	112.5	87.5	4	0.87	3.30	11.18	15.35
1.0	112.6	87.5	5	1.08	3.30	11.18	15.57
1.2	112.6	87.5	6	1.30	3.30	11.18	15.78
1.4	112.7	87.5	7	1.52	3.30	11.18	16.00
1.6	112.7	87.5	8	1.73	3.30	11.18	16.21
1.8	112.8	87.5	9	1.95	3.30	11.18	16.43
2.0	112.9	87.6	10	2.16	3.30	11.18	16.64
2.2	113.0	87.6	11	2.37	3.30	11.18	16.85
2.4	113.1	87.6	12	2.59	3.30	11.18	17.07
2.6	113.2	87.6	13	2.80	3.30	11.18	17.28
2.8	113.3	87.6	14	3.01	3.30	11.18	17.49
3.0	113.4	87.6	15	3.23	3.30	11.18	17.71
3.2	113.5	87.6	16	3.44	3.30	11.18	17.92
3.4	113.6	87.7	17	3.65	3.30	11.18	18.13
3.6	113.8	87.7	18	3.86	3.30	11.18	18.34
3.8	113.9	87.7	19	4.07	3.30	11.18	18.55
4.0	114.0	87.7	20	4.28	3.30	11.18	18.76
4.2	114.2	87.7	21	4.49	3.30	11.18	18.97
4.4	114.3	87.7	22	4.70	3.30	11.18	19.18
4.6	114.5	87.8	23	4.91	3.30	11.18	19.39
4.8	114.7	87.8	24	5.12	3.30	11.18	19.60
5.0	114.9	87.8	25	5.33	3.30	11.18	19.81
5.2	115.0	87.8	26	5.54	3.30	11.18	20.02
5.4	115.2	87.9	27	5.75	3.30	11.18	20.23
5.6	115.4	87.9	28	5.96	3.30	11.18	20.44
5.8	115.6	87.9	29	6.17	3.30	11.18	20.64
6.0	115.8	87.9	30	6.37	3.30	11.18	20.85
6.2	116.0	88.0	31	6.58	3.30	11.18	21.06
6.4	116.2	88.0	32	6.79	3.30	11.18	21.26
6.6	116.4	88.0	33	6.99	3.30	11.18	21.47
6.8	116.6	88.1	34	7.20	3.30	11.18	21.68
7.0	116.9	88.1	35	7.41	3.30	11.18	21.88
7.2	117.1	88.1	36	7.61	3.30	11.18	22.09
7.4	117.3	88.1	37	7.82	3.30	11.18	22.29
7.6	117.5	88.2	38	8.02	3.30	11.18	22.50
7.8	117.8	88.2	39	8.23	3.30	11.18	22.70

Exhibit 2

Case 1 b

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
8.0	118.0	88.2	40	8.43	3.30	11.18	22.91
8.2	118.3	88.3	41	8.63	3.30	11.18	23.11
8.4	118.5	88.3	42	8.84	3.30	11.18	23.31
8.6	118.8	88.3	43	9.04	3.30	11.18	23.52
8.8	119.0	88.4	44	9.24	3.30	11.18	23.72
9.0	119.3	88.4	45	9.45	3.30	11.18	23.92
9.2	119.5	88.4	46	9.65	3.30	11.18	24.12
9.4	119.8	88.5	47	9.85	3.30	11.18	24.33
9.6	120.1	88.5	48	10.05	3.30	11.18	24.53
9.8	120.3	88.6	49	10.25	3.30	11.18	24.73
10.0	120.6	88.6	50	10.45	3.30	11.18	24.93
10.2	120.9	88.6	51	10.65	3.30	11.18	25.13
10.4	121.2	88.7	52	10.85	3.30	11.18	25.33
10.6	121.4	88.7	53	11.05	3.30	11.18	25.53
10.8	121.7	88.7	54	11.25	3.30	11.18	25.73
11.0	122.0	88.8	55	11.45	3.30	11.18	25.93
11.2	122.3	88.8	56	11.65	3.29	11.18	26.13
11.4	122.6	88.9	57	11.85	3.29	11.18	26.33
11.6	122.9	88.9	58	12.05	3.29	11.18	26.52
11.8	123.2	88.9	59	12.25	3.29	11.18	26.72
12.0	123.5	89.0	60	12.45	3.29	11.18	26.92
12.2	123.8	89.0	61	12.64	3.29	11.18	27.12
12.4	124.1	89.1	62	12.84	3.29	11.18	27.32
12.6	124.4	89.1	63	13.04	3.29	11.18	27.51
12.8	124.7	89.1	64	13.24	3.29	11.18	27.71
13.0	125.0	89.2	65	13.43	3.29	11.18	27.91
13.2	125.3	89.2	66	13.63	3.29	11.18	28.10
13.4	125.6	89.3	67	13.82	3.29	11.18	28.30
13.6	125.9	89.3	68	14.02	3.29	11.18	28.49
13.8	126.2	89.3	69	14.21	3.29	11.18	28.69
14.0	126.5	89.4	70	14.41	3.29	11.18	28.88
14.2	126.8	89.4	71	14.60	3.29	11.18	29.08
14.4	127.2	89.5	72	14.80	3.29	11.18	29.27
14.6	127.5	89.5	73	14.99	3.29	11.18	29.47
14.8	127.8	89.6	74	15.19	3.29	11.18	29.66
15.0	128.1	89.6	75	15.38	3.29	11.18	29.85
15.2	128.4	89.6	76	15.57	3.29	11.18	30.05
15.4	128.8	89.7	77	15.77	3.29	11.18	30.24
15.6	129.1	89.7	78	15.96	3.29	11.18	30.43

Exhibit 2

Case 1 b

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
15.8	129.4	89.8	79	16.15	3.29	11.18	30.62
16.0	129.7	89.8	80	16.34	3.29	11.18	30.82
16.2	130.1	89.9	81	16.54	3.29	11.18	31.01
16.4	130.4	89.9	82	16.73	3.29	11.18	31.20
16.6	130.7	90.0	83	16.92	3.29	11.18	31.39
16.8	131.1	90.0	84	17.11	3.29	11.18	31.58
17.0	131.4	90.1	85	17.30	3.29	11.18	31.77
17.2	131.7	90.1	86	17.49	3.29	11.18	31.96
17.4	132.1	90.1	87	17.68	3.29	11.18	32.15
17.6	132.4	90.2	88	17.87	3.29	11.18	32.34
17.8	132.7	90.2	89	18.06	3.29	11.18	32.53
18.0	133.1	90.3	90	18.25	3.29	11.18	32.72
18.2	133.4	90.3	91	18.44	3.29	11.18	32.91
18.4	133.7	90.4	92	18.63	3.29	11.18	33.10
18.6	134.1	90.4	93	18.82	3.29	11.18	33.29
18.8	134.4	90.5	94	19.01	3.29	11.18	33.48
19.0	134.8	90.5	95	19.20	3.29	11.18	33.67
19.2	135.1	90.6	96	19.38	3.29	11.18	33.85
19.4	135.4	90.6	97	19.57	3.29	11.18	34.04
19.6	135.8	90.6	98	19.76	3.29	11.18	34.23
19.8	136.1	90.7	99	19.95	3.29	11.18	34.42
20.0	136.5	90.7	100	20.13	3.29	11.18	34.60
20.2	136.8	90.8	101	20.32	3.29	11.18	34.79
20.4	137.2	90.8	102	20.51	3.29	11.18	34.98
20.6	137.5	90.9	103	20.69	3.29	11.18	35.16
20.8	137.8	90.9	104	20.88	3.29	11.18	35.35
21.0	138.2	91.0	105	21.06	3.29	11.18	35.53
21.2	138.5	91.0	106	21.25	3.29	11.18	35.72
21.4	138.9	91.1	107	21.43	3.29	11.18	35.90
21.6	139.2	91.1	108	21.62	3.29	11.18	36.09
21.8	139.6	91.2	109	21.80	3.29	11.18	36.27
22.0	139.9	91.2	110	21.99	3.29	11.18	36.46
22.2	140.3	91.3	111	22.17	3.29	11.18	36.64
22.4	140.6	91.3	112	22.36	3.29	11.18	36.82
22.6	141.0	91.4	113	22.54	3.29	11.18	37.01
22.8	141.3	91.4	114	22.72	3.29	11.18	37.19
23.0	141.7	91.4	115	22.91	3.29	11.18	37.37
23.2	142.0	91.5	116	23.09	3.29	11.18	37.56
23.4	142.4	91.5	117	23.27	3.29	11.18	37.74

