Nebraska Public Power District
Nebraska's Energy Leader

NLS990050
June 15, 1999

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Proposed License Amendment
Service Water Backup to the Reactor Equipment Cooling Post LOCA
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

In accordance with the provisions specified in 10 CFR 50.90 and 10 CFR 50.4, the Nebraska Public Power District (District) requests that the Nuclear Regulatory Commission (NRC) review and approve a License Amendment to the Cooper Nuclear Station (CNS) design basis. This proposed License Amendment would allow the use of the Service Water (SW) system to directly supply cooling water to the Reactor Equipment Cooling (REC) system during a Loss of Coolant Accident (LOCA) event. The necessary equipment and procedures required to effect this arrangement are essentially in place since this back-up service water supply to the REC critical loops has been previously licensed for other emergency events. Certain minor revisions to station procedures will be made (following NRC approval) regarding preferential system lineups to address single failure concerns. Since the CNS USAR does not describe this specific use of service water, this proposed License Amendment requests the NRC review and approval of the proposed USAR changes and the associated use of service water as a back-up to REC in a post LOCA situation.

The present REC leakage criteria during normal plant operation was established such that the REC system surge tank has sufficient capacity to assure that the REC system would operate during post LOCA conditions for 30 days without any operator action to provide makeup to the tank. This REC leakage criteria is sufficiently small to have caused operational problems and, in one case, entry into a 24 hour Limiting Condition of Operation (LCO). The approval of the proposed Licensing Amendment would allow an Updated Safety Analysis Report (USAR) change which would establish a leakage criteria for the REC system which is sufficiently conservative to assure REC operation for at least seven days following a large break LOCA but would alleviate operational concerns. The SW system backup could then be used, if necessary, to directly supply cooling water to the REC critical loops during the period from 7 to 30 days.

The No Significant Hazards Consideration Evaluation (Attachment 1) and the Safety Evaluation (Attachment 2), demonstrate that there are no significant safety concerns associated with the License Amendment to allow use of the SW system backup following a LOCA. The District therefore requests that the NRC approve this license amendment which would allow a USAR change, as shown in Attachment 3.

Cooper Nuclear Station
P.O. Box 98 / Brownville, NE 68321-0098
Telephone: (402) 825-3811 / Fax: (402) 825-5211
http://www.nppd.com

This proposed change has been reviewed by the necessary Safety Review Committees and the District has concluded that the proposed changes do not involve a significant hazards consideration.

By copy of this letter and attachments the appropriate State of Nebraska official is being notified in accordance with 10 CFR 50.91(b)(1). Copies to the Region IV Office and the CNS Resident Inspector are also being sent in accordance with 10 CFR 50.4(b)(2).

Should you have any questions concerning this matter, please contact Mr. Guy Cesare, Nuclear Licensing and Safety Manager at (402) 825-5433.

Sincerely,

John H. Swailes
Vice President of Nuclear Energy

/rar
Attachments

cc: Regional Administrator w/attachment
USNRC - Region IV

Senior Project Manager 10 copies w/attachment
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector w/attachment
USNRC

Environmental Health Division-Program Manager w/attachment
Nebraska Department of Health

NPG Distribution w/o attachment

STATE OF NEBRASKA)
)
NEMAHA COUNTY)

Michael F. Peckham, being first duly sworn, deposes and says that he is an authorized representative of the Nebraska Public Power District, a public corporation and political subdivision of the State of Nebraska; that he is duly authorized to submit this correspondence on behalf of Nebraska Public Power District; and that the statements contained herein are true to the best of his knowledge and belief.

Michael F. Peckham

Subscribed in my presence and sworn to before me this 14th day of June, 1999.

GENERAL NOTARY-State of Nebraska
LUANN BRAY
My Comm. Exp. May 11, 2002

LuAnn Bray

NOTARY PUBLIC

LICENSE AMENDMENT
SERVICE WATER SYSTEM BACKUP TO THE REACTOR EQUIPMENT COOLING SYSTEM IN A POST LOCA CONDITION
COOPER NUCLEAR STATION
NRC DOCKET NO. 50-298, LICENSE DPR-46

1.0 INTRODUCTION

The Nebraska Public Power District (District) requests that the Nuclear Regulatory Commission (NRC) approve a License Amendment to the Cooper Nuclear Station (CNS) design basis. The purpose of the requested License Amendment is to allow the use of the Service Water (SW) system to directly supply cooling water to the Reactor Equipment Cooling (REC) system during a Loss of Coolant Accident (LOCA) event. The present maximum allowable REC water leakage rate is based on the requirement that there will be sufficient water in the REC surge tank to allow the REC system to fulfill its safety function for 30 days in a post LOCA condition. A proposed Updated Safety Analysis Report (USAR) revision, shown in Attachment 3, would allow CNS to revise the maximum allowable REC system leakage during normal power operation such that the REC system surge tank would assure that the REC would fulfill its safety function for at least the first seven days following a large break LOCA. The SW system would fulfill the safety functions of the REC system, if required, for the remaining duration of the accident. The associated 10CFR50.59 safety evaluation for this USAR revision indicated that prior NRC approval would be required before the USAR revision could be incorporated.

