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50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana M 05000316
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SUBJECT: Application for amends to licenses DPR-58 & DPR-74,revising containment recirculation sump water inventory.Calculation & non-proprietary WCAP-15302 rept also encl.

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See WCAP-15302
See Proposed Change To Tech Specs.

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AMERICAN ELECTRIC POWER

C1099-08
10 CFR 50.90

Docket Nos.: 50-315
50-316

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October 1, 1999

Donald C. Cook Nuclear Plant Units 1 and 2
TECHNICAL SPECIFICATION CHANGE REQUEST
CONTAINMENT RECIRCULATION SUMP WATER INVENTORY

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 has determined that, for certain small break loss-of-coolant accident scenarios, there may not be sufficient containment recirculation sump water inventory to support continued operation of the emergency core cooling system and containment spray system pumps during and following switchover to cold leg recirculation.

Resolution of this issue consists of a combination of physical plant modifications, new analyses of containment recirculation sump inventory, and resultant changes to the accident analyses to ensure sufficient water inventory in the containment recirculation sump. These planned modifications and analyses result in the changes to the T/S proposed in this submittal. The physical plant modifications and analyses resulting in the proposed T/S changes resolve Confirmatory Action Letter No. RIII-97-011, Item 1, "Recirculation Sump Inventory/Containment Dead Ended Compartments."

A public meeting was held on July 12, 1999, involving I&M representatives and Nuclear Regulatory Commission/Nuclear Reactor Regulation staff. The purpose of this meeting was for I&M to present the analyses and proposed physical



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modifications to resolve the containment recirculation sump minimum inventory issue. Following this meeting, I&M received comments from a member of the public concerning the technical presentation. These comments and the associated I&M responses are provided in Attachment 11.

I&M requests approval of this request by December 13, 1999. This request is based on supporting the development and approval of applicable emergency operating procedures, and allowing sufficient time for licensed operator training on the approved changes prior to entry of Unit 2 into Mode 4.

Copies of this letter and its attachments are being transmitted to the Michigan Public Service Commission and Michigan Department of Public Health, in accordance with the requirements of 10 CFR 50.91.

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

Sincerely,

R. P. Powers

R. P. Powers
Vice President

SWORN TO AND SUBSCRIBED BEFORE ME
THIS 1st DAY OF October, 1999

Patricia A. Eddie
Notary Public

PATRICIA A. EDDIE

My Commission Expires ______

\gew

c: A. C. Bakken, III, w/attachments
J. E. Dyer, w/attachments
MDEQ - DW & RPD
NRC Resident Inspector, w/attachments
R. Whale

Attachments

1. Description and Safety Analysis for the Proposed Changes
2A. Technical Specifications Pages Marked to Show Proposed Changes – Revised Pages - Unit 1
2B. Technical Specifications Pages Marked to Show Proposed Changes – Revised Pages - Unit 2
3A. Proposed Technical Specifications Pages – Revised Pages - Unit 1
3B. Proposed Technical Specifications Pages – Revised Pages - Unit 2
4. No Significant Hazards Consideration Evaluation
5. Environmental Assessment
6. Description and Resolution of Containment Recirculation Sump Water Inventory Issue
7. Fauske & Associates, Incorporated - FAI/99-77, "Containment Sump Level Evaluation for the D.C. Cook Plant"
8. MPR Associates, Incorporated - "Containment Sump Level Design Condition & Failure Effects Analysis for Potential Draindown Scenarios"
9. MPR Associates, Incorporated - "Evaluation of Cook Recirculation Sump Level for Reduced Pump Flow Rates"
10. WCAP-15302, "Donald C. Cook Nuclear Plant Units 1 and 2 Modifications to the Containment Systems Westinghouse Safety Evaluation (SECL 99-076, Revision 3)"
11. Response to July 12, 1999, Public Meeting Technical Comments
12. Commitments

ATTACHMENT 11 TO C1099-08

# RESPONSE TO JULY 12, 1999, PUBLIC MEETING TECHNICAL COMMENTS

A public meeting was held on July 12, 1999, involving Indiana Michigan Power Company (I&M) representatives and Nuclear Regulatory Commission/Nuclear Reactor Regulation staff. The purpose of this meeting was for I&M to present the analyses and proposed physical modifications to resolve the containment recirculation sump minimum inventory issue.

Following this meeting, I&M received several comments from a member of the public concerning the technical presentation. These comments, and the associated I&M responses, are described below.

1. Do the emergency diesel generator load profiles (voltage vs. time) indicate sufficient margin to accommodate the air recirculation fan loads at 144 seconds?

   Yes. Starting the containment air recirculation/hydrogen skimmer (CEQ) fans at 144 seconds will have no effect on the transient study for the emergency diesel generators. The sequencing of loads is completed well before the CEQ fans start. The emergency diesel generator steady state loading evaluates total load throughout the emergency diesel loading sequence. The CEQ fan start time change will not result in a new peak load. Therefore, the results of the steady state calculation will not be affected.

2. Can the emergency diesel generator fuel oil tanks and transfer system accommodate the higher output (i.e., greater fuel consumption)?

   Yes. The emergency diesel generator fuel oil system is designed to support continuous full load operation. As noted above, the change in CEQ fan start time will not change the maximum steady state output. Therefore, the emergency diesel generator fuel oil tanks and transfer system will not be affected. The total fuel consumed in the transient will change slightly due to the potential for a longer fan run time. This will be evaluated as part of the design change process, but will be insignificant compared to the total available fuel oil capacity.

