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NLS2014030
August 26, 2014

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-000

Subject: License Amendment Request to Delete Condensate Storage Tank as an Alternate Source of Makeup Water
Cooper Nuclear Station Docket No. 50-298, License No. DPR-46

Dear Sir or Madam:

The purpose of this letter is for the Nebraska Public Power District (NPPD) to request an amendment to Facility Operating License DPR-46 in accordance with the provisions of 10 CFR 50.4 and 10 CFR 50.90 to revise the Cooper Nuclear Station (CNS) Technical Specifications (TS) and TS Bases. The proposed amendment would delete Option b from TS Surveillance Requirement (SR) 3.5.2.1 and its associated Bases. Option b allows use of Condensate Storage Tank (CST) 'A' as an alternative source of makeup water to the Reactor Pressure Vessel during MODE 4 and MODE 5, but CST 'A' is not qualified to Seismic Category I.

NPPD requests approval of the proposed amendment by September 1, 2015, allowing one year for Nuclear Regulatory Commission (NRC) review. Once approved, the amendment shall be implemented within 60 days.

Attachment 1 provides a description of the TS changes, the basis for the amendment, the no significant hazards consideration evaluation pursuant to 10 CFR 50.91(a)(1), and the environmental consideration pursuant to 10 CFR 51.22. Attachment 2 provides the proposed changes to the current CNS TS in marked up format. Attachment 3 provides the final typed TS pages to be issued with the amendment. Attachment 4 provides conforming changes to the TS Bases for NRC information.

No formal regulatory commitments are being made by this submittal. This proposed TS change has been reviewed by the necessary safety review committees (Station Operations Review Committee and Safety Review and Audit Board). Amendments to the CNS Facility Operating License through Amendment 248 issued April 29, 2014, have been incorporated. This request is submitted under oath or affirmation pursuant to 10 CFR 50.30(b).

By copy of this letter and its attachments, the appropriate State of Nebraska official is notified in accordance with 10 CFR 50.91(b)(1). Copies are also being provided to the NRC Region IV office and the CNS Senior Resident Inspector in accordance with 10 CFR 50.4(b)(1).

COOPER NUCLEAR STATION
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***Telephone:** (402) 825-3811 / **Fax:** (402) 825-5211*
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NRR

Should you have any questions concerning this matter, please contact David Van Der Kamp, Licensing Manager, at (402) 825-2904.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 8/26/14
(Date)

Sincerely,

Oscar A. Limpias
Vice President-Nuclear and
Chief Nuclear Officer

/jo

Attachments:
1. License Amendment Request to Delete Condensate Storage Tank as an Alternate Source of Makeup Water
2. Proposed Technical Specification Revision (Markup)
3. Proposed Technical Specification Revision (Final Typed Format)
4. Proposed Technical Specification Bases Revisions (Information Only)

cc: Regional Administrator w/attachments
USNRC - Region IV

Cooper Project Manager w/attachments
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector w/attachments
USNRC - CNS

Nebraska Health and Human Services
Department of Regulation and Licensure w/ attachments.

NPG Distribution w/o attachments

CNS Records w/attachments

Attachment 1

License Amendment Request to Delete Condensate Storage Tank as an Alternate Source of Makeup Water

Cooper Nuclear Station, NRC Docket No. 50-298, License No. DPR-46

Revised Technical Specification Page

3.5-9

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Facility Operating License DPR-46 for Cooper Nuclear Station (CNS). The proposed change revises the Operating License to delete Option b from Technical Specification (TS) Surveillance Requirement (SR) 3.5.2.1 and its associated Bases. Option b allows use of Condensate Storage Tank (CST) 'A' as an alternative source of makeup water to the Reactor Pressure Vessel (RPV) during MODE 4 and MODE 5, but CST 'A' is not qualified to Seismic Category I.