Exhibit 2

Case 1 b

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
23.6	142.7	91.6	118	23.46	3.29	11.18	37.92
23.8	143.1	91.6	119	23.64	3.29	11.18	38.10
24.0	143.4	91.7	120	23.82	3.29	11.18	38.29
24.2	143.8	91.7	121	24.00	3.29	11.18	38.47
24.4	144.1	91.8	122	24.18	3.29	11.18	38.65
24.6	144.5	91.8	123	24.36	3.29	11.18	38.83
24.8	144.8	91.9	124	24.55	3.29	11.18	39.01
25.0	145.2	91.9	125	24.73	3.29	11.18	39.19
25.2	145.5	92.0	126	24.91	3.29	11.18	39.37
25.4	145.9	92.0	127	25.09	3.29	11.18	39.55
25.6	146.2	92.1	128	25.27	3.29	11.18	39.73
25.8	146.6	92.1	129	25.45	3.29	11.18	39.91
26.0	146.9	92.2	130	25.63	3.29	11.18	40.09
26.2	147.3	92.2	131	25.81	3.29	11.18	40.27
26.4	147.6	92.3	132	25.99	3.29	11.18	40.45
26.6	148.0	92.3	133	26.16	3.29	11.18	40.63
26.8	148.3	92.4	134	26.34	3.29	11.18	40.81
27.0	148.7	92.4	135	26.52	3.29	11.18	40.99
27.2	149.0	92.5	136	26.70	3.29	11.18	41.17
27.4	149.4	92.5	137	26.88	3.29	11.18	41.34
27.6	149.7	92.6	138	27.06	3.29	11.18	41.52
27.8	150.1	92.6	139	27.23	3.28	11.18	41.70
28.0	150.4	92.6	140	27.41	3.28	11.18	41.88
28.2	150.8	92.7	141	27.59	3.28	11.18	42.05
28.4	151.1	92.7	142	27.77	3.28	11.18	42.23
28.6	151.5	92.8	143	27.94	3.28	11.18	42.41
28.8	151.8	92.8	144	28.12	3.28	11.18	42.58
29.0	152.2	92.9	145	28.29	3.28	11.18	42.76
29.2	152.5	92.9	146	28.47	3.28	11.18	42.94
29.4	152.9	93.0	147	28.65	3.28	11.18	43.11
29.6	153.2	93.0	148	28.82	3.28	11.18	43.29
29.8	153.6	93.1	149	29.00	3.28	11.18	43.46
30.0	153.9	93.1	150	29.17	3.28	11.18	43.64
30.2	154.3	93.2	151	29.35	3.28	11.18	43.81
30.4	154.6	93.2	152	29.52	3.28	11.18	43.99
30.6	155.0	93.3	153	29.70	3.28	11.18	44.16
30.8	155.3	93.3	154	29.87	3.28	11.18	44.34
31.0	155.7	93.4	155	30.05	3.28	11.18	44.51
31.2	156.0	93.4	156	30.22	3.28	11.18	44.68

Exhibit 2

Case 1 b

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
31.4	156.4	93.5	157	30.39	3.28	11.18	44.86
31.6	156.7	93.5	158	30.57	3.28	11.18	45.03
31.8	157.1	93.6	159	30.74	3.28	11.18	45.20
32.0	157.4	93.6	160	30.91	3.28	11.18	45.38
32.2	157.8	93.7	161	31.09	3.28	11.18	45.55
32.4	158.1	93.7	162	31.26	3.28	11.18	45.72
32.6	158.4	93.7	163	31.43	3.28	11.18	45.89
32.8	158.8	93.8	164	31.61	3.28	11.18	46.07
33.0	159.1	93.8	165	31.78	3.28	11.18	46.24
33.2	159.5	93.9	166	31.95	3.28	11.18	46.41
33.4	159.8	93.9	167	32.12	3.28	11.18	46.58
33.6	160.2	94.0	168	32.29	3.28	11.18	46.75
33.8	160.5	94.0	169	32.46	3.28	11.18	46.93
34.0	160.9	94.1	170	32.64	3.28	11.18	47.10
34.2	161.2	94.1	171	32.81	3.28	11.18	47.27
34.4	161.6	94.2	172	32.98	3.28	11.18	47.44
34.6	161.9	94.2	173	33.15	3.28	11.18	47.61
34.8	162.3	94.3	174	33.32	3.28	11.18	47.78
35.0	162.6	94.3	175	33.49	3.28	11.18	47.95
35.2	162.9	94.4	176	33.66	3.28	11.18	48.12
35.4	163.3	94.4	177	33.83	3.28	11.18	48.29
35.6	163.6	94.5	178	34.00	3.28	11.18	48.46
35.8	164.0	94.5	179	34.17	3.28	11.18	48.63
36.0	164.3	94.6	180	34.34	3.28	11.18	48.80
36.2	164.7	94.6	181	34.51	3.28	11.18	48.97
36.4	165.0	94.6	182	34.67	3.28	11.18	49.13
36.6	165.4	94.7	183	34.84	3.28	11.18	49.30
36.8	165.7	94.7	184	35.01	3.28	11.18	49.47
37.0	166.0	94.8	185	35.18	3.28	11.18	49.64
37.2	166.4	94.8	186	35.35	3.28	11.18	49.81
37.4	166.7	94.9	187	35.52	3.28	11.18	49.97
37.6	167.1	94.9	188	35.68	3.28	11.18	50.14
37.8	167.4	95.0	189	35.85	3.28	11.18	50.31
38.0	167.7	95.0	190	36.02	3.28	11.18	50.48
38.2	168.1	95.1	191	36.19	3.28	11.18	50.64
38.4	168.4	95.1	192	36.35	3.28	11.18	50.81
38.6	168.8	95.2	193	36.52	3.28	11.18	50.98
38.8	169.1	95.2	193	36.50	3.28	11.18	50.95
39.0	169.4	95.3	193	36.47	3.28	11.18	50.93