3. If ECCS recirculation switchover occurs at 1900 seconds in both the current design and in the new design, why is more RWST inventory required? (It appears that the RWST flow duration into containment, and therefore the required RWST inventory, is the same in both cases).

   The slide that was used in the presentation detailing the sequence of events following a design basis accident was to highlight the change in event progression as a result of the earlier actuation of the CEQ fans, and mistakenly listed the time for the initiation of switchover to cold leg recirculation as 1900 seconds into the event. The real impact of the

refueling water storage tank (RWST) modifications (RWST overflow line modification and existing instrumentation respan) is that, all other conditions being equal, switchover to cold leg recirculation will occur later in the event.

4. The overall reduction in ice mass corresponds to slightly over 16,000 gallons of water. If AEP elected not to reduce the minimum ice mass per basket, would the RWST inventory need to be increased by 16,000 gallons?

   The 16,000 gallon approximate values for both the increase in RWST contained inventory and the reduction in ice mass are only coincidentally the same. The planned modifications to the RWST result in "new" water injected into the containment prior to initiation of emergency core cooling system (ECCS) recirculation. The actual amount of additional deliverable RWST water is approximately 25,500 gallons. This additional water not only increases water inventory in the containment recirculation sump, but also increases the time for the onset of cold leg recirculation.

   The reduction in ice weight for the ice baskets is unrelated to the short-term portion of the calculations for determining water inventory in the containment recirculation sump. The most important ice-related parameter in the early stages of an event is the rate of ice melt, and the change in minimum ice weight does not impact the ice melt rate. The ice weight change does reasonably impact the ultimate amount of water in the containment recirculation sump under long-term steady-state conditions following a loss-of-coolant accident. However, at that point in time there is more than enough water in the containment recirculation sump to satisfy the minimum required vortexing level.

   Thus, the magnitude of the two changes is unrelated.

ATTACHMENT 12 TO C1099-08

COMMITMENTS

The following table identifies those actions committed to by Indiana Michigan Power Company (I&M) in this submittal. Other actions discussed in the submittal represent intended or planned actions by I&M. They are described to the Nuclear Regulatory Commission (NRC) for the NRC's information and are not regulatory commitments.

| Commitment | Date |
|---|---|
| All the identified modifications in this submittal for a particular unit will be in place for the restart of that unit (either Unit 1 or Unit 2). | Prior to Mode 4 entry for the applicable unit |
| The safety evaluations addressing the structural and mechanical effects of the planned modifications will be documented in the Design Change Packages for the individual modifications. | Prior to Mode 4 entry for the applicable unit |
| The final impact on each affected Emergency Operating Procedure (EOP) will be addressed as part of a comprehensive EOP review, revision, and validation program. | Prior to Mode 4 entry for the applicable unit |
| Net positive suction head (NPSH) calculations for the different operating configurations of the emergency core cooling system (ECCS) pumps and containment spray system (CTS) pumps have been completed. The results of these calculations will be provided in a separate submittal addressing Generic Letter (GL) 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps." | Prior to Mode 4 entry for the applicable unit |

50-315 D. C. COOK 1 IMPCO

ATTACHMENT 1 TO C1099-08 DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

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ATTACHMENT 1 TO C1099-08

DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

## A. Summary of 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 has determined that, for certain small break loss-of-coolant accident (LOCA) scenarios, there may not be sufficient containment recirculation sump water inventory to support continued operation of the emergency core cooling system (ECCS) and containment spray system (CTS) pumps during and following switchover to cold leg recirculation. The cause of this deficiency includes design features of the internal lower containment compartments that cause significant amounts of water to be diverted from, and not to be made available to, the containment recirculation sump. A further description of the technical issues involved with this deficiency, including the original design basis of the containment recirculation sump and the circumstances leading to the discovery and resolution of these issues, is provided in Attachment 6.

I&M has determined that a combination of physical plant modifications, new analyses of containment recirculation sump inventory, and resultant changes to the accident analyses are necessary to ensure sufficient water inventory in the containment recirculation sump. The planned modifications result in increasing the amount of water delivered to the reactor coolant system (RCS) and containment following a LOCA, and increasing the amount of ice melt from the ice condenser during the early stages of a LOCA. New containment recirculation sump inventory analyses have been performed that reflect the planned modifications and verify sufficient inventory is available in the containment recirculation sump following a LOCA. Finally, the accident analyses have been evaluated, and revised as necessary, to reflect the planned modifications and proposed T/S. These planned modifications and analyses result in the following proposed changes to the T/S:

- The required refueling water storage tank (RWST) contained inventory is being increased to address the new minimum deliverable borated water volume used in the containment recirculation sump water inventory analyses and accident analyses. In addition, a conservative maximum RWST solution temperature is being added to the existing T/S to ensure the value used in the accident analyses remains bounding.

- The engineered safety features actuation system (ESFAS) initiating signal and time delay to start the containment air recirculation/hydrogen skimmer (CEQ) fans and open associated valves are being revised to maximize the resultant ice condenser ice melt rate following a LOCA. This ensures sufficient containment recirculation sump water inventory following a small break LOCA.

