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February 4, 2000

C0200-09
10 CFR 50.54(f)

Docket Nos.: 50-315
50-316

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
REQUESTED INFORMATION
GENERIC LETTER (GL) 97-04, ASSURANCE OF SUFFICIENT NET POSITIVE SUCTION HEAD FOR EMERGENCY CORE COOLING AND CONTAINMENT HEAT REMOVAL PUMPS

References:
1) I&M to NRC letter AEP:NRC:1280A, "Requested Information - Generic Letter (GL) 97-04 Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps," dated January 30, 1998
2) NRC to I&M letter, "Donald C. Cook Nuclear Plant, Units 1 and 2 - Closeout of Generic Letter 97-04, 'Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps,' dated October 7, 1997 (TAC Nos. M99980 and M99981)," dated January 7, 1999

This correspondence provides a revised response to GL 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps." Indiana Michigan Power (I&M) originally responded to GL 97-04 in Reference 1.

In Reference 2, the Nuclear Regulatory Commission (NRC) stated that it could not determine whether the then current Net Positive Suction Head (NPSH) analyses are accurate and requested that a revised GL 97-04 response be submitted once the Cook Nuclear Plant design basis NPSH analysis is found to be correct and sufficient.

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Accordingly, I&M has reviewed and revised the NPSH calculations in accordance with I&M procedures governing performance of design basis calculations. The revised calculations indicate that significant margin exists for each of the pumps under worst-case analyzed conditions. The attachment to this letter provides a revised response to the generic letter based on the revised NPSH calculations. This submittal supersedes in its entirety the Reference 1 submittal. The UFSAR will be revised to reflect the results of the revised calculations in accordance with the requirements of 10 CFR 50.71(e).

Should you have any questions, please contact Mr. Robert C. Godley, Director of Regulatory Affairs, at (616) 466-2698.

Sincerely,

M. W. Rencheck
Vice President Nuclear Engineering

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 4th DAY OF February, 1999

Notary Public

My Commission Expires PATRICIA A. EDDIE
NOTARY PUBLIC - BERRIEN CO. MICH
MY COMMISSION EXPIRES
NOVEMBER - 5 - 2000

\dms

Attachment

c: J. E. Dyer
MDEQ - DW & RPD, w/o attachment
NRC Resident Inspector
R. Whale, w/o attachment

bc: T. P. Beilman
FOLIO
R. W. Gaston, w/o attachment
R. J. Grumbir
S. B. Haggerty
D. W. Jenkins/Hopkins & Sutter, w/o attachment
W. T. MacRae/ M. J. Gumns, w/o attachment
M. W. Marano
M. W. Rencheck/S. A. Greenlee/D. R. Hafer, w/o attachment
J. F. Stang, Jr., - NRC Washington, DC

ATTACHMENT TO C0200-09

Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, provides the following revised response to GL 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps." The pumps within the scope of Generic Letter (GL) 97-04 are the containment spray (CTS), residual heat removal (RHR), safety injection (SI) and centrifugal charging (CC) pumps.

GL 97-04 Request No. 1

"Specify the general methodology used to calculate the head loss associated with the ECCS suction strainers."

I&M Response to Request No. 1

The suction strainer head loss used in the net positive suction head (NPSH) calculations was established based on empirical data obtained from containment recirculation sump model testing performed by Alden Research Laboratory (ARL). Results of the sump model demonstration tests conducted by ARL were submitted to the Nuclear Regulatory Commission (NRC) by American Electric Power Service Corporation's letter number AEP:NRC:00112, "Results of Containment Sump Model Testing," dated December 20, 1978. Testing methodology and results were described in the ARL report, "Hydraulic Model Investigation of Vortexing and Swirl Within a Reactor Containment Recirculation Sump; Donald C. Cook Nuclear Power Station," dated September 1978, attached to that letter.

Containment recirculation sump screen blockage of up to 50% at maximum flow rates was modeled during the tests. The sump model configuration tested by ARL consisted of a single coarse grating and a single fine mesh screen. The ARL sump model testing included various plate blockage schemes at the containment recirculation sump entrance and included empirical head loss data at the containment recirculation sump screen. Loss coefficients were provided for various test schemes. Loss coefficient data from Table 10 of the ARL test report indicates that the highest observed head loss across the sump is 0.77 ft. This data reflects 50% sump screen blockage.