Nebraska Public Power District (NPPD) requests approval of the proposed amendment by September 1, 2015, allowing one year for Nuclear Regulatory Commission (NRC) review. Upon receipt of the approved amendment, CNS will implement the change within 60 days. Pending issuance of the amendment, the following interim actions are being taken. CNS revised procedures for Core Spray (CS) and Residual Heat Removal (RHR) Low Pressure Coolant Injection (LPCI) systems to note that aligning the CS or RHR pumps to take suction from CST 'A' in MODES 4 and 5 will require the pumps to be technically inoperable for TS purposes due to the CST being Seismic Class II and the pumps being Seismic Class I.

2.0 DETAILED DESCRIPTION

The following revisions are proposed to TS Section 3.5.2

2.1 Proposed Change

Delete Option b of SR 3.5.2.1 and the Note preceding it. Change the first option to delete "a." and combine it with the stem so the revised SR states, "Verify, for each required ECCS injection/spray subsystem, the suppression pool water level is $\geq$ 12 ft 7 inches."

2.2 Need for Change

TS changes related to using CST 'A' as a suction path for CS and LPCI when draining the suppression chamber date back to Amendment 12, issued October 6, 1975, and Amendment 11 issued December 30, 1975. These were implemented to satisfy an NRC request to revise TS to allow draining the suppression pool and inspection of the Safety Relief Valve supports. The NPPD License Amendment Request (LAR) did not include the use of the CST. The NRC, after discussions with NPPD, made major modifications to the proposed LAR, which added the use of the CST as a suction path for Emergency Core Cooling System (ECCS) pumps.

The Safety Evaluation Report (SER) for Amendment 88 received September 21, 1984, noted that the predecessor specification to SR 3.5.2.1 is consistent with NUREG-0123, Rev. 3, Boiling Water Reactor (BWR) Standard TS (Reference 6.2) which permits refueling operations with the suppression chamber drained. The SER

states the NRC concluded since the proposed changes are consistent with their current requirements and provide adequate cooling, they are acceptable.

Amendment 97 issued April 9, 1986, consolidated these provisions into one place in TS for conditions required to be met for refueling. This, in turn, was converted to SR 3.5.2.1 Option b, as part of the conversion to Standard Technical Specifications.

Information Notice 2012-01 (Reference 6.1) identified that a Pressurized Water Reactor Plant had incorrectly authorized procedural interface of non-seismic, non-safety-related Fuel Pool Purification System to the Seismic Class I, safety-related Refueling Water Storage Tank (RWST) during MODES 1, 2, 3 and 4. This practice had the effect of rendering the RWST inoperable.

Subsequently, NRC Inspectors questioned whether the office of Nuclear Regulatory Regulation had been properly apprised that CST 'A' is a Seismic Class II, non-safety related system tying into Seismic Class I, safety-related systems of CS and LPCI. In letters during the 1975 time frame between NRC, the BWR Vendor, and the BWR industry, there were no references to the seismic classification of any of the systems. It is not known if phone calls between NPPD and the NRC at the time included any discussion of seismic capability.

Since no documented reference could be found to show the NRC was aware that CSTs were not Seismic Class I, then provisions in TS which allow alignment of ECCS to the CST would render the ECCS pumps to be technically inoperable for TS purposes because the CST could not be relied on to survive a safe shutdown earthquake.

2.3 Bases Changes

Revised TS Bases are provided in Attachment 4 for NRC information. These Bases revisions will be made as an implementing action pursuant to TS 5.5.10, TS Bases Control Program, following issuance of the amendment. The TS Bases for Limiting Condition for Operation (LCO) 3.5.2 are revised by deleting phrases that take credit for the CST as an alternate source of makeup water to the ECCS pumps.

3.0 TECHNICAL EVALUATION

3.1 System Description

CNS is a BWR of General Electric design BWR4 with a Mark 1 containment.

The ECCS systems at CNS consist of the High Pressure Coolant Injection (HPCI) System, the CS System, the LPCI mode of RHR System, and the Automatic Depressurization System. The suppression pool provides the required source of water for the ECCS. The emergency condensate storage tanks are capable of providing a

source of water for the HPCI System. Although no credit is taken in the safety analyses for the CST, CST 'A' is capable of providing a source of water for the CS System and LPCI subsystems.

