Nebraska Public Power District
"Always there when you need us"

50.90

NLS2008084
November 6, 2008

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to Nuclear Regulatory Commission Request for Additional Information Re: Reactor Equipment Cooling System (TAC No. MD8374)
Cooper Nuclear Station, Docket No. 50-298, DPR-46

References:

1. Letter from Carl F. Lyon, U. S. Nuclear Regulatory Commission, to Stewart B. Minahan, Nebraska Public Power District, dated September 9, 2008, "Cooper Nuclear Station - Request for Additional Information Re: Reactor Equipment Cooling System (TAC No. MD8374)"

2. Letter from Stewart B. Minahan, Nebraska Public Power District, to the U.S. Nuclear Regulatory Commission, dated March 24, 2008, "License Amendment Request to Revise Technical Specification 3.7.3, Reactor Equipment Cooling System"

Dear Sir or Madam:

The purpose of this letter is for the Nebraska Public Power District to submit a response to a Request for Additional Information (RAI) from the Nuclear Regulatory Commission (NRC) (Reference 1). The RAI requested information in support of the NRC review of a License Amendment Request (LAR) to revise the Technical Specifications (TS) for Cooper Nuclear Station (CNS) (Reference 2). The LAR proposed revisions to TS 3.7.3, Reactor Equipment Cooling System.

The response to the specific questions in the RAI is provided in Attachment 1. No regulatory commitments are made in this submittal.

The information submitted by this response to the RAI does not change the conclusions or the basis of the no significant hazards consideration evaluation provided with Reference 2.

A001
NRR

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

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

Executed on 11/6/08
(date)

Sincerely,

Stewart B. Minahan
Vice President – Nuclear and
Chief Nuclear Officer

/em

Attachment

cc: Regional Administrator w/ attachment
USNRC - Region IV

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

Senior Resident Inspector w/ attachment
USNRC - CNS

Nebraska Health and Human Services w/ attachment
Department of Regulation and Licensure

NPG Distribution w/o attachment

CNS Records w/ attachment

Attachment 1

Response to Nuclear Regulatory Commission Request for Additional Information Re: Reactor Equipment Cooling System (TAC No. MD8374)

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

Reference: Letter from Carl F. Lyon, U. S. Nuclear Regulatory Commission, to Stewart B. Minahan, Nebraska Public Power District, dated September 9, 2008, "Cooper Nuclear Station - Request for Additional Information Re: Reactor Equipment Cooling System (TAC No. MD8374)"

NRC Question #1

On page 10 of Attachment 1 of the LAR [License Amendment Request], the licensee provides in Table 1 a comparison of the provisions of the Amendment 185 safety evaluation with Cooper's compliance. Item 2 of Table 1 cites that "calculations have determined that the SW [Service Water] System can provide sufficient cooling to the essential loads of the REC [Reactor Equipment Cooling] System, in addition to providing required cooing of SW loads, at any time following a LOCA [Loss-of-Coolant-Accident]." Since Amendment 185 was approved in March 2001, **[a]** *discuss how the licensee has confirmed that the earlier calculations made for the SW System have remained valid and* **[b]** *if any additional calculations are needed considering the proposed reliance upon operators to perform the cross connection of the REC System to the SW System after a LOCA, if the REC System is inoperable.*

Response

Part [a] Validity of Previous Cooper Nuclear Station (CNS) Calculations-of-Record

The use of the SW System as a backup to the REC System was approved by Amendment 185, dated March 13, 2001. The calculations that supported that LAR were identified in the response to Questions #6 and #11 in Attachment 1 of the Nebraska Public Power District (NPPD) letter dated November 14, 2000. The response to Question #6 identified calculations NEDC 97-087, Rev. 2; NEDC 96-029 and NEDC 00-108. The response to Question #11 identified calculations NEDC 97-085, Rev. 3 and NEDC 92-093, Rev. 4.