- The minimum required ice weight in the ice condenser is being revised to reflect the amount of ice used in the containment recirculation sump water inventory analyses and accident analyses. The associated T/S Bases will be revised to state that the minimum ice weight is required as an as-found condition with an appropriate margin to account for uncertainties in weighing of the ice baskets. Previous provisions in the T/S Bases will also be deleted that described reducing the minimum required ice weight or number of ice baskets to be weighed based on operating experience data.

The proposed T/S changes and associated T/S Bases changes provided to assist in the review of the T/S changes are described in detail in Sections B, C, and D of this attachment. T/S pages and associated T/S Bases pages that are marked to show the proposed changes are provided in Attachments 2A and 2B for Unit 1 and Unit 2, respectively. Note that these changes may reflect formatting that differs slightly from the current pages. These format changes are intended to improve appearance and are not intended to introduce other changes. The proposed T/S pages and associated T/S Bases pages, with the changes incorporated, are provided in Attachments 3A and 3B for Unit 1 and Unit 2, respectively.

B. Proposed T/S Change for RWST Contained Inventory and Solution Temperature

Description of the Current Requirements

T/S 3/4.1.2.8, "Borated Water Sources - Operating," and T/S 3/4.5.5, "Refueling Water Storage Tank," require a minimum contained volume for the RWST of 350,000 gallons of water. The RWST water is required to contain between 2400 and 2600 ppm boron at a minimum solution temperature of 70°F. There is no existing requirement for RWST maximum solution temperature. Both T/S are applicable in Modes 1 through 4.

Bases for the Current Requirements

The minimum RWST contained inventory is based upon ensuring that sufficient negative reactivity is injected into the reactor core to counteract any positive increase in reactivity caused by RCS cooldown. The minimum RWST contained inventory ensures that a sufficient supply of borated water is available for injection by the ECCS pumps and containment spray by the CTS pumps following a LOCA or a main steam line break (MSLB).

The limits on RWST minimum volume ensure that, when combined with water from melted ice, the RCS, and the safety injection accumulators, sufficient water is available within containment to permit recirculation cooling flow to the reactor core. In addition, the limits on boron concentration ensure that the reactor will remain subcritical following a LOCA assuming mixing of the RWST,

RCS, ECCS water, and other sources of water that may eventually reside in the containment recirculation sump.

The limits on RWST minimum volume and boron concentration also ensure a long-term pH value for the solution recirculated within containment after a LOCA that minimizes the evolution of iodine. In addition, the effect of chloride and caustic stress corrosion on mechanical systems and components is minimized when the long-term pH values are controlled following a LOCA.

The ECCS analyses to determine $F_Q$ limits in T/S 3/4.2.2, "Heat Flux Hot Channel Factor - $F_Q(Z)$," and T/S 3/4.2.6, "Allowable Power Level - APL," assume an RWST water temperature of 70°F. The RWST water temperature determines the temperature of the containment spray water initially delivered to the containment following a LOCA or MSLB inside containment. The minimum assumed RWST water temperature is one of the factors which determines the containment back-pressure in the ECCS analyses performed in accordance with the provisions of 10 CFR 50.46 and 10 CFR 50, Appendix K.

<u>Need for Revision of the Requirements</u>

Physical modifications to the RWST overflow line and a respan of the RWST level instrumentation are being implemented to allow increasing the available deliverable volume from the RWST. This additional available water is necessary to ensure sufficient containment recirculation sump water inventory to prevent vortexing and possible failure of the ECCS pumps and CTS pumps. The proposed T/S change in minimum RWST contained inventory is needed to be consistent with the total minimum deliverable RWST volume assumed in the containment recirculation sump inventory analyses and revised accident analyses.

The existing T/S only specifies a minimum RWST solution temperature. However, the recently conducted Expanded System Readiness Reviews identified the need to also include the maximum RWST solution temperature in the T/S. This change is needed to ensure that actual RWST temperature is maintained less than the maximum assumed temperature in the existing accident analyses. This proposed change is also necessary to be consistent with the T/S in NUREG-0452, "Westinghouse Standard Technical Specifications," and NUREG-1431, Revision 1, "Standard Technical Specifications - Westinghouse Plants."

<u>Description of the Proposed Changes</u>

I&M proposes to revise T/S 3/4.1.2.8 and T/S 3/4.5.5 to increase the minimum RWST contained inventory to 375,500 gallons, and to specify the maximum allowed RWST solution temperature of 100°F.

Bases for the Proposed Changes

The proposed T/S change in the minimum RWST contained inventory reflects planned modifications to the RWST overflow line and an increase in span of the RWST level instrumentation to provide for additional available water from the RWST.

The modification to the RWST overflow line allows the proposed increase in the T/S minimum RWST contained inventory of 25,500 gallons. With this modification, the existing operating margin between the T/S minimum RWST contained inventory level and actual overflow of water from the tank is maintained. Structural evaluations of the RWST confirm that there is no impact to the seismic capability of the RWST at the new, higher overflow water level. In addition, the indicated RWST water levels (indicated as 0-100% of span) at the time the operator is instructed to begin and complete the switchover to cold leg recirculation will not change.