The Condensate Storage System provides station system makeup, receives system reject flow, and provides condensate for any continuous service needs and intermittent batch type services. The total stored design quantity is based on the demand requirements during refueling for filling the dryer separator pool and the reactor well and, for coping with a Station Blackout special event.

One 450,000-gallon (CST 'A') and one 700,000-gallon (CST 'B') capacity CST supply the various station requirements. They can receive demineralized makeup water from the water treatment plant or reprocessed water from the Radwaste system. The tanks are constructed of coated carbon steel with electric heaters for anti-freeze protection.

3.2 Updated Safety Analysis Report (USAR) Safety Design Basis

Condensate Storage System does not have a Safety Design Basis; it is not safety related. Its Power Generation Design Basis states the Condensate Storage system provides station system makeup, receives system reject flow, and provides condensate for any continuous service needs and intermittent batch type services. The total stored design quantity is based on the demand requirements during refueling for filling the dryer separator pool and the reactor well and, for coping with a Station Blackout special event.

The safety objective of the ECCS, in conjunction with the primary and secondary containments, is to limit the release of radioactive materials to the environs following a loss-of-coolant accident (LOCA), so that resulting radiation doses are kept to a practical minimum and are within the values given in published regulations.

ECCS have 13 Safety Design Bases as follows:

1. To provide adequate cooling of the reactor core under abnormal and accident conditions, various cooling systems shall be provided of such number, diversity, reliability, and redundancy that only a highly improbable combination of events could result in inadequate cooling of the core.

2. In the event of a LOCA, the ECCS shall remove the residual stored heat and heat from radioactive decay from the reactor core at such a rate that fuel clad melting is prevented and any core mechanical deformation does not limit effective cooling of the reactor core.

3. The ECCS shall provide for continuity of core cooling over the complete range of postulated break sizes in the reactor coolant pressure boundary.

4. ECCS shall be initiated automatically by conditions which sense the potential inadequacy of core cooling, thus limiting the degree to which safety is dependent upon operator judgment in a time of stress.

5. Operation of the ECCS shall be initiated regardless of the availability of power from offsite supplies and the normal generating system of the plant.

6. Action taken to effect containment integrity shall not negate the ability to achieve core cooling.

7. To provide assurance that the ECCS shall operate effectively, each component required to operate in a LOCA shall be testable during normal operation of the nuclear system.

8. The components of the ECCS within the reactor vessel shall be designed to withstand the transient mechanical loading during a LOCA accident so that the required standby cooling flow is not restricted.

9. The equipment of the ECCS shall withstand the physical effects of a LOCA so that the core can be effectively cooled. These effects are missiles, fluid jets, high temperature, pressure, and humidity.

10. The ECCS shall be capable of withstanding earthquake ground motions without impairment of their functions.

11. To provide a reliable supply of water for the ECCS the prime source of liquid for cooling the reactor core after a LOCA shall be a stored source located within the primary containment. The source shall be located in the primary containment in such a manner that a closed cooling water path is established during ECCS operation.

12. The calculated cooling performance following postulated LOCA accidents shall conform to criteria in 10 CFR 50.46(b) governing peak cladding temperature, maximum cladding oxidation, maximum hydrogen generation, coolable core geometry, and long-term cooling.

13. The limits prescribed in 10 CFR 50.46(b) shall be met assuring the most limiting single failure in the ECCS.

3.3 Current TS Bases

The ECCS is designed, in conjunction with the primary and secondary containment, to limit the release of radioactive materials to the environment following a LOCA. The ECCS uses two independent methods (flooding and spraying) to cool the core during a LOCA.

ECCS performance is evaluated for the entire spectrum of break sizes for a postulated LOCA. The long term cooling analysis following a design basis LOCA demonstrates that only one low pressure ECCS spray subsystem is required, post LOCA, to provide sufficient heat removal and maintain adequate reactor vessel water level. It is reasonable to assume, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown. To provide redundancy, a minimum of two low pressure ECCS injection or spray subsystems are required to be OPERABLE in MODES 4 and 5.