2.0 NECESSITY FOR LICENSE AMENDMENT

The REC functions, in conjunction with the SW system, during accident and transient conditions to assure cooling for Emergency Core Cooling Systems (ECCS). The proposed License Amendment affects the method by which the REC functions following a LOCA. During the Architect/Engineer Inspection conducted by the NRC, a question was asked regarding the effect of leakage from the REC system and the effect of such a leak on the ability of the REC system to fulfill its safety functions post LOCA. The response to the inspection question, in summary, stated that the accident duration was 30 days and established a conservative REC leakage criteria during normal operation, such that the REC system, in particular the REC surge tank, would remain functional without operator action for 30 days post LOCA. There is no safety related water makeup source to the REC surge tank for which credit can be taken during post LOCA conditions. The reason that no credit can be taken for operator action to provide makeup water, within the CNS licensing basis, is that CNS made a commitment to the NRC in response to a Three Mile Island inquiry (Reference 1) regarding radiation levels in the Reactor Building, that operator action was not required in the Reactor Building post LOCA.

The permissible REC leakage rate established above, based on a 30 day accident duration, is small and has already caused entry into a 24 hour Limiting Condition of Operation (LCO). The intent of this proposed License Amendment is to establish a REC leakage rate which would provide relief from undue operational concerns but would not result in a significant safety hazard. The requirements for component cooling systems (for CNS the REC system), contained in NUREG 0800, Standard Review Plan (Reference 2), state that the REC surge tank shall have sufficient capacity to accommodate expected leakage for seven days. The requirement to provide extended essential cooling to the ECCS system pumps for the period from seven to 30 days would be fulfilled, if necessary, by the SW system backup to the REC system. Note that this backup would be used if operator entry into the Reactor Building is not possible due to high radiation levels for the full 30 day accident duration.

3.0 DESCRIPTION OF USAR CHANGES

The USAR marked up pages required to describe the use of the SW system backup for the REC system in a post LOCA condition are shown in Attachment 3.

4.0 NO SIGNIFICANT HAZARDS CONSIDERATION EVALUATION

10 CFR 50.91(a)(1) requires that licensee requests for operating license amendments be accompanied by an evaluation of significant hazards posed by the issuance of the amendment. This evaluation is to be performed with respect to the criteria given in 10 CFR 50.92 (c). The following analysis meets those requirements.

Evaluation of this Amendment with Respect to 10 CFR 50.92

The enclosed USAR changes, necessary to implement the proposed License Amendment, are judged to involve no significant hazards based on the following:

1. *Does not involve a significant increase in the probability or consequences of an accident previously evaluated.*

   The proposed change does not involve a significant increase in the probability of an accident previously evaluated in the USAR since there are no hardware changes associated with this USAR change. Procedure changes associated with this USAR change are limited to direction on which division of SW/REC backup to initiate first, and incorporation of new system leakage limits into surveillance procedures.

   The proposed change also does not involve a significant increase in the consequences of an accident previously evaluated in the USAR. This conclusion is based on the safety evaluation (Attachment 2) which demonstrates that the SW system will fulfill the safety

functions of the REC system in a post LOCA condition and thus the proposed change will not affect the performance and reliability of the REC system. The emergency systems cooled by the REC system, the ECCS systems and their room coolers, will therefore also fulfill their safety function when directly supplied by the SW system.

2. *Does not create the possibility for a new or different kind of accident from any accident previously evaluated.*

   The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated in the USAR. The proposed license amendment does not introduce any new equipment or hardware changes. It does, however, allow the SW system to perform a different type of function than it is presently licensed to perform in a post LOCA condition. This SW system post LOCA function has been previously demonstrated to fulfill the functions of the REC in a non LOCA emergency shutdown which are the same as the functions required following a LOCA.

3. *Does not create a significant reduction in the margin of safety.*

   The proposed activity does not involve a significant reduction in the margin of safety. The safety evaluation (Attachment 2) demonstrates that the SW system will perform the required REC post LOCA functions. There is an added required operator action which is to align the SW system to directly supply cooling water to the REC critical loops. As discussed in the safety evaluation, this action can be performed from the main control room utilizing one control switch and there is sufficient control room indication for the operator to be alerted to the need for the use of service water backup. There is also sufficient time for the operator to perform the task. Trending (prior to a postulated LOCA) routinely provides the control room operator with REC system leakage information. In a post LOCA situation, this leakage information would assist the operator in taking timely action to initiate the service water back-up before the need is alarmed in the control room.