A maximum RWST water temperature of 105°F is used in the ECCS analyses performed in accordance with the provisions of 10 CFR 50.46 and 10 CFR 50, Appendix K. A maximum RWST water temperature of 105°F is also used in the containment integrity analyses performed to determine time-dependent containment pressures and temperatures following a LOCA or MSLB inside containment. Addition of the maximum RWST solution temperature to the T/S using 100°F to conservatively bound the analytical limit of 105°F, ensures that the containment integrity and LOCA analyses remain bounding. This change is also consistent with NUREG-0452 and NUREG-1431, Revision 1.

C. Proposed T/S Change for Manual and Automatic Actuation Logic and Time Delay for CEQ Fans and Valves

Description of the Current Requirements

ESFAS requirements are listed in T/S Table 3.3-3, "Engineered Safety Feature Actuation System Instrumentation," T/S Table 3.3-4, "Engineered Safety Feature Actuation System Instrumentation Trip Setpoints," and T/S Table 4.3-2, "Engineered Safety Feature Actuation System Instrumentation Surveillance Requirements."

The T/S tables specify that manual actuation of the CEQ fans is accomplished as part of the containment spray manual actuation requirements. These manual actuation requirements are applicable in Modes 1 through 4.

Automatic actuation of the CEQ fans and valves is not specifically detailed in the T/S tables. However, the existing design includes actuation of the CEQ fans and hydrogen skimmer valves at a time delay of 9 ± 1 minutes after receipt of a containment spray automatic actuation signal (containment pressure - high-high) in Modes 1 through 3. The component cooling water (CCW)

supply and return valves to the CEQ fan motors open without time delay after receipt of a containment spray automatic actuation signal (containment pressure - high-high). The containment spray automatic actuation logic is required to be operable in Modes 1 through 3.

T/S 3/4.6.5.6, "Containment Air Recirculation Systems," specifies surveillance requirements to verify the delay of 9 ± 1 minutes after receipt of the automatic signal for starting of the CEQ fans and opening the hydrogen skimmer valves.

Bases for the Current Requirements

The design of the CEQ system ensures that following a LOCA the containment atmosphere is circulated for cooling by the containment sprays and the accumulation of hydrogen in localized portions of the containment structure is minimized.

The automatic actuation signal and time delay for the CEQ fans and valves affects the containment back-pressure used in the ECCS analyses performed in accordance with the provisions of 10 CFR 50.46 and 10 CFR 50, Appendix K.

In the ECCS analyses performed during the original licensing of both CNP units (circa 1970), the computer models used were overly sensitive to containment back-pressure following a LOCA as compared to the current ECCS analyses of record. This was especially true during the period after initial blowdown of the RCS until the reactor vessel is reflooded by the initial injection of the safety injection accumulators and flow from the ECCS pumps.

Because of the limitations of the calculational methodology used in the original ECCS analyses, the actuation signal and minimum time delay for the CEQ fans and valves were established to maximize containment back-pressure following a LOCA. Maximizing containment back-pressure provided a benefit in the original ECCS analyses by limiting break flow from the RCS, thereby reducing the time for reactor vessel reflood. The existing time delay for the CEQ fans and valves also ensured adequate cooling of the containment atmosphere by the CTS and prevented localized accumulation of hydrogen in the lower containment compartments.

Need for Revision of the Requirements

The proposed T/S changes for the ESFAS initiating signal and time delay to start the CEQ fans and open associated valves reflect modifications being performed to ensure earlier forced flow of steam and air through the ice condenser. This modification has the effect of increasing the ice melt rate in the earlier stages of a LOCA. Credit for increased ice melt ensures that, for the limiting size LOCA and LOCA break locations, sufficient water inventory will be present in the containment recirculation sump during RCS cold leg recirculation. The containment recirculation sump inventory analyses and accident analyses described in this submittal reflect these planned modifications.

The planned modifications result in removing automatic actuation of the CEQ fans and valves from the existing containment spray ESFAS automatic actuation logic and manual actuation from the existing containment spray manual actuation pushbuttons. After the modification, the CEQ fans and valves will be automatically actuated from a containment pressure - high initiation signal from the ESFAS automatic actuation logic. The CEQ fans and valves will be manually actuated by using the normal handswitches located in the control room instead of a manual pushbutton that actuates the ESFAS automatic actuation logic. Manual actuation of the CEQ fans and valves is only required in the event the ESFAS automatic actuation fails, or in Mode 4 when the ESFAS automatic actuation logic is not required. This results in the need to revise the ESFAS T/S tables and CEQ fan and valve T/S surveillance requirements to reflect the new design.

Description of the Proposed Changes

I&M proposes to revise T/S Table 3.3-3, T/S Table 3.3-4, T/S Table 4.3-2, and T/S 3/4.6.5.6 to reflect planned modifications to the ESFAS actuation logic and to the time delay relay for starting of the CEQ fans and opening of the CCW supply, return, and hydrogen skimmer valves to the CEQ fans.

This design change will modify the CEQ fans starting logic to allow the fans to start after a 120 ± 12 seconds time delay after receipt of a containment pressure - high (1.1 psig) ESFAS signal. The design change also considers instrument uncertainties for the actuation pressure setpoint. The existing design has the fans start after a time delay of 9 ± 1 minutes after receipt of a containment pressure - high-high (2.9 psig) signal. Earlier actuation of the CEQ fans in response to containment pressure - high is reflected in the new analyses of water inventory in the containment recirculation sump and the associated analyses described in Section E below.