Two low pressure ECCS injection/spray subsystems are required to be OPERABLE. The low pressure ECCS injection/spray subsystems consist of two CS subsystems and two LPCI subsystems. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or CST to the RPV. Each LPCI subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or CST to the RPV. Only a single LPCI pump is required per subsystem because of the larger injection capacity in relation to a CS subsystem. In MODES 4 and 5, the RHR System cross tie shutoff valve is not required to be closed. The necessary portions of the Service Water System and the Reactor Equipment Cooling System are also required to each required low pressure ECCS injection/spray subsystem.

One LPCI subsystem may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. Because of low pressure and low temperature conditions in MODES 4 and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core cooling prior to postulated fuel uncovery.

Surveillance Requirement 3.5.2.1 states the minimum water level of 12 feet, 7 inches, required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the CS System and LPCI subsystem pumps, recirculation volume, and vortex prevention. With the suppression pool water level less than the required limit, all ECCS injection or spray subsystems are inoperable unless aligned to the OPERABLE CST 'A'.

When suppression pool level is < 12 feet, 7 inches, the CS System and LPCI subsystems are considered OPERABLE only if they can take suction from CST 'A', and the CST 'A' water level is sufficient to provide the required NPSH for the required CS pump and LPCI pumps. (LPCI pumps 'A' and 'D' are the only LPCI pumps that can be aligned to CST 'A'.) Therefore, a verification that either the suppression pool water level is ≥ 12 feet, 7 inches, or that the required CS and LPCI subsystems are aligned to take suction from CST 'A' and CST 'A' contains ≥ 150,000 gallons of water, equivalent to 14 feet, ensures that the CS System and LPCI subsystems (LPCI pumps 'A' and 'D') can supply at least 50,000 gallons of makeup water to the RPV. The excess 100,000 gallons remains as a supplementary volume and to ensure adequate ECCS pump NPSH. However, as noted, only one required CS or LPCI subsystem may take credit for the CST option during Operations with the Potential to Drain the Reactor Vessel (OPDRVs). During OPDRVs, the volume in CST 'A' may not provide adequate makeup if the RPV were completely drained. Therefore, only one CS or LPCI subsystem is allowed to use the CST option. This ensures the other required ECCS subsystem has adequate makeup volume.

The 12-hour Frequency of these SRs was developed considering operating experience related to suppression pool water level and CST 'A' water level variations and instrument drift during the applicable MODES. Furthermore, the 12-hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool or CST 'A' water level condition.

3.4 Technical Justification of Proposed Changes

Prohibiting alignment of ECCS pumps to CST during MODES 4 and 5 eliminates the vulnerability of them becoming inoperable due to a seismic event that causes the CST to fail. This ensures ECCS pumps would be available to mitigate the consequences of a drain down event.

3.5 USAR Accident Analysis Impact

The existing TS only allows use of the CST during MODES 4 and 5. The USAR accident analysis is not impacted. Revising the TS by removing Option b from SR 3.5.2.1 ensures that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem will not be impacted by a seismic event and can maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown.

3.6 Conclusion

In summary, the proposed change is technically sound and continues to maintain the same level of safety as the current licensing basis.

4.0 REGULATORY SAFETY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

The following is a discussion of the applicable regulations and NPPD's continued compliance.

4.1.1 10 CFR 50.36, Technical Specifications

10 CFR 50.36(b) requires that each license authorizing operation of a utilization facility to include TS. 10 CFR 50.36(c) specifies the categories that are to be included in TS. 10 CFR 50.36(c)(iii)(3) identifies SRs as one of the categories to be included in TS. 10 CFR 50.36(c)(iii)(3) states:

"Surveillance Requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

The prohibition against aligning ECCS pumps to the CST will continue to ensure that CS and RHR Systems are able to perform their safety related functions. Thus, the LCO will continue to be met. Therefore, CNS continues to meet this regulation with the proposed changes to TS LCO/SR 3.5.2.