Exhibit 2

Case 1 b

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
40.0	171.0	95.5	193	36.36	3.28	11.18	50.82
41.0	172.3	95.7	193	36.25	3.28	11.18	50.71
42.0	173.5	95.8	193	36.14	3.28	11.18	50.60
43.0	174.5	96.0	193	36.04	3.28	11.18	50.49
44.0	175.4	96.1	193	35.93	3.28	11.18	50.38
45.0	176.2	96.2	193	35.82	3.27	11.18	50.28
46.0	176.9	96.3	193	35.72	3.27	11.18	50.17
47.0	177.5	96.4	193	35.62	3.27	11.18	50.07
48.0	178.0	96.5	193	35.51	3.27	11.18	49.97
49.0	178.4	96.5	193	35.41	3.27	11.18	49.87
50.0	178.8	96.6	193	35.31	3.27	11.18	49.77
51.0	179.1	96.6	193	35.22	3.27	11.18	49.67
52.0	179.3	96.6	193	35.12	3.27	11.18	49.57
53.0	179.5	96.7	193	35.02	3.27	11.18	49.47
54.0	179.7	96.7	193	34.93	3.27	11.18	49.37
55.0	179.8	96.7	193	34.83	3.27	11.18	49.28
56.0	179.9	96.7	193	34.74	3.27	11.18	49.19
57.0	180.0	96.7	193	34.64	3.27	11.18	49.09
58.0	180.0	96.7	193	34.55	3.27	11.18	49.00
59.0	180.0	96.7	193	34.46	3.27	11.18	48.91
60.0	180.0	96.7	193	34.37	3.27	11.18	48.82

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
0.0	107.7	91.1	0	0.00	7.87	11.18	19.05
0.2	107.7	91.1	1	0.22	7.87	11.18	19.27
0.4	107.7	91.1	2	0.43	7.87	11.18	19.49
0.6	107.7	91.1	3	0.65	7.87	11.18	19.70
0.8	107.7	91.1	4	0.87	7.87	11.18	19.92
1.0	107.8	91.1	5	1.08	7.87	11.18	20.13
1.2	107.8	91.1	6	1.30	7.87	11.18	20.35
1.4	107.9	91.1	7	1.52	7.87	11.18	20.56
1.6	107.9	91.1	8	1.73	7.86	11.18	20.78
1.8	108.0	91.2	9	1.95	7.86	11.18	20.99
2.0	108.1	91.2	10	2.16	7.86	11.18	21.20
2.2	108.1	91.2	11	2.37	7.86	11.18	21.42
2.4	108.2	91.2	12	2.59	7.86	11.18	21.63
2.6	108.3	91.2	13	2.80	7.86	11.18	21.84
2.8	108.4	91.2	14	3.01	7.86	11.18	22.05
3.0	108.5	91.2	15	3.23	7.86	11.18	22.26
3.2	108.6	91.2	16	3.44	7.86	11.18	22.47
3.4	108.7	91.2	17	3.65	7.86	11.18	22.69
3.6	108.8	91.3	18	3.86	7.85	11.18	22.90
3.8	108.9	91.3	19	4.07	7.85	11.18	23.11
4.0	109.1	91.3	20	4.28	7.85	11.18	23.32
4.2	109.2	91.3	21	4.49	7.85	11.18	23.53
4.4	109.3	91.3	22	4.70	7.85	11.18	23.73
4.6	109.4	91.3	23	4.91	7.85	11.18	23.94
4.8	109.6	91.4	24	5.12	7.85	11.18	24.15
5.0	109.7	91.4	25	5.33	7.85	11.18	24.36
5.2	109.9	91.4	26	5.54	7.85	11.18	24.57
5.4	110.0	91.4	27	5.75	7.85	11.18	24.78
5.6	110.2	91.4	28	5.96	7.84	11.18	24.98
5.8	110.3	91.5	29	6.17	7.84	11.18	25.19
6.0	110.5	91.5	30	6.37	7.84	11.18	25.40
6.2	110.6	91.5	31	6.58	7.84	11.18	25.60
6.4	110.8	91.5	32	6.79	7.84	11.18	25.81
6.6	110.9	91.5	33	6.99	7.84	11.18	26.01
6.8	111.1	91.6	34	7.20	7.84	11.18	26.22
7.0	111.2	91.6	35	7.41	7.84	11.18	26.42
7.2	111.4	91.6	36	7.61	7.84	11.18	26.63
7.4	111.6	91.6	37	7.82	7.84	11.18	26.83
7.6	111.7	91.7	38	8.02	7.83	11.18	27.04
7.8	111.9	91.7	39	8.23	7.83	11.18	27.24

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
8.0	112.1	91.7	40	8.43	7.83	11.18	27.44
8.2	112.2	91.7	41	8.63	7.83	11.18	27.64
8.4	112.4	91.7	42	8.84	7.83	11.18	27.85
8.6	112.6	91.8	43	9.04	7.83	11.18	28.05
8.8	112.8	91.8	44	9.24	7.83	11.18	28.25
9.0	112.9	91.8	45	9.45	7.83	11.18	28.45
9.2	113.1	91.8	46	9.65	7.83	11.18	28.65
9.4	113.3	91.9	47	9.85	7.83	11.18	28.85
9.6	113.5	91.9	48	10.05	7.82	11.18	29.06
9.8	113.6	91.9	49	10.25	7.82	11.18	29.26
10.0	113.8	91.9	50	10.45	7.82	11.18	29.46
10.2	114.0	92.0	51	10.65	7.82	11.18	29.66
10.4	114.2	92.0	52	10.85	7.82	11.18	29.85
10.6	114.4	92.0	53	11.05	7.82	11.18	30.05
10.8	114.5	92.0	54	11.25	7.82	11.18	30.25
11.0	114.7	92.1	55	11.45	7.82	11.18	30.45
11.2	114.9	92.1	56	11.65	7.82	11.18	30.65
11.4	115.1	92.1	57	11.85	7.82	11.18	30.85
11.6	115.3	92.1	58	12.05	7.81	11.18	31.04
11.8	115.5	92.2	59	12.25	7.81	11.18	31.24
12.0	115.7	92.2	60	12.45	7.81	11.18	31.44
12.2	115.8	92.2	61	12.64	7.81	11.18	31.64
12.4	116.0	92.2	62	12.84	7.81	11.18	31.83
12.6	116.2	92.3	63	13.04	7.81	11.18	32.03
12.8	116.4	92.3	64	13.24	7.81	11.18	32.22
13.0	116.6	92.3	65	13.43	7.81	11.18	32.42
13.2	116.8	92.3	66	13.63	7.81	11.18	32.61
13.4	117.0	92.4	67	13.82	7.81	11.18	32.81
13.6	117.1	92.4	68	14.02	7.81	11.18	33.00
13.8	117.3	92.4	69	14.21	7.80	11.18	33.20
14.0	117.5	92.4	70	14.41	7.80	11.18	33.39
14.2	117.7	92.5	71	14.60	7.80	11.18	33.59
14.4	117.9	92.5	72	14.80	7.80	11.18	33.78
14.6	118.1	92.5	73	14.99	7.80	11.18	33.97
14.8	118.3	92.5	74	15.19	7.80	11.18	34.17
15.0	118.5	92.6	75	15.38	7.80	11.18	34.36
15.2	118.6	92.6	76	15.57	7.80	11.18	34.55
15.4	118.8	92.6	77	15.77	7.80	11.18	34.74
15.6	119.0	92.6	78	15.96	7.80	11.18	34.94
15.8	119.2	92.7	79	16.15	7.79	11.18	35.13