The proposed changes to T/S Table 3.3-3, T/S Table 3.3-4, and T/S Table 4.3-2 include specifying manual actuation requirements for the CEQ fans and valves separately from the existing containment spray manual actuation requirements. In addition, the new containment pressure - high automatic actuation logic requirements for the CEQ fans and valves are proposed to be added to the appropriate limiting conditions for operation requirements, trip setpoints, and surveillance requirements in the T/S tables.

The proposed changes to T/S 3/4.6.5.6 reflect the planned modifications to the time delay for starting of the CEQ fans and actuation of the CEQ valves. The existing T/S Surveillance Requirement 4.6.5.6.d for the CEQ valves is proposed to be deleted. A new T/S Surveillance Requirement 4.6.5.6.d is proposed to add verification that the CEQ fans will start from their respective handswitches in the control room, and the CEQ valves will open, every 3 months on a staggered test basis. The requirement to verify that the CEQ valve opens when the CEQ fan is started is proposed to be added to the existing T/S Surveillance Requirement 4.6.5.6.a. In

addition, it is proposed that T/S Surveillance Requirement 4.6.5.6.a be specified as applicable in Modes 1, 2, and 3 only.

Bases for the Proposed Changes

The proposed T/S changes specifying the actuation of the CEQ fans and valves on a containment pressure - high signal, with a time delay of 120 ± 12 seconds, reflect planned modifications to increase the amount of air and steam flow through the ice condenser during the early stages of a small break LOCA.

The earlier induced flow through the ice condenser has two noticeable effects. First, the energy of the steam released during the small break LOCA in the lower containment compartment is preferentially absorbed by the ice bed rather than in passive structures. Preferential absorption of heat by the ice bed results in increased ice melt, lower temperatures in the lower containment compartment, and increased containment recirculation sump inventory. Second, this absorption of energy released earlier in a small break LOCA will delay reaching the containment pressure - high-high actuation setpoint, which in turn would delay the initiation of containment sprays. For a large break LOCA, the time of CTS initiation is not delayed because of the resultant rapid containment pressure rise. Delaying CTS initiation also increases ice melt since the containment sprays would compete with the ice condenser for heat removal. Another benefit of the planned modifications is that short-term accumulation of hydrogen in the lower containment compartments is minimized for both large break and small break LOCA scenarios.

The computer models used in the current ECCS analyses of record are not as sensitive to containment back-pressure following a LOCA as compared to the original ECCS analyses. The revised accident analyses described in Attachment 10 considered the impact of the planned modification to the actuation signal and minimum time delay for the CEQ fans and valves. These analyses demonstrate that the planned modifications are acceptable.

The proposed changes to T/S Table 3.3-3, T/S Table 3.3-4, and T/S Table 4.3-2 are consistent with other existing ESFAS requirements. The proposed limiting conditions for operation in the tables are identical to the existing requirements for containment pressure - high automatic actuation logic and CEQ fan and valve manual actuation requirements. This includes total number of channels, channels to trip, minimum number of channels required, mode applicability, and action statement requirements identical to existing requirements for manual actuation and containment pressure - high automatic actuation logic.

The new manual actuation functional unit is required to address the fact that the new design will require use of the control room handswitches to manually actuate the CEQ fans and valves. Consistent with existing requirements, the capability to manually actuate the CEQ fans and valves will be required in Modes 1 through 4. The new functional unit for the CEQ fans is required to address the new, separate ESFAS automatic actuation logic for the CEQ fans and valves. Also consistent with existing requirements, the automatic actuation logic will be required

to be operable in Modes 1 through 3. In addition, the containment pressure - high setpoint is not changed by this submittal, and the proposed surveillance requirements are identical to other existing requirements for manual actuation and containment pressure - high automatic actuation logic.

The proposed change to T/S 3/4.6.5.6 reflects the time delay used in the analyses of water inventory in the containment recirculation sump and the associated analyses described in Section E below.

The new surveillance requirement for verifying manual start of the CEQ fans from the control room and verification that the CEQ valves open when the CEQ fans start, is consistent with the new design of the CEQ fan and valve actuation logic. This is because manual actuation of the CEQ fans and valves will be through use of the normal handswitches in the control room instead of a pushbutton that initiates the ESFAS automatic actuation logic (like the existing containment spray automatic actuation design).

Adding the requirement to verify that the CEQ valves open when the respective CEQ fan starts is consistent with the existing and new design of the CEQ fan and valve logic. Each CEQ fan has a single time delay relay that will be set at 120 ± 12 seconds. The CEQ valves are interlocked with the respective CEQ fan to open immediately when the CEQ fan starts. Therefore, the existing T/S Surveillance Requirements 4.6.5.6.a and 4.6.5.6.d are both describing the same time delay relay and are redundant.

Specifying T/S Surveillance Requirement 4.6.5.6.a as applicable only for Modes 1 through 3 reflects that the planned modification does not include a manual actuation pushbutton using ESFAS automatic actuation logic. Consistent with the ESFAS T/S table changes, the T/S surveillance requirements that address operability of the automatic actuation logic are only required in Modes 1 through 3. The other T/S surveillance requirements are necessary for verifying both automatic actuation and manual actuation functions. Therefore, it is appropriate to require the other T/S surveillance requirements in Modes 1 through 4.