4.2 Precedent

No applicable precedents have been identified for this proposed license amendment. NPPD requests that this amendment request be reviewed on its own merits.

4.3 No Significant Hazards Consideration

10 CFR 50.91(a)(1) requires that licensee requests for operating license amendments be accompanied by an evaluation of no significant hazard posed by issuance of the amendment. Nebraska Public Power District (NPPD) has evaluated this proposed amendment with respect to the criteria given in 10 CFR 50.92(c). The following is the evaluation required by 10 CFR 50.91(a)(1).

NPPD is requesting an amendment of the operating license for Cooper Nuclear Station to delete Option b from Technical Specifications (TS) Surveillance Requirement (SR) 3.5.2.1 and its associated Bases. Option b allows Condensate Storage Tank (CST) 'A' to be used as an alternative source of makeup water to the Reactor Pressure Vessel during MODE 4 and MODE 5, but CST 'A' is not qualified to Seismic Category I and could fail during a safe shutdown earthquake. By removing Option b from the SR, alignment of Emergency Core Cooling Systems

(ECCS) pumps to CST 'A' would be prohibited, and the design functions of the ECCS to mitigate the consequences of a LOCA after the LOCA event would be preserved.

1. **Do the proposed changes involve a significant increase in the probability or consequences of an accident previously evaluated?**

   Response: No.

   It does not alter assumptions or results of analyses that verify ECCS systems are capable of performing their design functions during or after a LOCA. It does impose a restriction on plant operation, but the restriction does not affect any accident initiator, and it improves accident mitigation capability. The proposed amendment does not change any results of previously evaluated accidents in the Updated Safety Analysis Report (USAR) nor events with which the plant must be able to cope (e.g., earthquake, flooding, turbine missiles, and fire). ECCS operating procedures and administrative controls that are affected do not increase the likelihood of an event, nor do they change mitigating capabilities.

   The probability of occurrence remains the same as already presented in the USAR for initiating events. Thus, since the probabilities and consequences continue to meet the licensing basis, they are not significant changes.

   Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. **Do the proposed changes create the possibility of a new or different kind of accident from any accident previously evaluated?**

   Response: No.

   This proposed TS amendment makes no physical change in the plant. It does not change the design functions of ECCS nor Condensate Storage Systems or components. The restriction on ECCS alignment preserves their availability and does not create the possibility of a new or different accident. It does not introduce a new or different kind of accident due to credible new failure mechanisms, malfunctions, or accident initiators not considered in the design and licensing bases.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. **Do the proposed changes involve a significant reduction in a margin of safety?**

   Response: No.

LOCA analysis results are not changed nor affected by the restriction on ECCS alignment to the suppression pool, because it is consistent with conditions assumed in the analysis. Thus, the conservatism in the evaluation and analysis methods are maintained. The safety margin before the TS change is the same as after the change. This change does not exceed or alter a design basis or safety limit and does not significantly reduce the margin of safety. Since, the drain-down events in MODES 4 and 5 are bounded by the LOCA analysis, the change to TS which prohibit their alignment to the CST also do not reduce the margin of safety.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the responses to the above questions, NPPD concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

10 CFR 51.22 provides criteria for, and identification of, licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment or environmental impact statement. 10 CFR 51.22(c)(9) identifies an amendment to an operating license for a reactor which changes an inspection or a surveillance requirement as a categorical exclusion provided that operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration, (2) result in a significant change in the types or significant increase in the amount of any effluents that may be released off-site, or (3) result in a significant increase in individual or cumulative occupational radiation exposure.