5.0 ENVIRONMENTAL IMPACT EVALUATION

10 CFR 51.22(c)(9) provides criteria for, and identification of, licensing and regulatory actions eligible for categorical exclusion from performing an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazard consideration, (2) result in a significant change in the types or significant increase in the amount of any effluents that may be released offsite, or (3) result in an increase in individual or cumulative occupational radiation exposure. The District has reviewed the proposed license amendment and concludes that it meets the eligibility criteria for categorical

exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(c), no environmental impact statement or environmental assessment needs to be prepared in connection with issuance of the proposed license changes. The basis for this determination is as follows:

1. The proposed license amendment does not involve significant hazards as described previously in the No Significant Hazards Consideration Evaluation.
2. As discussed in the No Significant Hazards Consideration Evaluation, this proposed change does not result in a significant increase in radiological doses for any Design Basis Accident. This proposed license amendment does n result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite. The proposed license amendment does not introduce any new equipment, nor does it require any existing equipment or systems to perform a different type of function than they are presently designed to perform. The District has concluded that there will not be a significant increase in the types or amounts of any effluents that may be released offsite and these changes do not involve irreversible environmental consequences beyond those already associated with normal operation.

6.0 CONCLUSION

The District has evaluated the proposed License Amendment, and the associated changes to the USAR, to allow the use of the presently installed SW system backup to the REC system in a post LOCA condition. This would allow a less restrictive, but still conservative, REC leakage criteria during normal plant operation, which would reduce the risk of an undesirable plant shutdown due to the REC system being declared inoperable per Technical Specifications. The conclusion of this evaluation is that there are no significant safety concerns associated with this proposed License Amendment. Therefore, for the reasons detailed above, the District requests NRC approval of this proposed License Amendment.

7.0 REFERENCES

1. Letter from J. M. Pilant to NRC, dated April 16, 1982, Post TMI Requirements

2. NUREG 0800, Standard Review Plan, Section 9.2.2

SAFETY EVALUATION
PROPOSED LICENSE AMENDMENT
SW/REC INTERTIE

1.0 PURPOSE

The intent of this Safety Evaluation is to evaluate the safety significance of the proposed License Amendment, and the associated Updated Safety Analysis Report (USAR) changes, which would revise the maximum allowable Reactor Equipment Cooling (REC) system leakage during normal power operation. The present maximum allowable REC water leakage is based on the requirement that there will be sufficient water in the REC surge tank to allow the REC system to fulfill its safety function for 30 days in a post Loss of Coolant Accident (LOCA) condition. The proposed License Amendment would increase the maximum allowable REC leakage such that the REC system surge tank would assure the REC safety function for at least the first seven days following a large break LOCA with the Service Water (SW) system fulfilling the safety functions of the REC, if required, for the remaining duration of the accident.

2.0 SYSTEMS AND ACCIDENTS AFFECTED

2.1 Systems Affected

The only systems affected by this License Amendment are the REC and SW systems. The functions of the REC and SW systems are described in the USAR, Chapter X (Reference 1) and the required functions during transient and accident conditions are described in USAR Chapters X, XIV (Reference 2) and Appendix G (Reference 3). In summary, the REC system provides cooling water to the Emergency Core Cooling Systems (ECCS) pumps and the ventilation system which cools the ECCS pump rooms during post accident conditions. The heat is then transferred to the SW system, which then discharges to the Ultimate Heat Sink, the Missouri River.

2.2 Accidents Affected

The only accident analysis potentially affected by this change is the LOCA. In response to a Three Mile Island (TMI) concern on radiation levels in the Reactor Building in a post LOCA condition (Reference 7), Cooper Nuclear Station (CNS) stated that there are no operator actions required in the Reactor Building post LOCA. This means that no credit can be assumed for operator action in the Reactor Building to restore the water level in the REC surge tank during post LOCA conditions.

3.0 SW/REC INTERTIE

CNS is licensed for the SW system to directly supply cooling water to the REC critical loops to fulfill their safety requirements to assure the following (Reference 6):

1) The plant is capable of safe shutdown following a Design Basis Earthquake considering a concurrent single failure.

2) The plant is capable of safe shutdown considering any single passive failure in the critical services headers.

The SW and REC systems were modified, prior to initial licensing, with the provision of interties so that service water could be injected into the system to directly supply essential cooling loads (See figure 1). The above SW/REC intertie licensing basis does not include credit for use in a post LOCA condition. At the time of initial licensing, the REC safety function was credited within 5 minutes after event initiation. Service water backup is a manual operation from the Control Room for which credit cannot be assumed in the first 10 minutes following event initiation. Although not stated, and since under the then licensing basis it was not necessary, this was likely the reason that service water backup to the REC was not credited during post LOCA conditions. Trending (prior to a postulated LOCA) routinely provides the control room operator with REC system leakage information. In a post LOCA situation, this leakage information would assist the operator in taking timely action to initiate the service water back-up before the need is alarmed in the control room. A recent calculation (Reference 4) has determined that there is sufficient time for the operator to initiate the SW/REC back-up function after annunciation in the control room without impacting ECCS operation, and this information has been incorporated into the USAR.