The earlier calculations performed in support of the Amendment 185 amendment request have been revised since November 2000, and are currently in effect. (The revision cited for each calculation in the following discussion is the latest approved version.) Those calculations remain valid based on the fact that the changes made to them since issuance of Amendment 185 have not invalidated any of the assumptions made in them, they are consistent with the current licensing basis, and they have no conflicts with the REC Margin amendment request currently under review by the Nuclear Regulatory Commission (NRC). The calculations were revised to maintain them consistent with the design and licensing basis of CNS.

The following is a summary of the revisions made to the calculations that supported the issuance of Amendment 185 and the calculations that support the current LAR. Because the revisions made to the earlier calculations are consistent with the current licensing and design basis and do not conflict with the LAR currently under review, it is concluded that those earlier calculations remain valid.

NEDC 97-087

Calculation NEDC 97-087, Rev. 3, "Acceptance Criteria for High Pressure Coolant Injection (HPCI) Room Cooler and Reactor Building Quad Coolers", has been updated to reflect 95°F service water and 100°F REC system inlet water temperature to the Emergency Core Cooling System (ECCS) pump coolers and room coolers. The calculation presents an analytical demonstration of the SW system's ability to provide backup cooling to these coolers. The use of Control Room indications of SW system pressure is also evaluated for a LOCA/non-LOOP scenario. It is calculated that an indication greater than 38-psig is sufficient to ensure adequate SW flow to the REC critical loops.

In NEDC 97-087 conservative assumptions have been made with regard to the fan coil unit (FCU) heat loads. As one example, the Quad cooler heat loads have been arbitrarily increased by 5%, then rounded up to the nearest ten-thousand Btu/hr as an additional measure of conservatism. The required, calculated SW flow to remove the heat load from the four Quads plus the HPCI Room is 360 gpm. Accounting for instrument uncertainty, this minimum required SW flow rate is 416 gpm. Surveillance tests typically record approximately 470 gpm actual flow from a single REC pump when delivering demineralized water to five critical loops and coolers.

Surveillance of the REC critical loops is not performed using the Service Water Backup Cooling alignment. This is highly undesirable as it would leave the REC critical loops contaminated with Missouri River water. Post-test flushing to purge the mud, silt, sand and other debris out of the piping would be time and resource intensive. (CNS has recently cleaned river and SW piping debris out of the REC heat exchanger bells, the result of strainer debris bypass in the intake structure and piping corrosion). For these reasons, SW Backup Cooling performance is demonstrated analytically.

The SW Backup Cooling analysis in NEDC 97-087 assumes a service water fouling factor for the ECCS pump room and the Residual Heat Removal (RHR) pump seal coolers of 0.001 for the first 30-days after the accident, with a fouling factor of 0.006 assumed thereafter. The calculated FCU tube velocities are about 1.75 to 1.9 foot per second (fps), slightly less than the vendor-recommended minimum velocity of 2 fps. However, NEDC 97-087 concludes that silt out is not expected, based on CNS operating experience (OE). The calculation states that OE shows that silt out does not occur in tubes of similar size if the velocity is kept above 1 ft/sec.

NEDC 96-029

Calculation NEDC 96-029, Rev. 4, "Post LOCA Service Water System Flow Variations with River Level", is the SW System flow model with the FATHOM Version 3.0 computer program. This calculation was performed by MPR Associates and has been accepted by NPPD. Since Amendment 185, this calculation has been modified to include some different Diesel-Generator cooling flow conditions and to address throttled SW flow to the REC heat exchangers. Flow is calculated for different river levels, and a non-LOOP scenario has been added. New SW pumps (installed from December 2002 to February 2003) are evaluated but do not affect the results of the calculation. The effect of increasing the SW pump gland flow is addressed and shown to be negligible.