CNS review has determined that the proposed amendment, which would change a surveillance requirement, does not involve (1) a significant hazards consideration, (2) a significant change in the types or significant increase in the amounts of any effluent that might be released offsite, or (3) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore,

pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

6.1 Information Notice 2012-01, Seismic Considerations – Principally Issues Involving Tanks.

6.2 NUREG-0123, Rev. 3, Standard Technical Specifications for General Electric Boiling Water Reactors.

6.3 NRC Administrative Letter 98-10, Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety.

Attachment 2

Proposed Technical Specification Revision
(Markup)

Cooper Nuclear Station, Docket No. 50-298, DPR-46

Revised Technical Specification Page

3.5-9

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify, for each required ECCS injection/spray subsystem, the~~:~~ ~~a.~~ Suppression pool water level is ≥ 12 ft 7 inches~~; or~~ ~~b.~~ ~~----------NOTE----------~~ ~~Only one required ECCS injection/spray subsystem may take credit for this option during OPDRVs.~~ --- ~~Condensate storage tank (CST A) water level is ≥ 14 ft.~~	12 hours
SR 3.5.2.2	Verify, for each required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	31 days
SR 3.5.2.3	----------NOTE---------- One LPCI subsystem may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable. --- Verify each required ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days

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Attachment 3

Proposed Technical Specification Revision
(Final Typed Format)

Cooper Nuclear Station, Docket No. 50-298, DPR-46

Revised Technical Specification Page

3.5-9

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify, for each required ECCS injection/spray subsystem, the suppression pool water level is ≥ 12 ft 7 inches.	12 hours
SR 3.5.2.2	Verify, for each required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	31 days
SR 3.5.2.3	----------NOTE---------- One LPCI subsystem may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable. ---------- Verify each required ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days

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Attachment 4

Proposed Technical Specification Bases Revisions
(Information Only)

Cooper Nuclear Station, Docket No. 50-298, DPR-46

Revised Technical Specification Bases Pages

B 3.5-1
B 3.5-18
B 3.5-21
B 3.5-22

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.1 ECCS – Operating

BASES

BACKGROUND

The ECCS is designed, in conjunction with the primary and secondary containment, to limit the release of radioactive materials to the environment following a loss of coolant accident (LOCA). The ECCS uses two independent methods (flooding and spraying) to cool the core during a LOCA. The ECCS network consists of the High Pressure Coolant Injection (HPCI) System, the Core Spray (CS) System, the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System, and the Automatic Depressurization System (ADS). The suppression pool provides the required source of water for the ECCS. The emergency condensate storage tanks (ECSTs) are capable of providing a source of water for the HPCI System. ~~Although no credit is taken in the safety analyses for the condensate storage tank (CST), it is capable of providing a source of water for the CS System and LPCI subsystems.~~

On receipt of an initiation signal, ECCS pumps automatically start; simultaneously, the system aligns and the pumps inject water, taken either from the ECSTs or suppression pool, into the Reactor Coolant System (RCS) as RCS pressure is overcome by the discharge pressure of the ECCS pumps. Although the system is initiated, ADS action is delayed, allowing the operator to interrupt the timed sequence if the system is not needed. The HPCI pump discharge pressure almost immediately exceeds that of the RCS, and the pump injects coolant into the vessel to cool the core. If the break is small, the HPCI System will maintain coolant inventory as well as vessel level while the RCS is still pressurized. If HPCI fails, it is backed up by ADS in combination with LPCI and CS. In this event, if the ADS timed sequence is allowed to time out, the selected safety/relief valves (SRVs) would open, depressurizing the RCS, thus allowing the LPCI and CS to overcome RCS pressure and inject coolant into the vessel. If the break is large, RCS pressure initially drops rapidly and the LPCI and CS cool the core.

(continued)

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 ECCS — Shutdown

BASES

BACKGROUND

A description of the Core Spray (CS) System and the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS — Operating."

APPLICABLE SAFETY ANALYSES

The ECCS performance is evaluated for the entire spectrum of break sizes for a postulated loss of coolant accident (LOCA). The long term cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one low pressure ECCS spray subsystem is required, post LOCA, to provide sufficient heat removal and maintain adequate reactor vessel water level. It is reasonable to assume, based on engineering judgement, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level in the event of an inadvertant vessel draindown. To provide redundancy, a minimum of two low pressure ECCS injection/spray subsystems are required to be OPERABLE in MODES 4 and 5.