4.0 EVALUATION

4.1 Background

The REC functions, in conjunction with the SW system, during accident and transient conditions to assure cooling for ECCS. The proposed change affects the method by which the REC functions following a LOCA. During the Architect/Engineer Inspection conducted by the Nuclear Regulatory Commission (NRC), a question was asked regarding the effect of leakage from the REC system on the ability of the REC system to fulfill its safety functions post LOCA. The response to the inspection question, in summary, stated that the accident duration was 30 days and established a conservative REC leakage rate which would be monitored during normal operation, such that the REC system, in particular the REC surge tank, would remain functional without operator action for 30 days post LOCA. This REC surge tank leakage criteria, during normal operation, is necessary to assure the REC remains functional in a post LOCA condition since there is no safety related water makeup source to the REC surge tank for post LOCA conditions. The reason that operator action is excluded is that, as previously noted, CNS made a

commitment to the NRC in response to a TMI inquiry regarding radiation levels in the Reactor Building, that operator action was not required in the Reactor Building post LOCA.

The permissible REC leakage established above based on a 30 day accident duration is small and has already caused operational problems which resulted in an entry into a 24 hour Limiting Condition of Operation which was exited before the plant was forced to shutdown. The intent of the proposed change is to establish a REC leakage rate which would alleviate the operational concerns but would not result in a significant safety hazard. The requirements for component cooling systems (for CNS the REC system), contained in the NUREG 0800, Standard Review Plan (Reference 8), state that the surge tank shall have sufficient capacity to accommodate expected leakage for seven days. Since the CNS accident duration is considered to be 30 days, the safety functions of the REC system must be fulfilled by some other safety-related system for the period from seven to 30 days. This requirement to provide extended essential cooling to the ECCS system pumps for the period from seven to 30 days would be fulfilled by the SW system backup to the REC system.

4.2 Effect on Accident Mitigation

The capability of the SW system to fulfill its safety function and the safety function of the REC system, when the SW/REC intertie is activated, has been verified by Calculation NEDC 97-074 (Reference 5). This calculation demonstrated that sufficient cooling water flow would be available if the SW system backup is used to cool the ECCS systems and the associated rooms, even under the worst conditions of SW water temperature, 90°F, and river level, 865. The critical loops are normally supplied by clean REC water and the issue of silting of the critical loops due to the use of the SW system was also investigated in Reference 5. The conclusion of this calculation was that, even with the minimum flow from one SW pump through both REC critical loops, sufficient velocity would be achieved to ensure that the critical loops would operate when supplied with service water without loss of function due to silting.

If, during post LOCA conditions, the surge tank water inventory drops to a predetermined level due to system leakage, then a low water level alarm annunciates in the Control Room. The operator would then attempt to restore the level by refilling the tank with water. The time available for operator action from when the surge tank low level alarms and when the REC pumps would not have sufficient Net Positive Suction Head is about three days (Reference 4), assuming the REC leakage prior to the LOCA was at the maximum allowable (equivalent to seven days post LOCA availability). This provides ample time for the operator to either restore the REC surge tank level or initiate the SW system backup. If the operator is unable to restore the water level in the tank, due for instance, to high radiation levels in the Reactor Building, the operator will switch to the SW system backup for essential cooling of the ECCS systems. Note that SW system backup can be initiated from the Control Room by the use of one keylock switch. The instructions to initiate direct service water cooling for the REC critical loops are presently contained in a station procedure. The effect on the single failure criterion of this proposed change is discussed in section 5.6 below.

5.0 OTHER FACTORS

5.1 Quality Standards

This USAR change does not involve any hardware changes, therefore Quality Standards are not affected.

5.2 Natural Phenomena Protection

This USAR change does not change any seismic classification, the equipment used to initiate and maintain the SW system backup is seismically qualified.

5.3 Environmental Qualifications (EQ)

The electrical equipment used to initiate and maintain the REC/SW intertie is presently classified as EQ.

5.4 Missile Protection and High Energy Line Breaks (HELB)

Since this USAR change does not involve any changes to high energy piping, rotating equipment or structures, it does not effect missile protection or HELB issues.

5.5 Electrical Separation and Separation Criteria

There are no hardware changes associated with this USAR change and therefore no concern with electrical or mechanical separation.

5.6 Single Failure

The worst possible single failure for the SW system backup would be the failure of an operator to be alerted to the need for service water backup. The surge tank low water level alarm instrumentation described previously is neither redundant nor essential so that no credit can be taken within the design basis for this instrumentation to alert the operator. The REC low pressure alarm is essential and redundant so that this alarm meets the requirements for single failure. This alarm would provide sufficient operator notice that the service water backup should then be initiated. In addition, failure of the REC pumps is also indicated in the control room. Calculation NEDC 97-085 (Reference 4) indicates that, worst case with two Residual Heat Removal (RHR) pumps running in one quad, there is sufficient time for the operator to initiate the SW/REC back-up after REC flow ceases before the room heats up to the maximum temperature for which the pumps are qualified.

Thus, there is sufficient time for the operator to determine that service water backup is required and initiate this backup. As noted above the SW/REC intertie can be initiated from the control

room by one keylock switch, which, when remote manually activated, automatically realigns the SW system to supply the REC critical loops directly with cooling water. The alignment of the SW system to supply the REC critical loops meets the requirements of the single active failure criterion with the one exception of the improbable single active failure described below.