The current version of NEDC 96-029 concludes that adequate SW flows will be provided to the Diesel Generator (DG), REC and RHR heat exchangers for a LOCA with or without LOOP, at river levels from 865 to 902 feet mean sea level. Throttling of the REC heat exchangers flow may be required for the LOOP scenario in which one SW pump is running at a degraded flow rate of 5500 gpm after ten minutes to ensure that adequate flow is maintained to the DGs. For the non-LOOP scenario, the analysis shows that at least 3500 gpm SW flow can be provided to the REC heat exchangers, even at the low-pressure setpoint of the non-essential SW header. Regarding flow to the REC heat exchangers, the calculation concludes that a SW flow rate of 400 gpm can be maintained. The calculation addresses silt and sediment deposition by means of the acceptance criterion that service water velocity must exceed 1 fps for prevention of silting in the heat exchangers.

NEDC 96-029 models the SW flow to the REC heat exchangers, but it does not model the SW flow through the critical loops. Calculation NEDC 96-029 demonstrates that SW flow of 400 gpm can be delivered through the REC heat exchangers for several post-accident configurations, generally with a large margin. As noted above, flow through the critical loops is analyzed in calculation NEDC 97-087 with the REC pump flow to the critical loops verified by surveillance, and SW Backup Cooling performance demonstrated analytically.

From NEDC 96-029, it can be inferred that realigning the SW system from cooling the REC heat exchangers to flow directly into the REC critical loops will result in decreased total SW system flow demand, hence increasing the flow to other SW loads (DGs, Control Room Heating and Ventilation, etc.), while still meeting the SW Backup Cooling flow minimum flow requirement of 416 gpm at the crosstie to the REC critical loops. No changes to the flow models of this calculation are currently planned to explicitly model flow through the REC critical loops when supplied with SW Backup Cooling.

<u>NEDC 00-108</u>

NEDC 00-108, Rev. 1, "Determine if water will flow out the REC Surge Tank vent line during SW System Backup Supply", addresses back flow out the REC Surge Tank vent if using SW Backup Cooling to the REC critical loops. The original calculation demonstrated that flow of service water out the surge tank vent would not occur if SW Backup Cooling is initiated. Only editorial and clerical revisions have been made to NEDC 00-108 since Amendment 185.

NEDC 97-085

Calculation NEDC 97-085, Rev. 8, "RHR Quad Heatup after a Loss of Cooling with Two Pump Operation", is a detailed scoping analysis of post-LOCA heating of the RHR Quads. This calculation was revised September 20, 2007 in support of the current CNS REC Margin LAR. This calculation modeled only the RHR Quad volumes, the intent being to scope the problem preparatory to revising calculation NEDC 00-095E, which models the entire Reactor Building thermal response for 180-days after the accident with the GOTHIC 7.0 computer program. NEDC 97-085 modeled short-term heating, (i.e., the first two hours). It presented the calculated room heatup by comparison to the CNS post-LOCA Equipment Qualification Profiles for the Northwest and Southwest (RHR) Quads, and it provided a basis for the assumption of Loss-of-REC Cooling after about 20 hours being a reasonable worst-case for subsequent analysis. This calculation is current with regard to the REC Margin LAR.

NEDC 92-093

NEDC 92-093, Rev. 9, "Core Spray Quad Temperature Rise", is a detailed scoping analysis of post-LOCA heating of the Core Spray (CS) Quads. This calculation was revised September 20, 2007 in support of the current CNS REC Margin LAR. This calculation modeled only the CS Quad volumes, the intent being to scope the problem preparatory to revising detailed calculation NEDC 00-095E, the 180-day simulation. This is similar to what was done with NEDC 97-085 as described above, again to support the REC Margin LAR. NEDC 92-093 models the first ten hours without active cooling, and it models alignment to SW Backup Cooling at one-hour. Similar to NEDC 97-085, it models Loss-of-REC-Cooling after 22 hours, then aligning SW Backup Cooling, with comparisons made to the post-LOCA EQ Profile for the Southeast Quad. A case is added with the Control Rod Drive pumps "off" to more properly model the room heat load for the postulated accident. This calculation is current with regard to the REC Margin LAR.