The low pressure ECCS subsystems satisfy Criterion 3 of 10 CFR 50.36 (c)(2)(ii) (Ref. 2).

LCO

Two low pressure ECCS injection/spray subsystems are required to be OPERABLE. The low pressure ECCS injection/spray subsystems consist of two CS subsystems and two LPCI subsystems. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool ~~or condensate storage tank (CST)~~ to the reactor pressure vessel (RPV). Each LPCI subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool ~~or CST~~ to the RPV. Only a single LPCI pump is required per subsystem because of the larger injection capacity in relation to a CS subsystem. In MODES 4 and 5, the RHR System cross tie shutoff valve is not required to be closed. The necessary portions of the

(continued)

BASES

ACTIONS

C.1, C.2, D.1, D.2, and D.3 (continued)

If at least one low pressure ECCS injection/spray subsystem is not restored to OPERABLE status within the 4 hour Completion Time, additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is OPERABLE; one standby gas treatment subsystem is OPERABLE; and secondary containment isolation capability is available in each associated penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases (i.e., one secondary containment isolation valve and associated instrumentation are OPERABLE or other acceptable administrative controls to assure isolation capability. These administrative controls consist of stationing a dedicated operator, who is in continuous communication with the Control Room at the controls of the isolation device. In this way, the penetration can be rapidly isolated when a need for secondary containment isolation is indicated). OPERABILITY may be verified by an administrative check, or by examining logs or other information, to determine whether the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the components. If, however, any required component is inoperable, then it must be restored to OPERABLE status. In this case, the Surveillance may need to be performed to restore the component to OPERABLE status. Actions must continue until all required components are OPERABLE.

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1

The minimum water level of 12 ft 7 inches required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the CS System and LPCI subsystem pumps, recirculation volume, and vortex prevention. With the suppression pool water level less than the required limit, all ECCS injection/spray subsystems are inoperable ~~unless they are aligned to the OPERABLE CST A~~.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1 (continued)

~~When suppression pool level is < 12 ft 7 inches, the CS System and LPCI subsystems are considered OPERABLE only if they can take suction from CST A, and the CST A water level is sufficient to provide the required NPSH for the required CS pump and LPCI pumps. (LPCI pumps "A" and "D" are the only LPCI pumps that can be aligned to CST A.) Therefore, a~~ A verification that ~~either the~~ suppression pool water level is ≥ 12 ft 7 inches~~, or that the required CS and LPCI subsystems are aligned to take suction from CST A and CST A contains ≥ 150,000 gallons of water, equivalent to 14 ft,~~ ensures that the CS System and LPCI subsystems ~~(LPCI pumps "A" and "D")~~ sufficient can supply ~~at least 50,000 gallons of~~ makeup water to the RPV with an ~~The~~ excess ~~100,000 gallons remains as a~~ supplementary volume ~~and~~ to ensure adequate ECCS pump NPSH. ~~However, as noted, only one required CS or LPCI subsystem may take credit for the CST option during OPDRVs. During OPDRVs, the volume in CST A may not provide adequate makeup if the RPV were completely drained. Therefore, only one CS or LPCI subsystem is allowed to use the CST option. This ensures the other required ECCS subsystem has adequate makeup volume.~~

The 12 hour Frequency of these SRs was developed considering operating experience related to suppression pool water level ~~and CST A water level~~ variations and instrument drift during the applicable MODES. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool ~~or CST A~~ water level condition.

SR 3.5.2.2, SR 3.5.2.4, and SR 3.5.2.5

The Bases provided for SR 3.5.1.1, SR 3.5.1.6, and SR 3.5.1.9 are applicable to SR 3.5.2.2, SR 3.5.2.4, and SR 3.5.2.5, respectively.

SR 3.5.2.3

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS

(continued)