There is a highly improbable single failure which could cause the SW system backup to the REC system to be unable to fulfill its function to supply cooling water to the REC critical loops in a post LOCA condition. A station procedure provides the operator with instructions for supplying service water to the REC critical loops when this is required. If the REC loops are split, i.e. valve REC-MOV-695 (See figure 1) is closed, the operator is instructed to start both trains of service water backup. If the REC loops are not split, i.e. valve REC-MOV-695 is open, then the operator is instructed to start only one train of service water backup, either Division I or Division II. As demonstrated by calculation NEDC 97-074 (Reference 5), one train of service water backup can supply both REC critical loops with sufficient cooling water flow.

If it becomes necessary for the operator to initiate the SW/REC interie in a post LOCA condition after the REC surge tank is empty, i.e. after at least seven days, the REC critical loops could lose cooling water due to the following scenario:

a) The REC loops are not split and thus valve REC-MOV-695, which is powered from Division I, is open.
b) The operator starts the Division I SW system backup train and thus now REC-MOV-695 and valve SW-MOV-886 are both open.
c) The single failure of Division I is now assumed and therefore neither REC-695 or SW-886 can be closed. Note no other failure has occurred to this point.
d) Since there is now no service water cooling to the REC critical loops, the operator will start the Division II service water backup train. However, the Division II cooling flow could be diverted into the open Division I service water backup path since both REC-695 and SW-886 are open and cannot be closed from the control room and entry into the Reactor Building is not an option.

Under these conditions, adequate cooling water flow to the REC critical loops cannot be guaranteed. This single failure is considered highly improbable for the following reasons:

1) A large break LOCA must occur with sufficient fuel damage to render the Reactor Building uninhabitable. Note that, since the single failure as described above must be assumed much later into the event, after at least seven days, the full complement of ECCS pumps, two Core Spray and two RHR pumps in Low Pressure Coolant Injection (LPCI) mode are available to deliver water to the reactor vessel. This will further reduce the Peak Clad Temperature compared to the worst case LOCA with only two ECCS pumps operating. This will also lessen the chances of fuel damage due to high fuel temperatures.

2) A coincident Loss of Offsite Power (LOOP) is assumed. This is an arbitrary assumption since, as shown in the USAR, an emergency plant shutdown will not cause grid instability and thus lead to a LOOP.

3) Repair procedures have been ineffective, for at least seven days, in restoring water to the REC surge tank.

4) The operator must choose to initiate the Division I service water backup train when valve REC-695 is open. Initiating the Division II train first is not a concern since even with a failure of Division II after it has been initiated, valve REC-695 is powered from Division I and can be closed from the control room.

5) The single failure must occur after the Division I service water backup has been initiated.

To prevent this unlikely event from occurring, the District, as part of the implementation of this License Amendment, will revise the station procedure to require the operator to preferentially initiate the Division II train of the SW/REC intertie when this function is required and when the REC critical loops are not split. With this provision in place the single failure vulnerability, discussed above, is eliminated.

As a defense in depth, it should be noted that if all cooling was lost to the REC critical loops, the reactor could still be maintained in a safe condition. The RHR pump seals can operate indefinitely without REC or service water cooling as noted in the response to Final Safety Analysis Report Question & Answer 10.5c. Also, with only a single RHR pump operating in each of the quads, the temperature in the quad never exceeds the maximum temperature at which the RHR motor will remain operable (Calculation NEDC 97-85, Reference 4). Under these conditions one RHR pump can function to supply cooling water to the reactor vessel in the LPCI mode. The other operable RHR pump can be aligned in the suppression pool cooling mode. Thus, the reactor will remain in a safe condition even with no REC cooling available.

5.7 Containment Isolation and Integrity

The USAR change does not involve any changes to the primary or secondary containment isolation system.

5.8 Control Room Habitability

This USAR change has no effect on the Control Room habitability since no credit is taken for use of the REC system to maintain Control Room habitability in a post LOCA environment There is no increase in the control room operator dose since the radiological consequences of the LOCA are unaffected by this USAR change.

5.9 Release of Radioactivity

The SW/REC intertie will fulfill the safety functions of the REC system and therefore the ECCS systems will continue to fulfill their safety function in the post LOCA condition. Thus there is

no increase in radioactive releases due to the LOCA, presently described in Chapter XIV of the USAR.

5.10 Possibility of Operator Error

The worst operator error which affects the SW system backup is the failure of the operator to acknowledge the surge tank low level alarm. This is the same as the single failure of the low surge tank level alarm, discussed above in section 5.6, and has the same resolution. An operator error which ignores the REC low pressure alarm and does not take action to initiate the SW/REC intertie, after other remedial actions have failed, is not a credible event.

5.11 Internal Flood Protection

Since there are no hardware changes, this USAR change has no effect on the internal flood analysis.

5.12 Probabilistic Safety Assessment

A Probabilistic Safety Assessment (PSA) study was performed which evaluated the following:

Case 1 - Allowing a seven day post accident availability leakage criteria for the REC surge tank.

Case 2 - Maintaining the current leakage criteria based on a 30 day availability.