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
16.0	119.4	92.7	80	16.34	7.79	11.18	35.32
16.2	119.6	92.7	81	16.54	7.79	11.18	35.51
16.4	119.8	92.8	82	16.73	7.79	11.18	35.70
16.6	120.0	92.8	83	16.92	7.79	11.18	35.89
16.8	120.1	92.8	84	17.11	7.79	11.18	36.08
17.0	120.3	92.8	85	17.30	7.79	11.18	36.27
17.2	120.5	92.9	86	17.49	7.79	11.18	36.46
17.4	120.7	92.9	87	17.68	7.79	11.18	36.65
17.6	120.9	92.9	88	17.87	7.79	11.18	36.84
17.8	121.1	92.9	89	18.06	7.78	11.18	37.03
18.0	121.3	93.0	90	18.25	7.78	11.18	37.22
18.2	121.5	93.0	91	18.44	7.78	11.18	37.40
18.4	121.6	93.0	92	18.63	7.78	11.18	37.59
18.6	121.8	93.0	93	18.82	7.78	11.18	37.78
18.8	122.0	93.1	94	19.01	7.78	11.18	37.97
19.0	122.2	93.1	95	19.20	7.78	11.18	38.15
19.2	122.4	93.1	96	19.38	7.78	11.18	38.34
19.4	122.6	93.1	97	19.57	7.78	11.18	38.53
19.6	122.8	93.2	98	19.76	7.78	11.18	38.71
19.8	123.0	93.2	99	19.95	7.77	11.18	38.90
20.0	123.1	93.2	100	20.13	7.77	11.18	39.09
20.2	123.3	93.2	101	20.32	7.77	11.18	39.27
20.4	123.5	93.3	102	20.51	7.77	11.18	39.46
20.6	123.7	93.3	103	20.69	7.77	11.18	39.64
20.8	123.9	93.3	104	20.88	7.77	11.18	39.83
21.0	124.1	93.3	105	21.06	7.77	11.18	40.01
21.2	124.3	93.4	106	21.25	7.77	11.18	40.20
21.4	124.4	93.4	107	21.43	7.77	11.18	40.38
21.6	124.6	93.4	108	21.62	7.77	11.18	40.57
21.8	124.8	93.4	109	21.80	7.77	11.18	40.75
22.0	125.0	93.5	110	21.99	7.76	11.18	40.93
22.2	125.2	93.5	111	22.17	7.76	11.18	41.12
22.4	125.4	93.5	112	22.36	7.76	11.18	41.30
22.6	125.5	93.5	113	22.54	7.76	11.18	41.48
22.8	125.7	93.6	114	22.72	7.76	11.18	41.66
23.0	125.9	93.6	115	22.91	7.76	11.18	41.85
23.2	126.1	93.6	116	23.09	7.76	11.18	42.03
23.4	126.3	93.6	117	23.27	7.76	11.18	42.21
23.6	126.5	93.7	118	23.46	7.76	11.18	42.39
23.8	126.6	93.7	119	23.64	7.76	11.18	42.57

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
24.0	126.8	93.7	120	23.82	7.75	11.18	42.75
24.2	127.0	93.7	121	24.00	7.75	11.18	42.93
24.4	127.2	93.8	122	24.18	7.75	11.18	43.12
24.6	127.4	93.8	123	24.36	7.75	11.18	43.30
24.8	127.5	93.8	124	24.55	7.75	11.18	43.48
25.0	127.7	93.8	125	24.73	7.75	11.18	43.66
25.2	127.9	93.9	126	24.91	7.75	11.18	43.84
25.4	128.1	93.9	127	25.09	7.75	11.18	44.01
25.6	128.3	93.9	128	25.27	7.75	11.18	44.19
25.8	128.5	93.9	129	25.45	7.75	11.18	44.37
26.0	128.6	94.0	130	25.63	7.74	11.18	44.55
26.2	128.8	94.0	131	25.81	7.74	11.18	44.73
26.4	129.0	94.0	132	25.99	7.74	11.18	44.91
26.6	129.2	94.0	133	26.16	7.74	11.18	45.09
26.8	129.4	94.1	134	26.34	7.74	11.18	45.26
27.0	129.5	94.1	135	26.52	7.74	11.18	45.44
27.2	129.7	94.1	136	26.70	7.74	11.18	45.62
27.4	129.9	94.1	137	26.88	7.74	11.18	45.80
27.6	130.1	94.2	138	27.06	7.74	11.18	45.97
27.8	130.2	94.2	139	27.23	7.74	11.18	46.15
28.0	130.4	94.2	140	27.41	7.74	11.18	46.33
28.2	130.6	94.2	141	27.59	7.73	11.18	46.50
28.4	130.8	94.3	142	27.77	7.73	11.18	46.68
28.6	131.0	94.3	143	27.94	7.73	11.18	46.85
28.8	131.1	94.3	144	28.12	7.73	11.18	47.03
29.0	131.3	94.3	145	28.29	7.73	11.18	47.21
29.2	131.5	94.4	146	28.47	7.73	11.18	47.38
29.4	131.7	94.4	147	28.65	7.73	11.18	47.56
29.6	131.8	94.4	148	28.82	7.73	11.18	47.73
29.8	132.0	94.4	149	29.00	7.73	11.18	47.90
30.0	132.2	94.4	150	29.17	7.73	11.18	48.08
30.2	132.4	94.5	151	29.35	7.72	11.18	48.25
30.4	132.5	94.5	152	29.52	7.72	11.18	48.43
30.6	132.7	94.5	153	29.70	7.72	11.18	48.60
30.8	132.9	94.5	154	29.87	7.72	11.18	48.77
31.0	133.1	94.6	155	30.05	7.72	11.18	48.95
31.2	133.2	94.6	156	30.22	7.72	11.18	49.12
31.4	133.4	94.6	157	30.39	7.72	11.18	49.29
31.6	133.6	94.6	158	30.57	7.72	11.18	49.47
31.8	133.8	94.7	159	30.74	7.72	11.18	49.64

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
32.0	133.9	94.7	160	30.91	7.72	11.18	49.81
32.2	134.1	94.7	161	31.09	7.72	11.18	49.98
32.4	134.3	94.7	162	31.26	7.71	11.18	50.15
32.6	134.5	94.8	163	31.43	7.71	11.18	50.33
32.8	134.6	94.8	164	31.61	7.71	11.18	50.50
33.0	134.8	94.8	165	31.78	7.71	11.18	50.67
33.2	135.0	94.8	166	31.95	7.71	11.18	50.84
33.4	135.1	94.9	167	32.12	7.71	11.18	51.01
33.6	135.3	94.9	168	32.29	7.71	11.18	51.18
33.8	135.5	94.9	169	32.46	7.71	11.18	51.35
34.0	135.7	94.9	170	32.64	7.71	11.18	51.52
34.2	135.8	94.9	171	32.81	7.71	11.18	51.69
34.4	136.0	95.0	172	32.98	7.70	11.18	51.86
34.6	136.2	95.0	173	33.15	7.70	11.18	52.03
34.8	136.3	95.0	174	33.32	7.70	11.18	52.20
35.0	136.5	95.0	175	33.49	7.70	11.18	52.37
35.2	136.7	95.1	176	33.66	7.70	11.18	52.54
35.4	136.9	95.1	177	33.83	7.70	11.18	52.71
35.6	137.0	95.1	178	34.00	7.70	11.18	52.88
35.8	137.2	95.1	179	34.17	7.70	11.18	53.05
36.0	137.4	95.2	180	34.34	7.70	11.18	53.21
36.2	137.5	95.2	181	34.51	7.70	11.18	53.38
36.4	137.7	95.2	182	34.67	7.70	11.18	53.55
36.6	137.9	95.2	183	34.84	7.69	11.18	53.72
36.8	138.0	95.2	184	35.01	7.69	11.18	53.88
37.0	138.2	95.3	185	35.18	7.69	11.18	54.05
37.2	138.4	95.3	186	35.35	7.69	11.18	54.22
37.4	138.5	95.3	187	35.52	7.69	11.18	54.39
37.6	138.7	95.3	188	35.68	7.69	11.18	54.55
37.8	138.9	95.4	189	35.85	7.69	11.18	54.72
38.0	139.0	95.4	190	36.02	7.69	11.18	54.89
38.2	139.2	95.4	191	36.19	7.69	11.18	55.05
38.4	139.4	95.4	192	36.35	7.69	11.18	55.22
38.6	139.5	95.5	193	36.52	7.69	11.18	55.38
38.8	139.7	95.5	193	36.50	7.68	11.18	55.36
39.0	139.9	95.5	193	36.47	7.68	11.18	55.34
39.2	140.0	95.5	193	36.45	7.68	11.18	55.31
39.4	140.2	95.5	193	36.43	7.68	11.18	55.29
39.6	140.3	95.6	193	36.41	7.68	11.18	55.27
39.8	140.4	95.6	193	36.39	7.68	11.18	55.24