## D. Proposed T/S Change for Minimum Required Ice Weight in the Ice Condenser

Description of the Current Requirements

T/S 3/4.6.5.1, "Ice Bed," specifies a minimum required ice weight per ice basket of 1333 pounds, or a total of 2,590,000 pounds. T/S Bases 3/4.6.5.1 specifies a 5% allowance for ice loss through sublimation over an eighteen-month period as the basis for the minimum required ice weight. T/S 3/4.6.5.1 Surveillance Requirements state, in part, that operability of the ice condenser shall be verified at least once per 18 months by weighing a representative sample of ice baskets. To account for uncertainties associated with ice basket weighing and sublimation of ice over an

eighteen-month period, each ice basket is verified to contain at least 1333 pounds of ice. This is an as-left value for ice weight that includes a measurement uncertainty (1%), and allowance for ice sublimation (5%), applied to the minimum ice weight used in the accident analyses.

T/S Bases 3/4.6.5.1 includes allowance for adjusting ice weights or the number of ice baskets to be weighed during surveillance testing based on accumulated data over multiple operating cycles.

Bases for the Current Requirements

The requirements associated with the ice condenser ensure that sufficient pressure suppression capability is provided to limit the containment peak pressure transient to less than or equal to 12 psig during LOCA and MSLB conditions.

The ice bed T/S ensures that the minimum required ice weight is properly distributed through the containment bays. In addition, sufficient heat removal capability is available to condense the reactor system volume released during a LOCA. These conditions are consistent with the assumptions used in the LOCA analyses. The limits on minimum required ice weight also ensure that when combined with water from the RWST, the RCS, and the safety injection accumulators, sufficient water is available within containment to permit recirculation cooling flow to the reactor core. The minimum weight requirement of 1333 pounds of ice per basket contains a 5% allowance for ice loss through sublimation over an eighteen-month period.

The T/S Bases state that, if the observed sublimation is equal to or lower than design predictions after three years of operation, the minimum weight of the ice baskets may be adjusted downward. In addition, the required number of ice baskets to be weighed every eighteen months may be reduced after three years of operation if such a reduction is supported by observed sublimation data. These provisions to adjust the ice weight or number of ice baskets to be weighed reflect that the original requirements were based on predictions rather than operating data.

Need for Revision of the Requirements

The new containment recirculation sump water inventory analyses have used a lower minimum weight of 1132 pounds of ice per basket. The minimum ice weight value chosen should minimize the required amount of ice in the ice condenser to facilitate effective management of ice inventory for the ice condenser and to facilitate ice condenser maintenance. In addition, the proposed ice weight must be sufficient to meet the acceptance criteria for the revised accident analyses described in WCAP-15302, "Donald C. Cook Nuclear Plant Units 1 and 2 Modifications to the Containment Systems Westinghouse Safety Evaluation (SECL 99-076, Revision 3)" (Attachment 10). The proposed T/S minimum ice weights meet these criteria.

The existing T/S requirement for minimum ice weight includes allowance for weight measurement uncertainty (1%) and for ice sublimation (5%) over an eighteen-month period. I&M prefers that the minimum ice weight be specified as an as-found value with only the weight

measurement uncertainty included in the T/S specified minimum ice weight. This is not consistent with NUREG-0452. However, it is consistent with the definition in 10 CFR 50.36 for a limiting condition for operation. In addition, NUREG-1431, Revision 1, does not specify an allowance for ice sublimation. Instead, licensees are required to control consideration of ice sublimation in owner-controlled documents such as approved procedures to ensure that the minimum ice weight at any given time during an operating cycle is at or above the analytical value. Therefore, specifying the minimum ice weight as an as-found value is consistent with this approach.

Compliance with the T/S had previously been demonstrated by a statistical analysis of sample ice basket weights which were considered representative. However, some ice baskets cannot be physically weighed, as acknowledged by both the T/S and the CNP Updated Final Safety Analysis Report (UFSAR). Visual surveys of ice baskets indicated that some ice baskets in both units, predominantly in radial row 9, but also radial row 8 and azimuthal row 5, showed greater than expected ice loss due to sublimation. Since the data used to support the existing ice weight limit was based on the same sampling method, it was necessary to reevaluate the calculations performed to determine the weight limit and the assumptions used. Based on this reevaluation, the proposed T/S reflect the restoration of the 10% allowance for sublimation over an eighteen-month period.

The existing T/S Bases includes provisions to allow adjusting ice weights or number of baskets to be weighed based on accumulated data over multiple operating cycles. However, the value in T/S cannot be changed without NRC approval. Therefore, the T/S Bases statement is not necessary since it would result in implementing an unapproved T/S change if it were followed.

Description of the Proposed Changes

I&M proposes to revise T/S 3/4.6.5.1, "Ice Bed," to reflect the minimum ice weight used in the new analyses of containment recirculation sump inventory and associated analyses described in Section E below. The new minimum ice weight of 1144 pounds per ice basket, or 2,222,000 pounds total, includes a 1% allowance for uncertainties involved in weighing of the ice baskets. Therefore, the actual ice weight proposed in the T/S is based on an as-found weight of ice corrected for measurement uncertainties to determine operability of the ice condenser. In addition, an editorial change to revise "each ice basket" to "ice baskets" is proposed to clarify that the as-found weight applies to all of the ice baskets weighed.