The results of these scenarios cannot be compared to the risk criteria for Core Damage Frequency (CDF) or Large Early Release Frequency since core damage is assumed early in the initiating event so that operator action is not possible in the Reactor Building. However, the results of the PSA study indicated that there is no significant difference between the two cases in achieving the desired safe conclusion to the accident. In addition, the PSA study also indicated that a loss of REC transient is less of a contributor to CDF than a forced shutdown.

6.0 SUMMARY

This Safety Analysis for the proposed License Amendment, and the associated USAR change, for the use of the SW system backup for the REC system in a post LOCA environment demonstrates that there is no significant effect on the health and safety to the public as a result of this proposed change.

7.0 REFERENCES

1. USAR, Volume IV, Chapter X, Sections 6.0, Reactor Equipment Cooling System and Section 8.1, Service Water System

2. USAR, Volume V, Chapter XIV, Station Safety Analysis

3. USAR, Volume VII, Appendix G, Nuclear Safety Operational Analysis

4. Calculation NEDC 97-085, RHR Quad Heatup After Loss of Cooling with Two Pump Operation

5. Calculation NEDC 97-074, Evaluation of the Service Water System to Provide Direct Backup Cooling to the REC System's Critical Loops

6. AEC SER for CNS, dated 4/14/73

7. Letter from J. M. Pilant to NRC, dated April 16, 1982, Post TMI Requirements

8. NUREG 0800, Standard Review Plan, Section 9.2.2

The 550 gallon capacity head tank, located at the highest point of the system, accommodates system volume changes, maintains static pressure in the loop, detects gross leaks in the REC system and provides a means for adding makeup water. Makeup water to the REC system from the demineralized water storage tank is supplied by a connection from the demineralized water transfer pump to the head tank. Head tank level is maintained automatically by means of level transmitters and controllers mounted locally. Should failure of automatic system occur, manual isolation and bypass is supplied for the level control valve.[52] The head tank is readily accessible during reactor operation for level adjustment if desired. Venting of the tank is directed to the reactor building.

INSERT 'A' →

The common discharge header for the heat exchangers is monitored for low pressure and alarmed in the control room. A pressure test point is located at the inlet and outlet of each closed cooling water heat exchanger for pressure testing if desired. Pressure indicators are located on the suction and discharge of each pump and on the supply headers to the safety-related services. Local temperature elements are located on the inlet and outlet of the heat exchangers to indicate the temperature of the cooling water. One temperature indicator located on the common discharge header from the heat exchangers indicates the REC system temperature in the main control room. A cooling water sampling point is located at the common discharge header from the REC heat exchangers. Samples will be taken periodically to determine activity levels and quality of cooling water.

The following conditions will alarm in the main control room:

1. Head tank low level
2. Head tank high level
3. Heat exchanger discharge header low pressure
4. High radiation level

The REC system is powered by the emergency service buses.

6.5.2 Planned Operations

During normal power operation three pumps and one heat exchanger are operating providing coolant flow to all the equipment listed in Table X-6-1 except the safety-related cooling services which are valved off. The flow rate to each component in the system is initially set manually and maintained during operation. Floor alarms, temperature alarms, and local temperature and flow indicators are provided throughout the system for process monitoring. In addition, remote temperature indicators are provided to monitor drywell equipment. The design inlet water temperature to the equipment coolers and area cooling coils is 95°F. The design heat transfer for each heat exchanger under these conditions is 33×10^6 BTU/hr.

A radiation indicator-recorder is located in the system to continuously monitor radioactivity level. On detection of a high radiation level an alarm will sound automatically in the control room.

6.5.3 Accident and Transient Operations

Either REC loop has sufficient capacity with one pump operating to transfer the safety-related services design cooling load during postulated transient or accident conditions.[97]

This analysis envelopes the plant configuration with the equipment hatch plugs at the 903'-6" and 881'-9" elevations of the RHR System compartments removed. With the hatch plugs removed (Ref. DC 93-062), it will take longer for the RHR Systems compartments to heat up due to cooling provided by natural convection. Therefore, the above analysis is conservative for the described plant configuration and will not be revised.

The above analysis indicates that the REC system will not be needed until five minutes after a LOCA. Since operator action to manually start a REC pump would be required in less than ten minutes, the following automatic actions occur:

1. An automatic start of the REC pumps 20 seconds after power is restored to the emergency buses.

2. An automatic opening signal to the Division I Critical Service Header Motor Operated Valve (REC-MOV-711MV) 30 seconds after a Group VI Isolation signal is received and SW-MOV-650MV has automatically opened to its minimum flow position. REC-MOV-711MV will be fully open approximately 120 seconds after power is restored to the emergency buses.

3. An automatic opening signal to the Division II Critical Service Header Motor Operated Valve (REC-MOV-714MV) 30 seconds after a Group VI Isolation signal is received and SW-MOV-651MV has automatically opened to its minimum flow position. REC-MOV-714MV will be fully open approximately 120 seconds after power is restored to the emergency buses.

Sufficient pressure is generated by one pump to preclude starting of additional REC pumps. In the event of pump failure, the low pressure condition in the essential services supply header is indicated in the control room and another pump is manually started by a remote manual switch to correct the low pressure condition.