The existing sump configuration is somewhat different from that modeled in the containment sump demonstration tests in that a second coarse grating is installed after the fine mesh screen. Using the ARL test model data, the measured head loss was conservatively adjusted to account for the second coarse grating, yielding an additional head loss of 0.23 ft., and for the differences in fluid density between the ARL sump model test temperature and post accident containment sump temperature, yielding a gain in head of 0.03 ft. The resultant value for sump strainer loss used in the NPSH calculations is 0.97 ft. (0.77 + 0.23 – 0.03 = 0.97 ft.).

GL 97-04 Request No. 2

"Identify the required NPSH and the available NPSH."

I&M Response to Request No. 2

The required NPSH (NPSHR) and most-limiting available NPSH (NPSHA) for the RHR and CTS pumps, which take suction from either the refueling water storage tank (RWST) during injection or directly from the containment recirculation sump during recirculation, were determined for various combinations of pumps and valve alignments. The worst-case configurations for the RHR and CTS pumps were established based on comparison of the results of the cases evaluated.

The worst case during recirculation with the pump suction taken from the containment recirculation sump occurs when one RHR pump is treated as the single failure for the case and the containment recirculation sump level is at its minimum value (602' 10"). The worst-case values during injection were also determined for the RHR and CTS pumps, but were found to be bounded by the recirculation values with respect to NPSH margin.

The worst-case values during recirculation, and the worst-case values during injection with the pump suction taken from the RWST, are as follows:

Worst-Case RHR/CTS Pump NPSH During Recirculation (Suction from Sump)

Pump	NPSHR	NPSHA	Margin
Unit 1 East RHR	18.5 ft	30.6 ft	12.1 ft
Unit 1 West RHR	19.0 ft	28.0 ft	9.0 ft
Unit 1 East CTS	9.3 ft	29.5 ft	20.2 ft
Unit 1 West CTS	9.2 ft	29.6 ft	20.4 ft
Unit 2 East RHR	18.7 ft	30.6 ft	11.9 ft
Unit 2 West RHR	18.8 ft	26.2 ft	7.4 ft
Unit 2 East CTS	9.2 ft	29.9 ft	20.7 ft
Unit 2 West CTS	9.2 ft	28.7 ft	19.5 ft

Worst-Case RHR/CTS Pump NPSH During Injection (Suction from RWST)

Pump	NPSHR	NPSHA	Margin
Unit 1 East RHR	11.4 ft	39.5 ft	28.1 ft
Unit 1 West RHR	11.8 ft	39.8 ft	28.0 ft
Unit 1 East CTS	9.3 ft	53.9 ft	44.6 ft
Unit 1 West CTS	9.2 ft	53.8 ft	44.6 ft
Unit 2 East RHR	13.6 ft	35.4 ft	21.8 ft
Unit 2 West RHR	13.6 ft	34.9 ft	21.3 ft
Unit 2 East CTS	9.3 ft	54.9 ft	45.6 ft
Unit 2 West CTS	9.3 ft	53.9 ft	44.6 ft

The NPSHR and most-limiting NPSHA for the SI and CC pumps, which take suction from either the RWST during injection or directly from the discharge of the RHR pumps during recirculation, were determined for various combinations of pumps and valve alignments. The worst case during recirculation with the pump suction taken from the RHR pump occurs when one RHR pump is treated as the single failure, the remaining RHR pump is modeled as operating with 10% degraded head, and the containment recirculation sump level is at its minimum value. The 10% degraded head for the RHR pump is in accordance with the ASME Code, Section XI and the CNP Inservice Testing Program.

The worst-case values during injection were also determined for the SI and CC pumps, and were found to be bounding with respect to NPSH margin. The worst case NPSH for the SI pumps during injection occurred when the SI pump flows were artificially established (forced) at approximately 700 gpm with the other emergency core cooling system (ECCS) pumps operating at their calculated flow rates (this forced flow rate case was established to permit comparison with NPSH results in the UFSAR for the SI pumps at similar flow rates). The worst case NPSH for each CC pump during injection occurred when the other CC pump was treated as the single failure with the other ECCS pumps operating at their calculated flow rates.