NEDC 00-095E

Calculation NEDC 00-095E, Rev. 2, "CNS Reactor Building Post-LOCA Heating Analysis", mentioned above, determines temperatures in the Reactor Building following a LOCA if using SW for essential cooling in the ECCS pump rooms (the Quads) and the HPCI pump room. NEDC 00-095E has been revised to account for one-hour operator action time to align SW Backup Cooling to the REC critical loops, with Loss-of-REC System cooling assumed after 20 hours. This calculation was discussed by NPPD in its September 11, 2008 response to the July 7, 2008 NRC RAI on the REC Margin LAR, with excerpts provided as Enclosure 1 to the response.

NEDC 03-027

Calculation NEDC 03-027, Rev. 2, "Assessment of Post-LOCA Heatup Temperature Profiles for Reactor Building", assessed the 180-day Arrhenius temperatures using input from revised calculation NEDC 00-095E. This calculation has been discussed by NPPD in its September 11, 2008 response to the July 7, 2008 NRC RAI on the REC Margin LAR, with excerpts provided as Enclosure 2.

Part [b] Operator Response Time for System Re-Alignment

No additional calculations are needed to support the reliance on operator actions to align the SW System to the critical loops of the REC System.

The analysis assumes one hour to align the SW system to the REC critical loops based on Operations experience, walk-downs and simulator drills. If additional time for operator response had been assumed, the impact on the conclusions of the calculation would have been negligible since the analysis is not very sensitive to the operator response time. One reason for this is that the large heat loads assumed in the ECCS pump room heatup calculations are conservative and are assumed to be constant. The process piping heat load to these rooms is driven by the Suppression Pool (SP) water temperature, which exceeds 200°F after about 4 hours and remains above this for most of the first day. The Reactor Building thermal response analysis for the REC Margin LAR assumes failure of the REC System at about 20 hours. This maximizes the equipment soak time in the ECCS pump rooms with regard to the process piping heat loads. The failure is postulated to occur when the SP temperature is still within about 10 degrees of its maximum. NPPD considers this to be a reasonable worst-case for modeling an event that is beyond-design-basis. For example, the calculated SP temperature at 4.2 hours is 201.2°F for the CNS design-basis LOCA (e.g. USAR Table XIV-6-6, Case F used here), whereas it is about 201.1°F at 19.9 hours and 198.9°F after 22.1 hours. If it were assumed that the Loss-of-REC System Cooling occurred at 4 hours, there would be a negligible effect upon the ECCS pump room thermal response. Likewise, if it were assumed that it took the Operators two hours to realign to SW Backup Cooling instead of one hour, the impact to the 180-day thermal response would again be negligible. This is because the equilibrium room temperature is nearly reached within one hour after loss-of-cooling, as evidenced by calculations NEDC 97-085 and 92-093, as was discussed in the response to question 1[a] above.

Finally, it should be noted that entry into the Reactor Building (RB) is not required to make the SW Backup Cooling alignment. Thus, the thermal conditions in the RB have no bearing on the time for Operator decisions and response.

NRC Question #2

On page 9 of Attachment 1 of the LAR, the licensee states its preference to use the REC System following a LOCA as opposed to the SW System, which contains silt from the Missouri River. However, the LAR proposes to utilize the SW System at any time to provide cooling water to the ECCS pump room coolers following a LOCA. **[a]** *How does the licensee factor into its calculations the amount of silt being introduced to the ECCS pump room coolers, especially if the SW System can be used at any time after a LOCA?* **[b]** *When the SW System is in use, how will the licensee monitor the amount of silt going into the ECCS pump room coolers to ensure proper cooling will be provided throughout the mitigation period of 30 days after a LOCA?*

Response

Part [a] Calculated Silt Quantity

The quantity of silt is not explicitly addressed in the calculations. CNS calculations and the associated computer programs that model the SW System and the REC critical loops assume use of pure water. However, the calculations assume that the velocity of SW flow through the quad cooler heat exchanger tubes exceeds 1 fps. NPPD concludes that debris trapping, settling and/or precipitation will not occur as long as the calculated piping or heat exchanger tube velocity exceeds 1 ft/sec. As noted in the response to 1[a], the fouling factor for the ECCS pump room and the RHR pump seal coolers is assumed to be 0.001 for the first 30 days.