The same type of operation takes place in the event that the start-up and emergency (off-site) a-c power source is lost without concurrent LOCA conditions.

Additional flexibility of system operation has been provided through the capability of interconnection of the two loops through crossties. Thus, the system could still function under a variety of degraded conditions.

Control for REC Pumps 1-C and 1-D can be transferred to the alternate shutdown panels. The pumps can then be controlled independent from the Control Room in the special event of a fire.

6.6 Safety Evaluation

The REC System is designed with sufficient redundancy so that no single active system component failure nor any single active component failure in any other plant system can prevent it from achieving its safety objective. Two independent closed loops, each with full heat transfer capacity are provided.

The REC System contains both Class I Seismic and Class II Seismic piping. The system can still support plant shutdown if there is a failure in the Class II Seismic part of the system by remotely isolating the failure from the control room.

In the event of a failure (line break) in the Class II Seismic system piping, the operator will be alerted to this malfunction from signals received from various alarms connected to flow switches located in different portions of the REC system. The operator will perform the following functions:

1. Shut off the operating REC pumps. (Non-Safety-Related supply header valves REC-MO-700MV, REC-MO-702MV, REC-MO-712MV, REC-MO-713MV automatically closes on loss of pressure after a 40 second time delay).

2. Isolate Class I Seismic system by manually closing drywell isolation valve MO-709MV.

3. Initiate a manual reactor scram.

4. Restart one of the REC pumps to supply cooling water to the equipment connected to the safety-related cooling loops (Table X-6-1) and open either REC-MO-711MV or REC-MO-714MV.

5 Initiate the SW/REC Intertie valves if pressure cannot be maintained.

There is a 40 second time delay associated with automatic REC isolation valve closure to allow for REC system pressure recovery during operational transients so that the potential for unwanted auto isolations are minimized.

The 30 second time delay for the SW-650MV and SW-651MV auto-open functions prevents REC-711 and REC-714MV from opening during the voltage dips caused by the sequential starting of the ECCS pumps. The active safety function of the 30 seconds time delay will be to provide adequate time delay to prevent the opening of REC-711MV and REC-714MV during the voltage dips caused by the ECCS pumps starting period (0-15 seconds) and open REC-711MV and REC-714MV before the non-critical REC MOV's are fully closed (at t=60 seconds). The actual SW-650MV and SW-651MV valve position defined as 10% open is not part of the safety-function of SW-650MV, SW-651MV, REC-711MV, and REC-714MV, because the Operator will have to manually adjust SW-650MV and SW-651MV during the post-accident time period depending on which REC Heat Exchanger was in service prior to the accident. The SW-650MV, REC-711MV and SW-651MV, REC-714MV interlocks prevent the opening of REC-711MV and REC-714MV if SW-650MV and SW-651MV are fully closed, which prevents allowing REC coolant to the critical loops from a standby or inoperable REC heat exchanger.

As shown on Figure X-6-1, there are no air-operated valves separating the Seismic Class I and Class IIS system piping.[12]

Additional flexibility of system operation has been provided through the capability of interconnection of the two loops through the crossties. Thus the system could still function under a variety of degraded conditions.

In order to assure that a passive failure, such as a pipe break in a portion of the Class IS Seismic REC system will not deplete the system of cooling water, the system introduces service water in the event of such an occurrence.

The arrangement is shown in Figures X-6-2 and X-6-3. The critical services headers feeding the compartment air coolers are isolated from the rest of the REC system upon closure of M0-711MV, M0-714MV, and the two motor-operated valves located in the REC pump suction headers (Figure X-6-2). The service water is obtained from the headers feeding the REC heat exchangers (Figure X-6-3). The concept uses only service water to cool the compartment air coolers; operation of the REC pumps and heat exchangers is not required. The introduction of service water into the two loops of the REC system assures the following:

1. The plant is capable of safe shutdown following a Design Basis Earthquake considering a concurrent single failure.

INSERT 'B'

2. The plant is capable of safe shutdown considering any single passive failure in the critical services headers.[13]

It is concluded that the safety design bases are met.

6.7 Inspection and Testing

Pumps in the REC systems shall be proven operable by their use during normal station operations. Motor operated isolation valves can be tested to assure they are capable of opening and closing by operating manual switches in the control room and observing the position lights.

6.8 Nuclear Safety Operational Requirements

6.8.1 General

NOTE: Limiting Conditions for Operation and Surveillance testing requirements stated and listed in this subsection are based on analyses performed at the time of original license application. For current information refer to the Technical Specifications.