The worst-case values during recirculation, and the worst-case values during injection with the pump suction taken from the RWST, are as follows:

Worst-Case SI/CC Pump NPSH During Recirculation (Suction from RHR Pump)

Pump	NPSHR	NPSHA	Margin
Unit 1 North SI	13.5 ft	61.9 ft	48.4 ft
Unit 1 South SI	13.6 ft	58.4 ft	44.8 ft
Unit 1 East CC	17.3 ft	53.2 ft	35.9 ft
Unit 1 West CC	17.3 ft	53.2 ft	35.9 ft
Unit 2 North SI	14.3 ft	58.4 ft	44.1 ft
Unit 2 South SI	14.5 ft	55.5 ft	41.0 ft
Unit 2 East CC	17.3 ft	50.8 ft	33.5 ft
Unit 2 West CC	17.3 ft	50.4 ft	33.1 ft

Worst-Case SI/CC Pump NPSH During Injection (Suction from RWST)

Pump	NPSHR	NPSHA	Margin
Unit 1 North SI	23.1 ft	40.6 ft	17.5 ft
Unit 1 South SI	23.0 ft	40.1 ft	17.1 ft
Unit 1 East CC	24.2 ft	39.9 ft	15.7 ft
Unit 1 West CC	24.2 ft	39.7 ft	15.5 ft
Unit 2 North SI	23.0 ft	40.3 ft	17.3 ft
Unit 2 South SI	23.1 ft	39.9 ft	16.8 ft
Unit 2 East CC	22.8 ft	40.6 ft	17.8 ft
Unit 2 West CC	22.8 ft	39.7 ft	16.9 ft

These results reaffirm that significant NPSH margin continues to exist for each pump.

The NPSHR tabulated above is obtained from the individual ECCS and CTS pump performance curves at the calculated pump flow for the specific case under evaluation. The NPSHA tabulated above is calculated using the general methodology detailed below.

The equation for calculating NPSHA is:

$$NPSHA = h_p + h_{st} - h_{vpa} - h_{fs}$$

where:

h_p = absolute pressure (in feet) on the surface of the liquid supply,

h_{st} = static elevation difference (in feet) between the liquid level supply and the pump impeller eye,

h_{vpa} = head (in feet) corresponding to the vapor pressure of the pumped liquid at temperature, and

h_{fs} = head in feet of suction line losses

No credit is taken for containment overpressure. For conservatism, the minimum allowable primary containment internal pressure listed in the CNP Unit 1 and Unit 2 Technical Specification 3/4.6.1.4 (-1.5 psig) is used as the absolute pressure (13.2 psia) in the calculations.

The static height of the containment recirculation sump liquid level above the ECCS or CTS pump suction centerline or impeller eye (h_{st}) corresponds to the minimum containment recirculation sump water level assumed in the CNP accident analyses. This level corresponds to elevation 602'10." The ARL containment recirculation sump model tests confirmed this to be a level that conservatively precludes air entrainment and vortexing of the ECCS and CTS pumps.

The RWST water level used in the calculations of NPSHA for the RHR and CTS pumps during injection is the elevation at the top of the 24-inch horizontal outlet piping from the RWST. This level is based on procedural requirements that prevent operation of these pumps below this level. The RWST water level used in the calculation of NPSHA for the SI and CC pumps during injection is the centerline of the 24-inch horizontal outlet piping from the RWST. This water level is based on consideration being given to operation of these pumps with the RWST at this slightly reduced RWST water level. Operation of these pumps down to this level provides additional time for transfer of these pumps from the injection alignment to containment sump recirculation alignment. Substantial NPSH margin exists for operation of the SI and CC pumps at this slightly reduced RWST water level. The acceptability of operation of these pumps at this lowered level is being verified with regard to vortex formation.

The head corresponding to the vapor pressure of the containment recirculation sump liquid at the temperature being pumped (h_{vpa}) is a function of the temperature of the fluid. The maximum containment recirculation sump fluid temperature identified in the CNP accident analyses of 190°F is used. This value bounds both CNP units.

Suction line head losses include entrance losses and friction losses (h_{fs}) through pipe, valves, and fittings associated with the ECCS or CTS pump being evaluated. The head losses considered in this term are friction losses based on pipe roughness, pipe length, velocity head losses, head loss associated with sump screen, sump outlet pipe entrance losses, and number and type of valves and fittings in the suction piping.