Part [b] Silt Monitoring

The amount of silt going into the ECCS pump room coolers is not monitored. No system exists for doing this at CNS.

The following is a discussion of how the REC critical loop piping is protected from silt and sand entry during the conduct of valve stroke time surveillance testing of the valves that align the SW System to the REC critical loops. This process is detailed in Section 5 of CNS Procedure 6.REC.201 for Division 1. It prevents the undesirable introduction of mud and debris into the REC critical loops.

Figures 1 and 2, showing portions of the SW System at the crossties to the REC System, are provided as an aid in understanding the following discussion of the piping configuration.

[Refer to Figure 1.] With 4-inch motor operated valve (MOV) SW-888MV closed and 4-inch manual valve SW-423 open, the SW-to-REC crosstie is normally pressurized from the SW side. Surveillance of the SW Backup Cooling alignment first involves opening the 1-inch crosstie drain valve (SW-424) on the return side until a steady flow of SW water is observed. Valves SW-424 and SW-423 are then closed. The crosstie return piping is next vented and drained through valves SW-424 and SW-1267. These valves are then closed to isolate the crosstie.

[Refer to Figure 2.] A similar procedure is performed on the supply side, establishing service water flow to the drain through SW-418, then venting, draining and isolating the supply-side crosstie. With MOV 866MV, and manual valves SW-417, SW-418, and SW-1266 closed, 6-inch MOV REC-MO-711 is opened. Opening SW-MO-886 and SW-MO-888 then causes both the supply and return crosstie piping to be pressurized from the REC side, with demineralized water flow then established to the drains through SW-418 and SW-424. (The MOV stroke times are measured during this evolution). Upon completing the stroke-time tests, the MOVs are closed, and the 4-inch manual valves are returned to their sealed-open position for normal plant operation.

The two crosstie lines that supply water from the SW System to the REC critical loops are four inches in diameter and about 51 to 56 feet long. The two crosstie return lines, also four inches in diameter, are both horizontal runs of piping about 15 to 27 feet long. These lines are known to accumulate sand and silt. However, these lines are not flushed to remove any sand and silt that may have accumulated.

Silt accumulation in these crosstie lines was the subject of a question from the NRC during review of the LAR for use of the SW System as a backup for REC critical loop cooling (approved by Amendment 185 dated March 13, 2001). The response to that question was provided on pages 15 through 17 of Attachment 1 of NPPD letter NLS2000020 to the NRC dated November 14, 2000. The response discussed how areas of stagnant water are susceptible to silt deposition, and that a portion of the crosstie piping was found to be approximately 90% filled with sand during a refueling outage. The response also described the arrangement of the crosstie lines and noted that during an emergency in which SW backup would be needed, return flow through the SW-MOV-888MV would flush the silt out of the pipe. The response further noted that silt deposits are easily dispersed with flow having increased velocity.

NRC Question #3

The licensee proposes to revise Surveillance Requirement (SR) 3.7.3.1 from "Verify the REC surge tank water level is within limits" to "Verify the REC System leakage is within limits." [a] Please provide additional information on why this change is being proposed, including a discussion on the type of REC leakage that is being monitored and how this would affect the availability of the REC System if the leakage exceeds it limits. [b] Also, if the REC surge tank water level is no longer being monitored due to this proposed SR change, how will this affect the REC System availability when a LOCA occurs? [c] How will monitoring the REC leakage as opposed to the REC surge tank water level be a more conservative means for the operators to decide if the SW System should be used over the REC System in the event of a LOCA?

Response

[a] The change to SR 3.7.3.1 is proposed because the parameter of concern with respect to the operability of the REC System is leakage from the REC System and not surge tank level. The surge tank level is of interest only because monitoring the level in the tank is the means of monitoring and quantifying the leakage from the REC System, and as such this is more a terminology change than a methodology change.