Concurrent with NRC approval of the proposed T/S changes, I&M will revise T/S Bases 3/4.6.5.1 to increase the allowance for ice loss through sublimation from 5% to 10% over an eighteen-month period. This sublimation will be considered in the actual as-left ice weight to be specified in the procedures governing weighing and filling of the ice baskets. In addition, the provision to allow adjusting ice weights or number of baskets to be weighed based on accumulated data over multiple operating cycles will be deleted.

Bases for the Proposed Changes

The proposed T/S change to the minimum required ice weight in the ice condenser reflects the values used in analyses of minimum containment recirculation sump inventory and the accident analyses described in Section E below.

To be considered operable, the ice condenser is required to be capable of removing energy by condensing released steam, providing borated water to the containment recirculation sump, and maintaining structural integrity. In addition, the water from the melted ice, when combined with other sources of water during the accident including the RWST, the RCS, and safety injection accumulators, must not result in containment water levels above the maximum allowed floodup level, and must ensure sufficient boron concentration in the containment recirculation sump.

The analyses, as further described in Section E below, include an input assumption of a minimum ice weight of 2,200,000 pounds of ice (1132 pounds per ice basket). The proposed minimum total ice weight requirement for T/S 4.6.5.1.b.2 of 2,222,000 pounds is the calculated minimum weight of 2,200,000 pounds, plus a 1% weight measurement uncertainty allowance. The proposed minimum weight requirement for T/S 3.6.5.1 of 1144 pounds per ice basket is the calculated minimum weight of 1132 pounds per ice basket (2,200,000 pounds divided by 1944 ice baskets), plus a 1% weight measurement allowance. At the beginning of a fuel cycle, individual ice baskets will contain sufficient additional ice over the required minimum to account for an average ice bed sublimation of 10% over an eighteen-month period. Therefore, the minimum end-of-cycle ice weight would be greater than or equal to the amount needed to perform the required safety function.

Stating the required minimum ice weight on an as-found basis is a change from the existing T/S. The currently specified T/S minimum ice weight includes a 5% margin for sublimation over an eighteen-month period. Therefore, the currently specified value is an as-left value at the beginning-of-cycle. Specifying the as-left value in the T/S is consistent with the intent of NUREG-0452. However, it is preferable for the T/S to represent the value used for determining operability of the ice condenser regardless of the point in time the ice is physically weighed.

Sublimation of 10% over an eighteen-month period was initially established without industry data. However, the subsequent data from operating ice condenser plants have shown that overall sublimation is less than 10% during an eighteen-month operating cycle. Therefore, the assumption is conservative and appropriate.

NUREG-0452 and the CNP T/S Bases include a provision to reduce the allowance for ice loss through sublimation if observed sublimation is equal to or lower than design predictions after three years of operation. This provision was originally included in the T/S Bases to allow ice condenser plants to decrease as-left ice basket weights and to reduce the number of ice baskets required to be weighed after sufficient operating data was evaluated. This provision is not required because any changes to the actual T/S requirements may only be made in accordance

with an approved amendment to the operating license. It should be noted that NUREG-1431, Revision 1, does not include a specific value for sublimation allowance or the provision to reduce the allowance.

The accident analyses further described below demonstrate that the proposed minimum required ice weight is sufficient to ensure containment integrity is maintained by limiting the maximum containment pressure and temperature. In addition, the analyses described in Attachment 7 also demonstrate that sufficient ice is available to maintain a minimum water inventory in the containment recirculation sump above the minimum vortexing level.

The structural analysis for the ice condenser demonstrates that structural integrity is maintained up to an average weight of 1877 pounds for the ice baskets within each lattice frame structure (ice baskets plus ice). The maximum ice basket plus ice weight is administratively controlled to ensure that this limit is not exceeded for each lattice frame structure within the ice condenser.

E. Acceptability and Impact of the Proposed T/S Changes

Attachments 7 through 10 are analyses performed by Fauske & Associates, MPR Associates, and Westinghouse Electric Company. These analyses were performed to demonstrate the acceptability and impact of the proposed T/S changes. I&M has reviewed and approved these analyses in accordance with approved administrative procedures for owner-acceptance of vendor-supplied design and analysis information.

Minimum Containment Recirculation Sump Inventory Analyses

Attachment 7 describes the containment recirculation sump water inventory analyses. The analyses demonstrate that the increased RWST contained inventory, the analyzed amount of ice melt, and RCS and safety injection accumulator water inventory released to containment, is sufficient to ensure that the minimum containment recirculation sump level required to prevent vortexing is maintained. These containment recirculation sump inventory analyses include consideration of limiting single failures of ECCS and CTS components as described in Attachment 8.

As demonstrated by these analyses, a minimum containment recirculation sump level greater than or equal to 602'-10" (the level demonstrated by test to be acceptable) would be obtained for Mode 1 LOCA events. However, certain Mode 3 LOCA events result in minimum containment recirculation sump levels slightly less than 602'-10". This is because of the lower mass and energy release from the RCS experienced during a Mode 3 LOCA and the resultant decrease in the ice condenser ice melt rate. However, overall ECCS 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 shown in Attachment 9, the analyses demonstrate that 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 less than 602'-10" are still sufficient to prevent vortexing at the reduced ECCS and CTS flow rates expected.