GL 97-04 Request No. 3

"Specify whether the current design-basis NPSH analysis differs from the most recent analysis reviewed and approved by the NRC for which a safety evaluation was issued."

I&M Response to Request No. 3

The current design basis NPSH analysis differs from the most recent analysis reviewed and approved by the NRC for which a Safety Evaluation Report (SER) was issued. The most recent

SERs germane to NPSH requirements for the ECCS and CTS pumps are the SER dated September 10, 1973, for Unit 1 and the SER (Supplement 7) dated December 23, 1977, for Unit 2. The information upon which the NRC based these SERs (i.e., the licensing basis) is discussed below.

Unit 1 Licensing Basis

The applicable portion of the Unit 1 SER stated, "The applicant has provided information to demonstrate that adequate net positive suction head (NPSH) would be available at the inlets to both the containment spray pump and the residual heat removal pump during the injection and recirculation phases of post-accident operation without taking credit for increased containment pressure. This meets the requirements of Regulatory Guide 1.1, 'Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps'."
I&M's review of the licensing correspondence history concludes this SER statement was based on information presented in the Final Safety Analysis Report (FSAR[1]) at the time of operating license issuance for Unit 1. FSAR Section 6.1, "Engineered Safety Features - Criteria," Table 6.1-1, "Net Positive Suction Heads for Post-DBA Operation Pumps," and Section 6.3, "Engineered Safety Features - Containment Spray Systems," included information regarding NPSHA and NPSHR for various pumps, including the SI, CC, RHR and CTS pumps.

Unit 2 Licensing Basis

The applicable portion of the Unit 2 SER (Supplement 7) stated, "The applicants have performed an analysis to demonstrate that the emergency core cooling system pumps would have adequate net positive suction head margin during all modes of operation. The staff has reviewed this analysis and found it acceptable." The SER also discussed performance of pre-operational tests to confirm pump performance, system suction and discharge flow resistance, and demonstrate adequate net positive suction head.

I&M's review of the licensing correspondence history concludes this SER statement was based on information presented in the FSAR at the time of operating license issuance for Unit 2, including a response to FSAR Question 212.29 regarding Unit 2 sump NPSH requirements for the RHR and CTS pumps. FSAR Section 6.1, "Engineered Safety Features - Criteria," Table 6.1-1, "Net Positive Suction Heads for Post-DBA Operation Pumps," and Section 6.3, "Engineered Safety Features - Containment Spray Systems," included information regarding NPSHA and NPSHR for various pumps, including the SI, CC, RHR and CTS pumps.

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[1] References to the FSAR mean the FSAR in existence at the time of license issuance. This does not mean the UFSAR periodically updated in accordance with the requirements of 10 CFR 50.71e.

The following discussion provides a comparison of the licensing basis information available at the time of issuance of the above identified SERs for Units 1 and 2 and the current calculations.

Alignments Evaluated

The FSAR original NPSH analysis for Unit 1 and Unit 2 for the SI and CC pumps addressed alignment of the pumps to the RWST as the suction source (injection). The FSAR original NPSH analysis for Unit 1 and Unit 2 for the RHR and CTS pumps addressed alignment of the pumps to the containment recirculation sump as the suction source (recirculation). It was not clearly stated that the information represents worst-case alignments. The revised calculations include these same cases, as well as others. Based on the results of the multiple cases considered in the revised calculations, the FSAR represented alignments are confirmed to be the worst-case alignments for the pumps with respect to NPSH margin.

The FSAR did not include an analysis of the NPSH for the SI or CC pumps when supplied from the RHR pumps that are aligned to take suction from the containment recirculation sump (piggyback mode of operation). A calculation was submitted in response to FSAR Question 212.29 by a Westinghouse letter (AEW-7020) from M. H. Judkis to Edson G. Case dated October 13, 1977. The NPSH for the RHR and CTS pumps were evaluated under a set of conditions which included the SI and CC pump flows when aligned to the RHR pumps in piggyback mode. Although these flows were included in the NPSH evaluation for the RHR and CTS pumps, the NPSH for the SI and CC pumps were not evaluated. The revised calculations do include these alignments and identify that injection mode (aligned to RWST) rather than the piggyback mode of operation for the SI and CC pumps is the worst-case NPSH alignment for these pumps.