The current plan is to continue monitoring the surge tank level as the means of monitoring and quantifying leakage from the REC System. NPPD may implement an alternate method of monitoring leakage from REC at some time in the future if another such method is identified. The type of leakage being monitored is leakage from the non-critical and critical loops of the REC System.

Additionally, as stated in the proposed TS Bases included in the LAR, leakage in excess of the 30 day leak rate limit is not itself a condition that results in REC being inoperable. Rather, inoperability will be defined as leakage in excess of limits coupled with an inoperable SW backup subsystem. The combination of those two conditions will result in not meeting the LCO requirements of 'operable' REC subsystems. Then Conditions and

Required Actions will have to be entered and met to maintain CNS within licensed design parameters. During normal plant operation makeup water can be supplied to the REC surge tank. As a result, the REC System would remain operable and available to perform its function during normal plant operation even with leakage greater the 30-day limit. The technical specification revisions proposed in the amendment request would allow the SW System to provide cooling to the loads normally cooled by the REC System during a loss-of-coolant accident, in the event that the REC System had leakage in excess of limits.

[b] As noted in the response to part [a] above, NPPD plans to continue monitoring the surge tank level as the means of monitoring and quantifying leakage from the REC System, but may implement an alternate method of monitoring leakage from REC at some time in the future. Since system leakage will continue to be monitored, there is no affect to the REC System availability when a LOCA occurs. Because technical specifications require the REC System to be operable during operation, any alternate method of monitoring leakage (that may be developed in the future) will be at least as conservative as the method of monitoring the level in the surge tank.

[c] As explained in the response to part [b], the surge tank level is currently being used as the means to monitor leakage from the REC System, but may be replaced with an alternate method at some point in the future. Because technical specifications require the REC System to be operable during operation, any alternate method of monitoring leakage (that may be developed in the future) will be at least as conservative as the method of monitoring the level in the surge tank. Currently, there are no plans to implement a change in the method of monitoring leakage from the REC System.