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
40.0	140.5	95.6	193	36.36	7.68	11.18	55.22
40.2	140.7	95.6	193	36.34	7.68	11.18	55.20
40.4	140.8	95.6	193	36.32	7.68	11.18	55.18
40.6	140.9	95.6	193	36.30	7.68	11.18	55.15
40.8	141.0	95.7	193	36.27	7.67	11.18	55.13
41.0	141.1	95.7	193	36.25	7.67	11.18	55.11
41.2	141.2	95.7	193	36.23	7.67	11.18	55.08
41.4	141.2	95.7	193	36.21	7.67	11.18	55.06
41.6	141.3	95.7	193	36.19	7.67	11.18	55.04
41.8	141.4	95.7	193	36.17	7.67	11.18	55.02
42.0	141.5	95.7	193	36.14	7.67	11.18	54.99
42.2	141.5	95.7	193	36.12	7.67	11.18	54.97
42.4	141.6	95.7	193	36.10	7.67	11.18	54.95
42.6	141.6	95.7	193	36.08	7.67	11.18	54.93
42.8	141.7	95.8	193	36.06	7.67	11.18	54.90
43.0	141.7	95.8	193	36.04	7.66	11.18	54.88
43.2	141.8	95.8	193	36.01	7.66	11.18	54.86
43.4	141.8	95.8	193	35.99	7.66	11.18	54.84
43.6	141.9	95.8	193	35.97	7.66	11.18	54.81
43.8	141.9	95.8	193	35.95	7.66	11.18	54.79
44.0	142.0	95.8	193	35.93	7.66	11.18	54.77
44.2	142.0	95.8	193	35.91	7.66	11.18	54.75
44.4	142.0	95.8	193	35.89	7.66	11.18	54.73
44.6	142.0	95.8	193	35.87	7.66	11.18	54.70
44.8	142.1	95.8	193	35.85	7.66	11.18	54.68
45.0	142.1	95.8	193	35.82	7.66	11.18	54.66
45.2	142.1	95.8	193	35.80	7.65	11.18	54.64
45.4	142.1	95.8	193	35.78	7.65	11.18	54.62
45.6	142.2	95.8	193	35.76	7.65	11.18	54.59
45.8	142.2	95.8	193	35.74	7.65	11.18	54.57
46.0	142.2	95.8	193	35.72	7.65	11.18	54.55
46.2	142.2	95.8	193	35.70	7.65	11.18	54.53
46.4	142.2	95.8	193	35.68	7.65	11.18	54.51
46.6	142.2	95.8	193	35.66	7.65	11.18	54.49
46.8	142.2	95.8	193	35.64	7.65	11.18	54.46
47.0	142.2	95.8	193	35.62	7.65	11.18	54.44
47.2	142.2	95.8	193	35.60	7.64	11.18	54.42
47.4	142.3	95.8	193	35.58	7.64	11.18	54.40
47.6	142.3	95.8	193	35.56	7.64	11.18	54.38
47.8	142.3	95.8	193	35.54	7.64	11.18	54.36

Exhibit 3

Case 2

Time After 100 Hour Decay Time [hr]	SFP Temp [°F]	CCW Supply Temp [°F]	Fuel Assemblies Offloaded	Decay Heat Of Last Full Core Offload [MBtu/hr]	Decay Heat of Last Permanent Discharge [MBtu/hr]	Long-Term Decay Heat [MBtu/hr]	Total Decay Heat [MBtu/hr]
48.0	142.3	95.8	193	35.51	7.64	11.18	54.34
48.2	142.3	95.8	193	35.49	7.64	11.18	54.31
48.4	144.7		193	35.47	7.64	11.18	54.29
48.6	147.1		193	35.45	7.64	11.18	54.27
48.8	149.4		193	35.43	7.64	11.18	54.25
49.0	151.8		193	35.41	7.64	11.18	54.23
49.2	154.2		193	35.39	7.64	11.18	54.21
49.4	156.6		193	35.37	7.63	11.18	54.19
49.6	159.0		193	35.35	7.63	11.18	54.17
49.8	161.4		193	35.33	7.63	11.18	54.15
50.0	163.8		193	35.31	7.63	11.18	54.13
50.2	166.2		193	35.29	7.63	11.18	54.11
50.4	168.6		193	35.27	7.63	11.18	54.08
50.6	171.0		193	35.25	7.63	11.18	54.06
50.8	173.3		193	35.24	7.63	11.18	54.04
51.0	175.7		193	35.22	7.63	11.18	54.02
51.2	178.1		193	35.20	7.63	11.18	54.00
51.4	180.5		193	35.18	7.63	11.18	53.98
51.6	182.9		193	35.16	7.62	11.18	53.96
51.8	185.3		193	35.14	7.62	11.18	53.94
52.0	187.6		193	35.12	7.62	11.18	53.92
52.2	190.0		193	35.10	7.62	11.18	53.90
52.4	192.4		193	35.08	7.62	11.18	53.88
52.6	194.8		193	35.06	7.62	11.18	53.86
52.8	197.2		193	35.04	7.62	11.18	53.84
53.0	199.5		193	35.02	7.62	11.18	53.82
53.2	201.9		193	35.00	7.62	11.18	53.80
53.4	204.3		193	34.98	7.62	11.18	53.78
53.6	206.6		193	34.96	7.62	11.18	53.76
53.8	209.0		193	34.94	7.61	11.18	53.74
54.0	210.9		193	34.93	7.61	11.18	53.72

ATTACHMENT 2A TO C0501-03

TECHNICAL SPECIFICATIONS PAGES
MARKED TO SHOW PROPOSED CHANGES

REVISED PAGES
UNIT 1

3/4 9-3

B 3/4 9-1
B 3/4 9-2

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3 The reactor shall be subcritical for at least ~~168 hours~~.:

a. 100 hours

b. 148 hours

APPLICABILITY: Specification 3.9.3.a - From September 15 through June 15, ~~D~~during movement of irradiated fuel in the reactor pressure vessel

Specification 3.9.3.b - From June 16 through September 14, during movement of irradiated fuel in the reactor pressure vessel

ACTION:

With the reactor subcritical for less than the required time~~168 hours~~, suspend all operations involving movement of irradiated fuel in the reactor pressure vessel. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.3 The reactor shall be determined to have been subcritical as required~~for at least 168 hours~~ by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analyses. The value of 0.95 or less for K_{eff} includes a 1 percent delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2000 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The boron concentration requirement of specification 3.9.1.b has been conservatively increased to 2400 ppm to agree with the minimum concentration of the RWST.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products~~.~~ ~~This~~ The 100-hour decay time is consistent with the assumptions used in the fuel handling accident analyses~~.~~ and bounds the 148-hour decay time.