Single Failure Assumptions

With the exception of the evaluation of the NPSH for Unit 2 RHR and CTS pumps provided in response to FSAR Question 212.29, the FSAR did not identify assumptions regarding single failures that were considered in the analysis. The calculation provided in response to FSAR Question 212.29 included the single failure of one RHR pump. The results of this calculation with respect to the NPSH for the RHR and CTS pumps is not significantly different than that presented in the base NPSH case for these pumps. The revised calculations include considerations of single failures of pumps as well as 10% degradation of the RHR pump head for cases including the piggyback mode of operation for the SI and CC pumps.

Ice Melt Assumptions

The FSAR does not identify assumptions regarding ice melt inventory that were considered in the original NPSH analysis. The revised analysis takes credit for sufficient ice melting to maintain the minimum containment recirculation sump water level of 602'10" assumed in the calculation. In NRC to I&M letter "Donald C. Cook Nuclear Plant, Units 1 and 2 - Issuance of Amendments Re: Ice Weight and Surveillance Requirements (TAC Nos. M99742 and M99743)," dated January 2, 1998, the NRC approved the crediting of melted ice as well as other sources (i.e., leakage from the reactor coolant system and accumulator inventory) when determining minimum containment recirculation sump water inventory.

In I&M to NRC letter C1099-08, "Technical Specification Change Request - Containment Recirculation Sump Water Inventory," dated October 1, 1999, I&M submitted a revised analysis crediting ice melt for determining minimum containment recirculation sump water inventory. In this latest submittal, I&M concludes that sufficient water will reside in the containment recirculation sump to prevent vortexing of the RHR and CTS pumps during recirculation. As demonstrated by the revised analysis, a minimum containment recirculation sump level greater than or equal to 602'10" would be obtained for Mode 1 loss-of-coolant accident (LOCA) events. However, certain Mode 3 LOCA events result in short-duration minimum containment recirculation sump levels slightly less than 602'10", on the order of 602'4". This is because of the lower mass and energy release from the reactor coolant system experienced during a Mode 3 LOCA and the resultant decrease in the ice condenser ice melt rate. However, overall RHR and CTS flow required for mitigation of a Mode 3 LOCA is less than the maximum flows used in the original containment recirculation sump demonstration tests. As demonstrated in the submittal, minimum containment recirculation sump levels below 602'10" are acceptable to prevent vortexing in the containment recirculation sump at flows less than the maximum flows used in the original containment recirculation sump demonstration tests. For Mode 3 LOCA events, the analyses demonstrate that the minimum containment recirculation sump levels of approximately 602'4" are still sufficient to prevent vortexing at the reduced RHR and CTS flow rates expected. The impact on NPSH margins during Mode 3 LOCA events is negligible because of the reduced RHR and CTS flow requirements. The NRC approved the above license amendments on December 13, 1999.

Containment Pressure Assumptions

The FSAR did not take credit for containment overpressure in the analysis. A containment pressure of one atmosphere (14.7 psia) was assumed. The revised calculations use a reduced pressure of 13.2 psia in the calculation of NPSH for the limiting case for each pump. This value is based on the minimum containment pressure permitted by the Technical Specifications of -1.5 psig.

Fluid Temperature Assumptions

The FSAR used two different values for the containment recirculation sump water in the NPSH calculations for the RHR and CTS pumps during the recirculation phase. The first case, applicable to Units 1 and 2, used the value of 160°F as the water temperature. An additional case, applicable to Unit 2 only, used 190°F as the water temperature. The revised calculations for both Units 1 and 2 used 190°F as the containment recirculation sump water temperature. The value of 190°F bounds the containment recirculation sump water temperature anticipated under design basis accident conditions for both units.

The FSAR used 100°F as the value for the RWST water temperature for calculating NPSH for the SI and CC pumps during the injection phase. The revised calculations use the value of 105°F for the RWST temperature. The existing CNP Technical Specifications do not specify an upper limit for RWST temperature. A Technical Specification upper limit of 100°F for the RWST temperature has been proposed for both CNP units in I&M to NRC letter C1099-08, dated October 1, 1999. The value of 105°F for RWST water temperature conservatively bounds the proposed Technical Specification limit of 100°F. The NRC approved the above license amendments on December 13, 1999.