FIGURE 1

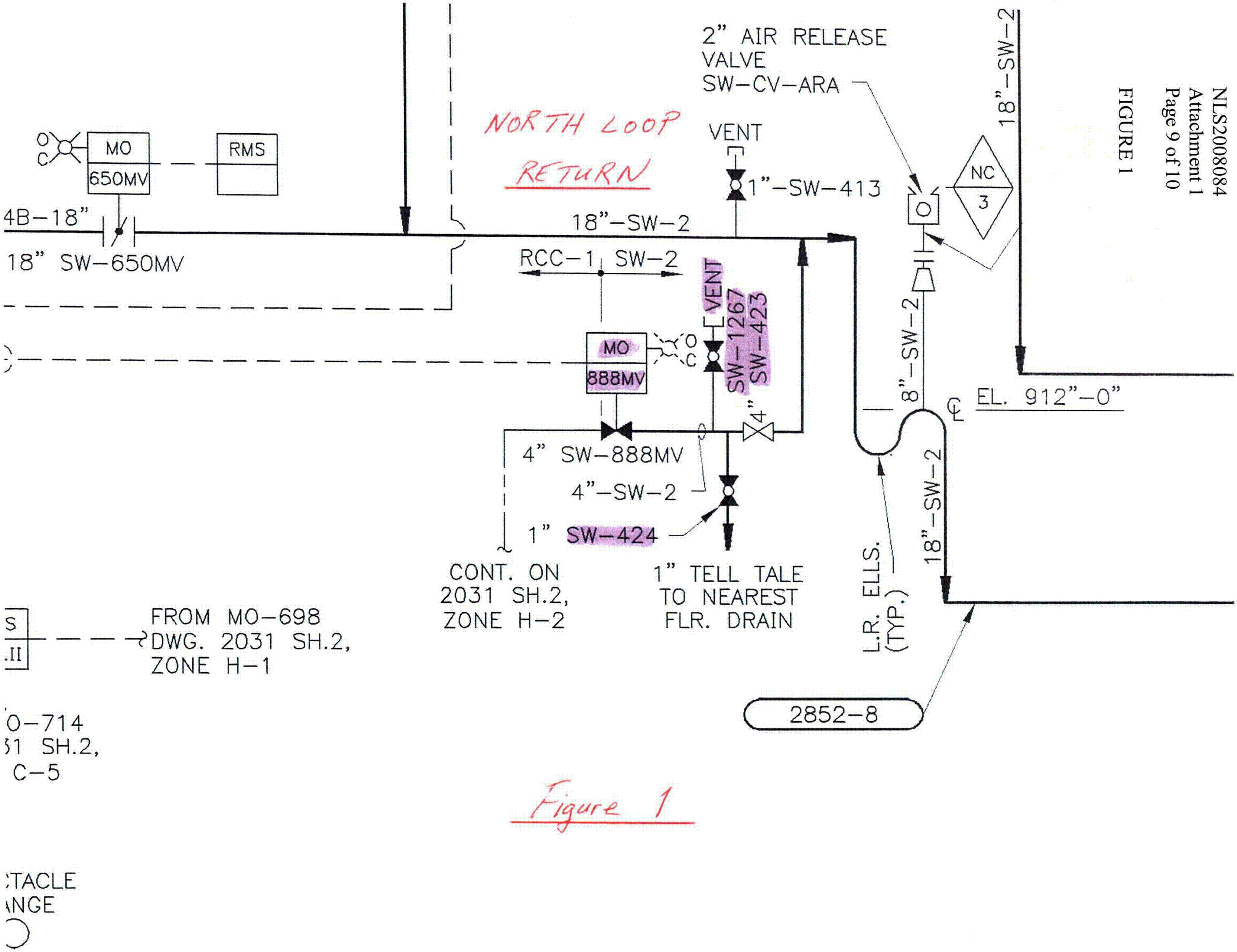
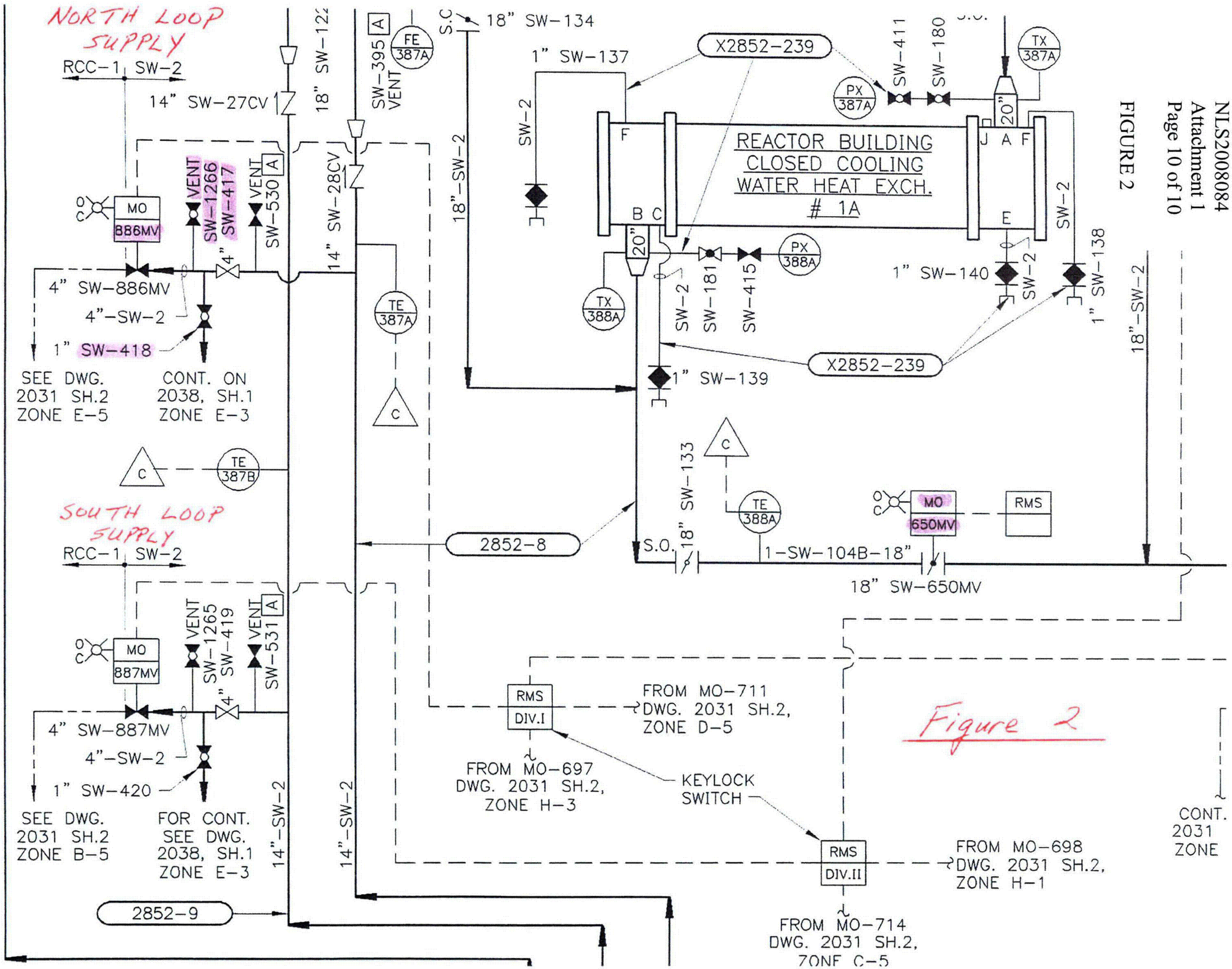