The minimum requirement for reactor subcriticality also ensures that the decay time is consistent with that assumed in the spent fuel pool cooling analysis. Including specific dates for applicability supports the lake temperature assumptions. The 100-hour decay time is based on a lake temperature of 77.8°F, whereas the 148-hour decay time is based on a design basis lake temperature of 85°F. Lake temperature data from 1968 through 1998 show that the lake temperature was below 77°F from September 15 through June 15. This supports the temperature of 77.8°F that is assumed in the spent fuel pool cooling analysis. Use of thirty years of data to select maximum temperature is consistent with Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants." Since core offload is a controlled evolution, applying a calendar time frame for applicability is acceptable.

A core offload has the potential to occur during both applicability time frames. The following guidance is provided to ensure the correct decay time is applied. For September outages, the date of initiation of core offload should be used to determine the required decay time. For June outages, 148 hours should be added to the date and time of reactor subcriticality. The resulting date should be used to determine the required decay time. This is to prevent initiating a core offload on June 15 after 100 hours and inadvertently continuing to offload on June 16 with the reactor having been subcritical less than 148 hours. In all other cases, the logged subcriticality date should be used to determine applicability.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment building penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

The specific guidelines to allow both airlock doors to remain open during CORE ALTERATIONS were developed to ensure that the assumptions for restricting radioactive leakage to the environment remained valid. The guidelines established for maintaining both airlock doors open include: 1) one door in each airlock is OPERABLE, 2) refueling cavity level is greater than 23 feet above the fuel, and 3) a designated individual is continuously available to close an airlock door (if required). An OPERABLE airlock door consists of a door capable of being closed and secured. Additionally, cables or hoses transversing the airlock must be designed in a manner that allows timely removal (e.g., quick disconnects). The requirement that the refueling cavity level is greater than 23 feet above the fuel ensures consistency with the assumptions of Specifications 3/4.9.10 and 3/4.9.11.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity conditions during CORE ALTERATIONS.

3/4.9.6 MANIPULATOR CRANE OPERABILITY

The OPERABILITY requirements for the manipulator cranes ensure that: 1) manipulator cranes will be used for movement of control rods and fuel assemblies 2) each crane has sufficient load capacity to lift a control rod or fuel assembly and 3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations.

3/4.9.7 CRANE TRAVEL - SPENT FUEL STORAGE BUILDING

The restriction on movement of loads in excess of 2,500 lbs. over other fuel assemblies in the storage pool ensures that, in the event of a dropped load, 1) the activity release will be limited to that contained in a single fuel assembly, and 2) any possible distortion of fuel in the storage racks will not result in a critical array. The 2,500-lb. load restriction is based on the combined nominal weight of a fuel assembly, a control rod assembly, and an associated fuel handling tool. Release of activity from a single fuel assembly is consistent with the assumption for the analysis for a fuel handling accident.

The restriction on movements of loads in excess of the impact energy limit, which is based on the kinetic energy of a dropped fuel assembly and control rod assembly from 15" above the fuel storage rack, is to bound other loads.

Prohibiting loads greater than 2,500 pounds or loads at heights that would exceed the kinetic energy impact limit allows flexibility in the movements of fuel and other relatively light loads, while providing reasonable assurance that the consequences of a fuel handling accident will not be exceeded.

3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

The requirement that at least one residual heat removal (RHR) loop be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification.

The requirement to have two RHR loops OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange ensures that a single failure of the operating RHR loop will not result in a complete loss of residual heat removal capability. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling. Thus, in the event of a failure of the operating RHR loop, adequate time is provided to initiate emergency procedures to cool the core.

3/4.9.9 CONTAINMENT PURGE AND EXHAUST ISOLATION SYSTEM

The OPERABILITY of this system ensures that the containment vent and purge penetrations will be automatically isolated upon detection of high radiation levels within the containment. The OPERABILITY of this system is required to restrict the release of radioactive material from the containment atmosphere to the environment.

ATTACHMENT 2B TO C0501-03

TECHNICAL SPECIFICATIONS PAGES
MARKED TO SHOW PROPOSED CHANGES

REVISED PAGES
UNIT 2

3/4 9-3

B 3/4 9-1
B 3/4 9-2

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3 The reactor shall be subcritical for at least ~~168 hours.~~:

a. 100 hours

b. 148 hours

APPLICABILITY: Specification 3.9.3.a - From September 15 through June 15, ~~D~~during movement of irradiated fuel in the reactor pressure vessel~~.~~

Specification 3.9.3.b - From June 16 through September 14, during movement of irradiated fuel in the reactor pressure vessel

ACTION:

With the reactor subcritical for less than the required time~~168 hours~~, suspend all operations involving movement of irradiated fuel in the reactor pressure vessel. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.3 The reactor shall be determined to have been subcritical as required~~for at least 168 hours~~ by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analysis. The value of 0.95 or less for K_{eff} includes a 1 percent delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2000 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The boron concentration requirement of specification 3.9.1.b has been conservatively increased to 2400 ppm to agree with the minimum concentration of the RWST.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. ~~This~~ The 100-hour decay time is consistent with the assumptions used in the fuel handling accident analysis~~.~~ and bounds the 148-hour decay time.

The minimum requirement for reactor subcriticality also ensures that the decay time is consistent with that assumed in the spent fuel pool cooling analysis. Including specific dates for applicability supports the lake temperature assumptions. The 100-hour decay time is based on a lake temperature of 77.8°F, whereas the 148-hour decay time is based on a design basis lake temperature of 85°F. Lake temperature data from 1968 through 1998 show that the lake temperature was below 77°F from September 15 through June 15. This supports the temperature of 77.8°F that is assumed in the spent fuel pool cooling analysis. Use of thirty years of data to select maximum temperature is consistent with Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants." Since core offload is a controlled evolution, applying a calendar time frame for applicability is acceptable.

A core offload has the potential to occur during both applicability time frames. The following guidance is provided to ensure the correct decay time is applied. For September outages, the date of initiation of core offload should be used to determine the required decay time. For June outages, 148 hours should be added to the date and time of reactor subcriticality. The resulting date should be used to determine the required decay time. This is to prevent initiating a core offload on June 15 after 100 hours and inadvertently continuing to offload on June 16 with the reactor having been subcritical less than 148 hours. In all other cases, the logged subcriticality date should be used to determine applicability.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment building penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

The specific guidelines to allow both airlock doors to remain open during CORE ALTERATIONS were developed to ensure that the assumptions for restricting radioactive leakage to the environment remained valid. The guidelines established for maintaining both airlock doors open include: 1) one door in each airlock is OPERABLE, 2) refueling cavity level is greater than 23 feet above the fuel, and 3) a designated individual is continuously available to close an

airlock door (if required). An OPERABLE airlock door consists of a door capable of being closed and secured. Additionally, cables or hoses transversing the airlock must be designed in a manner that allows timely removal (e.g., quick disconnects). The requirement that the refueling cavity level is greater than 23 feet above the fuel ensures consistency with the assumptions of Specifications 3/4.9.10 and 3/4.9.11.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity conditions during CORE ALTERATIONS.

3/4.9.6 MANIPULATOR CRANE OPERABILITY

The OPERABILITY requirements for the manipulator cranes ensure that: 1) manipulator cranes will be used for movement of control rods and fuel assemblies, 2) each crane has sufficient load capacity to lift a control rod or fuel assembly, and 3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations.