Table X-6-3 represents the nuclear safety operational requirements for the REC system for each BWR operating state. The entries in Table X-6-3 represent an extension of the plant-wide BWR systems analysis of Appendix G. The following referenced portions of the safety analysis report provide important information justifying the entries in Table X-6-3:

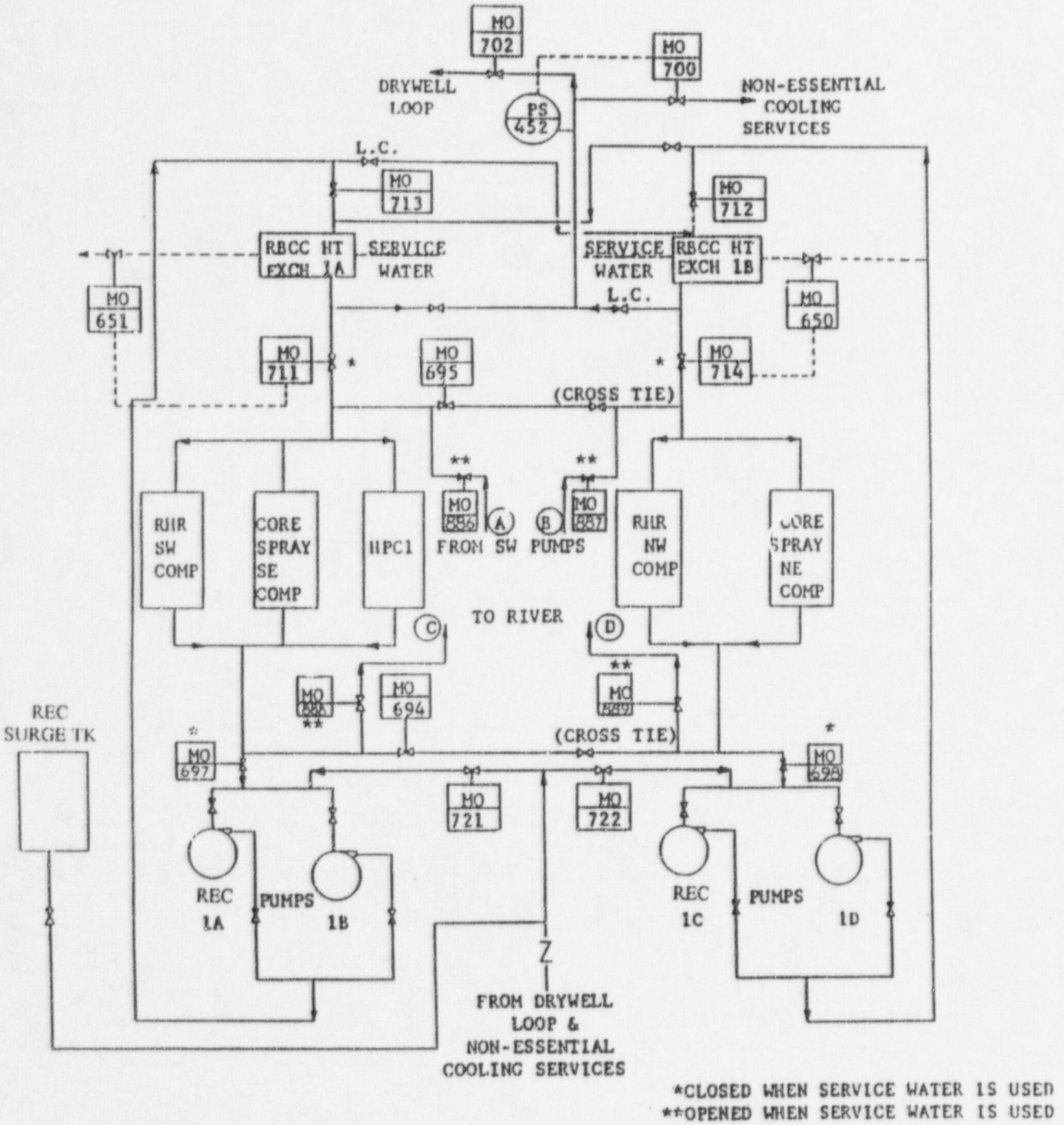
Reference	Information Provided
1. Earlier parts of Section X-6.	Description of the REC System
2. Station Nuclear Safety Operational Analysis, Appendix G.	Identifies conditions and events for which REC systems action is required.

INSERT A (USAR page X-6-4)

During normal plant power operation, water leakage from the REC system is monitored by station procedures to ensure that this leakage does not exceed the maximum allowable leakage. The maximum allowable leakage is based on the criterion that the REC surge tank shall be capable of providing sufficient NPSH for the REC pumps in a post LOCA condition for at least seven days without requiring any makeup during this seven day period.

INSERT B (USAR page X-6-9)

3. The plant is capable of a safe shutdown following a Design Basis LOCA considering the REC system allowable leakage as defined in Section X-6.5.1 above.



ADDITION OF SERVICE WATER INTERTIE TO REC SYSTEM FOR COOLING OF CRITICAL SERVICE ITEMS

SW/REC INTERTIE

NLS 990050

FIGURE 1

Correspondence No: NLS990050

The following table identifies those actions committed to by the District in this document. Any other actions discussed in the submittal represent intended or planned actions by the District. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the NL&S Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
CNS will revise the USAR in accordance with the marked-up pages of this proposed Licensing Amendment	30 days after approval of this Amendment
CNS will revise affected station procedures as necessary to initiate Division II SW to REC back-up first if both Divisions are available.	30 days after approval of this Amendment