Figure 1


NORTH LOOP SUPPLY
RCC-1, SW-2
14" SW-27CV
18" SW-122
SW-395 VENT
FE 387A
S.O.
18" SW-134
1" SW-137
X2852-239
SW-411
SW-180
TX 387A
PX 387A
20"
SW-2
18"-SW-2
REACTOR BUILDING CLOSED COOLING WATER HEAT EXCH. # 1A
F
J A F
B C
E
MO 886MV
VENT SW-1266 SW-417
VENT SW-530
SW-28CV
14"
4" SW-886MV
4"-SW-2
1" SW-418
SEE DWG. 2031 SH.2 ZONE E-5
CONT. ON 2038, SH.1 ZONE E-3
TE 387A
C
TX 388A
SW-2
SW-181
SW-415
PX 388A
1" SW-140
1" SW-138
1" SW-139
X2852-239
TE 387B
SOUTH LOOP SUPPLY
RCC-1, SW-2
MO 887MV
VENT SW-1265 SW-419
VENT SW-531
4" SW-887MV
4"-SW-2
1" SW-420
SEE DWG. 2031 SH.2 ZONE B-5
FOR CONT. SEE DWG. 2038, SH.1 ZONE E-3
14"-SW-2
2852-9
2852-8
18" SW-133
S.O.
TE 388A
1-SW-104B-18"
MO 650MV
RMS
18" SW-650MV
RMS DIV.I
FROM MO-711 DWG. 2031 SH.2, ZONE D-5
FROM MO-697 DWG. 2031 SH.2, ZONE H-3
KEYLOCK SWITCH
RMS DIV.II
FROM MO-698 DWG. 2031 SH.2, ZONE H-1
FROM MO-714 DWG. 2031 SH.2, ZONE C-5
CONT. 2031 ZONE
Figure 2

0.ATTACHMENT 3 LIST OF REGULATORY COMMITMENTS©

Correspondence Number: NLS2008084

The following table identifies those actions committed to by Nebraska Public Power District (NPPD) in this document. Any other actions discussed in the submittal represent intended or planned actions by NPPD. They are described for information only and are not regulatory commitments. Please notify the Licensing Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITMENT NUMBER	COMMITTED DATE OR OUTAGE
None		