3/4.9.7 CRANE TRAVEL - SPENT FUEL STORAGE BUILDING

The restriction on movement of loads in excess of 2,500 lbs. over other fuel assemblies in the storage pool ensures that, in the event of a dropped load, 1) the activity release will be limited to that contained in a single fuel assembly, and 2) any possible distortion of fuel in the storage racks will not result in a critical array. The 2,500-lb. load restriction is based on the combined nominal weight of a fuel assembly, a control rod assembly, and an associated fuel handling tool. Release of activity from a single fuel assembly is consistent with the assumption for the analysis for a fuel handling accident.

The restriction on movements of loads in excess of the impact energy limit, which is based on the kinetic energy of a dropped fuel assembly and control rod assembly from 15" above the fuel storage rack, is to bound other loads.

Prohibiting loads greater than 2,500 pounds or loads at heights that would exceed the kinetic energy impact limit allows flexibility in the movements of fuel and other relatively light loads, while providing reasonable assurance that the consequences of a fuel handling accident will not be exceeded.

3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

The requirement that at least one residual heat removal (RHR) loop be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification.

The requirement to have two RHR loops OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange ensures that a single failure of the operating RHR loop will not result in a complete loss of residual heat removal capability. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling. Thus, in the event of a failure of the operating RHR loop, adequate time is provided to initiate emergency procedures to cool the core.

ATTACHMENT 3A TO C0501-03

PROPOSED TECHNICAL SPECIFICATIONS PAGES

REVISED PAGES
UNIT 1

3/4 9-3

B 3/4 9-1
B 3/4 9-2

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3 The reactor shall be subcritical for at least~~:~~

a. 100 hours

b. 148 hours

APPLICABILITY: Specification 3.9.3.a - From September 15 through June 15, during movement of irradiated fuel in the reactor pressure vessel

Specification 3.9.3.b - From June 16 through September 14, during movement of irradiated fuel in the reactor pressure vessel

ACTION:

With the reactor subcritical for less than the required time, suspend all operations involving movement of irradiated fuel in the reactor pressure vessel. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.3 The reactor shall be determined to have been subcritical as required by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analyses. The value of 0.95 or less for K_{eff} includes a 1 percent delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2000 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The boron concentration requirement of specification 3.9.1.b has been conservatively increased to 2400 ppm to agree with the minimum concentration of the RWST.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products The 100-hour decay time is consistent with the assumptions used in the fuel handling accident analyses and bounds the 148-hour decay time.

The minimum requirement for reactor subcriticality also ensures that the decay time is consistent with that assumed in the spent fuel pool cooling analysis. Including specific dates for applicability supports the lake temperature assumptions. The 100-hour decay time is based on a lake temperature of 77.8°F, whereas the 148-hour decay time is based on a design basis lake temperature of 85°F. Lake temperature data from 1968 through 1998 show that the lake temperature was below 77°F from September 15 through June 15. This supports the temperature of 77.8°F that is assumed in the spent fuel pool cooling analysis. Use of thirty years of data to select maximum temperature is consistent with Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants." Since core offload is a controlled evolution, applying a calendar time frame for applicability is acceptable.

A core offload has the potential to occur during both applicability time frames. The following guidance is provided to ensure the correct decay time is applied. For September outages, the date of initiation of core offload should be used to determine the required decay time. For June outages, 148 hours should be added to the date and time of reactor subcriticality. The resulting date should be used to determine the required decay time. This is to prevent initiating a core offload on June 15 after 100 hours and inadvertently continuing to offload on June 16 with the reactor having been subcritical less than 148 hours. In all other cases, the logged subcriticality date should be used to determine applicability.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment building penetration closure and OPERABILITY ensure that a release of radioactive material within containment will be restricted from leakage to the environment. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE.

The specific guidelines to allow both airlock doors to remain open during CORE ALTERATIONS were developed to ensure that the assumptions for restricting radioactive leakage to the environment remained valid. The guidelines established for maintaining both airlock doors open include: 1) one door in each airlock is OPERABLE, 2) refueling cavity level is greater than 23 feet above the fuel, and 3) a designated individual is continuously available to close an

airlock door (if required). An OPERABLE airlock door consists of a door capable of being closed and secured. Additionally, cables or hoses transversing the airlock must be designed in a manner that allows timely removal (e.g., quick disconnects). The requirement that the refueling cavity level is greater than 23 feet above the fuel ensures consistency with the assumptions of Specifications 3/4.9.10 and 3/4.9.11.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity conditions during CORE ALTERATIONS.

3/4.9.6 MANIPULATOR CRANE OPERABILITY

The OPERABILITY requirements for the manipulator cranes ensure that: 1) manipulator cranes will be used for movement of control rods and fuel assemblies 2) each crane has sufficient load capacity to lift a control rod or fuel assembly and 3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations.

3/4.9.7 CRANE TRAVEL - SPENT FUEL STORAGE BUILDING

The restriction on movement of loads in excess of 2,500 lbs. over other fuel assemblies in the storage pool ensures that, in the event of a dropped load, 1) the activity release will be limited to that contained in a single fuel assembly, and 2) any possible distortion of fuel in the storage racks will not result in a critical array. The 2,500-lb. load restriction is based on the combined nominal weight of a fuel assembly, a control rod assembly, and an associated fuel handling tool. Release of activity from a single fuel assembly is consistent with the assumption for the analysis for a fuel handling accident.

The restriction on movements of loads in excess of the impact energy limit, which is based on the kinetic energy of a dropped fuel assembly and control rod assembly from 15" above the fuel storage rack, is to bound other loads.

Prohibiting loads greater than 2,500 pounds or loads at heights that would exceed the kinetic energy impact limit allows flexibility in the movements of fuel and other relatively light loads, while providing reasonable assurance that the consequences of a fuel handling accident will not be exceeded.

3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

The requirement that at least one residual heat removal (RHR) loop be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification.

The requirement to have two RHR loops OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange ensures that a single failure of the operating RHR loop will not result in a complete loss of residual heat removal capability. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling. Thus, in the event of a failure of the operating RHR loop, adequate time is provided to initiate emergency procedures to cool the core.

3/4.9.9 CONTAINMENT PURGE AND EXHAUST ISOLATION SYSTEM

The OPERABILITY of this system ensures that the containment vent and purge penetrations will be automatically isolated upon detection of high radiation levels within the containment. The OPERABILITY of this system is required to restrict the release of radioactive material from the containment atmosphere to the environment.

ATTACHMENT 3B TO C0501-03

PROPOSED TECHNICAL SPECIFICATIONS PAGES

REVISED PAGES
UNIT 2

3/4 9-3

B 3/4 9-1
B 3/4 9-2

DECAY TIME

LIMITING CONDITION FOR OPERATION

3.9.3 The reactor shall be subcritical for at least:

a. 100 hours

b. 148 hours

APPLICABILITY: Specification 3.9.3.a - From September 15 through June 15, during movement of irradiated fuel in the reactor pressure vessel.

Specification 3.9.3.b - From June 16 through September 14, during movement of irradiated fuel in the reactor pressure vessel

ACTION:

With the reactor subcritical for less than the required time, suspend all operations involving movement of irradiated fuel in the reactor pressure vessel. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.3 The reactor shall be determined to have been subcritical as required by verification of the date and time of subcriticality prior to movement of irradiated fuel in the reactor pressure vessel.