The report presented in Attachment 7 includes:

- a description of the Modular Accident Analysis Program (MAAP) computer code model and version (MAAP4.0.4.1) used for performing CNP containment recirculation sump inventory analyses,
- a description of the dynamic benchmarking performed for the MAAP4.0.4.1 model against available design basis models and ice condenser experiments,
- a description of the most limiting conditions used in the containment recirculation sump inventory analyses,
- the analytical results for Mode 1 LOCA events including comparison of minimum containment recirculation sump levels with the 602'-10" vortexing level,
- the analytical results for Mode 3 LOCA events including comparison of minimum recirculation sump levels with the minimum vortexing levels determined in Attachment 9,
- the analytical results for MSLB events, and
- conclusions of the containment recirculation sump inventory analyses.

The available net positive suction head (NPSH) for the ECCS pumps and CTS pumps is dependent on the minimum water levels in the containment recirculation sump. Analyses have been performed that demonstrate adequate available NPSH for the ECCS pumps and CTS pumps is assured when the pumps are aligned to take suction from the containment recirculation sump. The analyses also demonstrate that the minimum vortexing levels in the containment recirculation sump are more limiting than the required NPSH levels for the ECCS pumps and CTS pumps. The analyses for ensuring adequate NPSH considered each of the possible operating configurations for the ECCS pumps and CTS pumps following a LOCA. These operating configurations include initial ECCS injection and CTS operation, RCS cold leg recirculation, RCS hot leg recirculation, and the allowable operating configurations when residual heat removal (RHR) containment spray is placed into service following a large break LOCA.

In addition, I&M has evaluated minimum vortexing levels at reduced ECCS pump and CTS pump flow rates as further described in Attachments 7 and 9, and has demonstrated acceptable margin for the scenarios that involve lower pump flow rates. For the low flow cases, the vortexing levels are still bounding and provide margin above the required NPSH for the ECCS pumps and CTS pumps.

Evaluation of Accident Analyses Impacted by the Containment Recirculation Sump Issue

As further described in WCAP-15302 (Attachment 10), an evaluation was performed to determine the impact of the proposed T/S changes on the existing CNP accident analyses. This evaluation demonstrates that the accident analyses are not adversely affected by the proposed T/S changes. The analyses provided in WCAP-15302 reflect the proposed changes in letter C0999-11, "License Amendment Request for Credit of Rod Cluster Control Assemblies for Cold Leg Large Break Loss-of-Coolant Accident Subcriticality," dated September 17, 1999.

Evaluation of Debris Generation Impact on Containment Recirculation Sump Screens

The containment recirculation sump is provided with a screen and grating structure that prevents debris from entering the ECCS pumps and CTS pumps. This screen is designed to provide sufficient flow to prevent vortexing in the containment recirculation sump with a maximum blockage of 50%. This design capability was demonstrated in the containment recirculation sump testing performed by Alden Research Laboratory.

As previously described, modifications are being made to the containment structures to provide positive communication between the pipe annulus region and the RCS loop compartment. These modifications consist of adding several penetrations in the containment partition wall at low elevations. The flow rate through the containment crane wall and new containment partition wall penetrations will be small. The resulting low approach velocities will minimize debris transport. In addition, curbs and trash gratings will be provided some distance from the penetrations to minimize potential for blockage of the penetrations, and there are multiple penetrations in two separate areas to further protect against blockage. Therefore, the probability of blockage of the screens for the containment recirculation sump is not increased.

F. Summary of Impact of the Proposed Changes

The proposed T/S changes will ensure the capability of the containment recirculation sump, and the containment structures, systems, and components, to meet the original design basis requirements for the facility. By ensuring sufficient water inventory is maintained to prevent vortexing in the containment recirculation sump, the original evaluation of the consequences of previously evaluated accidents as described in the CNP UFSAR will not be affected. The physical modifications to be implemented are intended to ensure the original design basis functional capabilities of the containment recirculation sump, and other containment systems, structures, and components, to support ECCS, ice condenser, and CTS operation. The proposed T/S changes ensure that the containment structure and systems provide an effective barrier to the release of fission products.

G. Impact on Previous Submittals

No previous submittals affect the technical basis for this submittal, or require approval to support this submittal. However, several previous submittals affect T/S pages and associated T/S Bases pages that are submitted in this request. These include letters: 1) AEP:NRC:0433Q, "Technical Specifications Change Request – Administrative Changes," dated December 3, 1998; 2) AEP:NRC:0900O, "Technical Specifications Change Request – Ice Condenser Flow Channels," dated December 3, 1998; 3) AEP:NRC:1291, "Technical Specification Amendment – Distributed Ignition System Technical Specification and Associated Bases," dated December 3, 1998; and 4) C0999-11, "License Amendment Request for Credit of Rod Cluster Control Assemblies for Cold Leg Large Break Loss-of-Coolant Accident Subcriticality," dated September 16, 1999. The Westinghouse Nuclear Safety analyses provided in WCAP-15302 (Attachment 10) reflect the proposed changes in letter C0999-11, with both submittals reflecting the same subcriticality analyses. The T/S and T/S Bases pages in Attachments 2A, 2B, 3A, and 3B do not reflect the changes proposed in the other existing submittals. For these and any future submittals that affect the T/S and T/S Bases pages provided in this submittal, I&M will coordinate changes to the pages with the NRC Project Manager to ensure proper T/S and T/S Bases page control when the associated license amendment requests are approved.