Flow Rates Evaluated

The FSAR presented values for flow rate in the original NPSH analysis for the RHR and CTS pumps during the recirculation phase. The value was 4500 gpm for the RHR pumps. The revised calculations also evaluated the NPSH for the RHR pumps (operating alone) at a flow rate of approximately 4500 gpm per pump but determined that this case does not result in the worst-case NPSH for the RHR pumps. The revised calculations determined flow rates for each pump in the individual cases used to determine the worst-case NPSH. The flow rate established in the revised calculations for the worst case NPSH for the RHR pumps ranged between 4416 gpm and 4491 gpm.

The value presented in the FSAR was 3200 gpm as the flow rate for the CTS pumps. The revised calculations also evaluated the NPSH for the CTS pumps (operating alone) at a flow rate of approximately 3200 gpm per pump but determined that this case does not result in the worst-case NPSH for the CTS pumps. The revised calculations determined flow rates for each pump in the individual cases used to determine the worst-case NPSH. The flow rate established in the revised calculations for the worst case NPSH for the CTS pumps ranged between 3266 gpm and 3314 gpm.

An additional evaluation applicable to Unit 2 only was provided in response to FSAR Question 212.29. This evaluation uses higher flow rates for the RHR and CTS pumps during the recirculation phase. A value of 5050 gpm was used as the flow rate for the RHR pumps and a value of 3600 gpm was used as the flow rate for the CTS pumps. However, these flow rates were based on operation of the RHR pumps with crossties between the two trains of RHR open. The revised calculation does not evaluate NPSH at these elevated flow rates because operation with crossties open is not allowed by current procedures and these flow rates exceed the maximum flow rates achievable at the minimum system resistance.

The FSAR uses the value of 700 gpm for the SI pumps during the injection phase. The revised calculations uses pump specific values for the SI pumps. These values range between approximately 699.5 gpm and 700.4 gpm. These flow rate values bound the maximum flow rates achievable at the minimum system resistance for each specific SI pump. The impact on NPSH of the minor difference in the new flow rates and the FSAR flow rates is negligible.

The FSAR uses the value of 550 gpm for the CC pumps during the injection phase. The revised calculations use values of approximately 570 gpm (570.3 -573.7) as the flow rate for the CC pumps. These flow rate values bound the maximum flow rates achievable at the minimum system resistance for each specific CC pump.

NPSH Margin (NPSHA - NPSHR) Comparison

The following table provides a comparison of the minimum NPSH margin (NPSHA - NPSHR) for the SI, CC, RHR and CTS pumps between the FSAR values and the revised calculations.

Pump/Water Source	**Original FSAR NPSH margin (NPSHA - NPSHR)**	**Revised Calculation Worst-Case[2] NPSH Margin (NPSHA - NPSHR)**
Safety Injection/ (RWST)	10.6 ft	16.8 ft
Centrifugal Charging/ (RWST)	8.5 ft	15.5 ft
Residual Heat Removal/ (containment recirculation sump)	12 ft	7.4 ft
Containment Spray/ (containment recirculation sump)	21 ft	19.5 ft

The results of the revised calculations show significant NPSH margin exists for each of the pumps. Although the indicated RHR and CTS pump margin values are lower than those originally presented in the FSAR, this is principally the result of the additional conservative assumptions used in their derivation. The use of the value for containment pressure of -1.5 psig by itself reduces the calculated NPSHA by approximately 3.5 ft, and the use of 190°F instead of 160°F for the temperature of the pumped water reduces the calculated NPSHA by approximately 10.5 ft.

2 These values represent the worst-case for both D.C. Cook Units.

GL 97-04 Request No. 4

"Specify whether containment overpressure (i.e., containment pressure above the vapor pressure of the sump or suppression pool fluid) was credited in the calculation of available NPSH. Specify the amount of overpressure needed and the minimum overpressure available."

I&M Response to Request No. 4

No credit is taken for containment overpressure. The minimum allowable primary containment internal pressure listed in the CNP Unit 1 and Unit 2 Technical Specification 3/4.6.1.4 (-1.5 psig) is used as the absolute pressure (13.2 psia) in the NPSH calculations.

GL 97-04 Request No. 5

"When containment overpressure is credited in the calculation of available NPSH, confirm that an appropriate containment pressure analysis was done to establish the minimum containment pressure."

I&M Response to Request No. 5

Containment overpressure is not credited in the NPSH calculations.