3/4.9.1 BORON CONCENTRATION

The limitations on reactivity conditions during REFUELING ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. These limitations are consistent with the initial conditions assumed for the boron dilution incident in the accident analysis. The value of 0.95 or less for K_{eff} includes a 1 percent delta k/k conservative allowance for uncertainties. Similarly, the boron concentration value of 2000 ppm or greater includes a conservative uncertainty allowance of 50 ppm boron. The boron concentration requirement of specification 3.9.1.b has been conservatively increased to 2400 ppm to agree with the minimum concentration of the RWST.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor pressure vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. The 100-hour decay time is consistent with the assumptions used in the fuel handling accident analysis and bounds the 148-hour decay time.

The minimum requirement for reactor subcriticality also ensures that the decay time is consistent with that assumed in the spent fuel pool cooling analysis. Including specific dates for applicability supports the lake temperature assumptions. The 100-hour decay time is based on a lake temperature of 77.8°F, whereas the 148-hour decay time is based on a design basis lake temperature of 85°F. Lake temperature data from 1968 through 1998 show that the lake temperature was below 77°F from September 15 through June 15. This supports the temperature of 77.8°F that is assumed in the spent fuel pool cooling analysis. Use of thirty years of data to select maximum temperature is consistent with Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants." Since core offload is a controlled evolution, applying a calendar time frame for applicability is acceptable.

A core offload has the potential to occur during both applicability time frames. The following guidance is provided to ensure the correct decay time is applied. For September outages, the date of initiation of core offload should be used to determine the required decay time. For June outages, 148 hours should be added to the date and time of reactor subcriticality. The resulting date should be used to determine the required decay time. This is to prevent initiating a core offload on June 15 after 100 hours and inadvertently continuing to offload on June 16 with the reactor having been subcritical less than 148 hours. In all other cases, the logged subcriticality date should be used to determine applicability.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

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3/4.9.5 COMMUNICATIONS

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3/4.9.6 MANIPULATOR CRANE OPERABILITY

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3/4.9.7 CRANE TRAVEL - SPENT FUEL STORAGE BUILDING

The restriction on movement of loads in excess of 2,500 lbs. over other fuel assemblies in the storage pool ensures that, in the event of a dropped load, 1) the activity release will be limited to that contained in a single fuel assembly, and 2) any possible distortion of fuel in the storage racks will not result in a critical array. The 2,500-lb. load restriction is based on the combined nominal weight of a fuel assembly, a control rod assembly, and an associated fuel handling tool. Release of activity from a single fuel assembly is consistent with the assumption for the analysis for a fuel handling accident.

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3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

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The requirement to have two RHR loops OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange ensures that a single failure of the operating RHR loop will not result in a complete loss of residual heat removal capability. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling. Thus, in the event of a failure of the operating RHR loop, adequate time is provided to initiate emergency procedures to cool the core.

ATTACHMENT 4 TO C0501-03

NO SIGNIFICANT HAZARDS CONSIDERATION EVALUATION

Indiana Michigan Power Company (I&M) has evaluated this proposed amendment and determined that it does not involve a significant hazard. According to 10 CFR 50.92(c), a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

1. involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated;

2. create the possibility of a new or different kind of accident from any previously analyzed; or

3. involve a significant reduction in a margin of safety.

The proposed changes revise Technical Specification (T/S) 3/4.9.3, "Decay Time," to allow the start of core offload at 100 hours after reactor subcriticality between September 15 and June 15 and 148 hours after reactor subcriticality, between June 16 and September 14. The difference in the required decay times is dependent on the time of year due to the lake temperature assumed in the spent fuel pool (SFP) cooling analysis. T/S 3/4.9.3 currently prohibits fuel movement in the reactor pressure vessel until the reactor has been subcritical for at least 168 hours.

I&M has used American Concrete Institute ACI-349-97, "Code Requirements for Nuclear Safety Related Concrete Structures," for the SFP structural evaluation. ACI-318-63, "Building Code Requirements for Reinforced Concrete," which is described in Section 5.2, "Containment Structure," of the Donald C. Cook Nuclear Plant Updated Final Safety Analysis Report, does not provide any limitations with respect to maximum short term concrete temperature. Therefore, I&M is requesting approval to use ACI-349-97 to establish acceptability of the peak SFP temperature with respect to the concrete.

I&M also proposes format changes that improve appearance and are not intended to introduce other changes.

The determination that the criteria set forth in 10 CFR 50.92 are met for this amendment request is indicated below.

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

The proposed changes allow core offload to occur sooner after subcriticality, which affects the isotopic make-up of the fuel to be offloaded as well as the amount of decay heat that is present from the fuel at the time of offload. The proposed changes do not involve a significant increase in the probability of occurrence of an accident previously evaluated. The accident previously evaluated that is associated with fuel movement is the fuel handling accident. Allowing the fuel to be offloaded as early as 100 hours after subcriticality does not impact the manner in which the fuel is offloaded. The accident initiator is the dropping of the assembly. Since earlier offload does not affect fuel handling, there is no increase in the probability of occurrence of the accident. The T/S page format changes are administrative in nature have no impact. Thus, the probability of occurrence of an accident previously evaluated is not changed.

The proposed changes do not involve a significant increase in the consequences of an accident previously evaluated. The accident previously evaluated that is associated with fuel movement is the fuel handling accident. The time frame in which the assembly is moved has been evaluated against the 10 CFR 100 dose limits and 10 CFR 50.67 control room dose limits. All dose limits are met with the lower decay heat times. Thus, there is no significant increase in consequences. Therefore, the probability of occurrence or the consequences of accidents previously evaluated are not increased.

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

The proposed changes allow core offload to occur sooner after subcriticality, which affects the isotopic make-up of the fuel to be offloaded as well as the amount of decay heat that is present from the fuel at the time of offload. The isotopic makeup of the fuel and the amount of decay heat produced by the fuel do not currently initiate any accident. A change in the isotopic makeup of the fuel at the time of core offload or an increase in the decay heat produced by the fuel being offloaded will not cause the initiation of any accident. There is no change to the manner in which fuel is being handled or in the equipment used to offload or store the fuel. The additional decay heat load has been evaluated and does not create the possibility of an accident as the integrity of the spent fuel pool is maintained. The T/S page format changes are administrative in nature have no impact. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

The margin of safety pertinent to the proposed changes is the dose consequences resulting from a fuel handling accident. The shorter decay time prior to fuel movement has been evaluated against the 10 CFR 100 in the current licensing basis and all limits continue to be met. In addition, the integrity of the spent fuel pool has been demonstrated with the additional decay heat load. The change in isotopic makeup and additional heat load do not impact any safety settings and do not cause any safety limit to not be met. Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

In summary, based upon the above evaluation, I&M has concluded that the proposed amendment involves no significant hazards consideration.

ATTACHMENT 5 TO C0501-03

ENVIRONMENTAL ASSESSMENT

Indiana Michigan Power Company (I&M) has evaluated this license amendment request against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. I&M has determined that this license amendment request meets the criteria for a categorical exclusion set forth in 10 CFR 51.22(c)(9). This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50 that changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or that changes an inspection or a surveillance requirement, and the amendment meets the following specific criteria.

(i) The amendment involves no significant hazards consideration.

As demonstrated in Attachment 4, this proposed amendment does not involve significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

The proposed change will not result in a significant change in the types or significant increase in the amounts of any effluents released offsite. The decay time only allows fuel assemblies to be moved to the spent fuel pool sooner after reactor subcriticality has been achieved. While the fuel being moved to the spent fuel pool has a higher decay heat load and different isotopic makeup initially, these changes do not cause a significant change in any effluent that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed changes will not result in significant changes in the operation or configuration of the facility. There will be no change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposal result in any significant change in the normal radiation levels within the plant. Therefore, there will be no significant increase in individual or cumulative occupational radiation exposure resulting from this change.