Nebraska Public Power District

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June 13, 1988

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Subject: Justification for Interim Operation; Revision 1,
Cooper Nuclear Station
NRC Docket No. 50-298, DPR-46

Reference: (a) G. A. Trevors, NPPD letter to U.S. Nuclear Regulatory Commission, "Justification for Interim Operation," dated June 12, 1988.

Reference (a) submitted the District's justification for the interim operation of Cooper Nuclear Station. Attached are revised pages to the referenced letter and to Attachment 3 to the letter. This revision is being submitted to correct minor errors and to clarify the District's intent with regard to support modifications prior to startup. The corrections are as follows:

Cover Letter

Page 2 — The number of overstressed welded pipe anchors that will be modified prior to plant startup has been changed from three to four in two places on the page.

Attachment 3

Page 4 of 17 — typo - deleted "the"

Page 5 of 17 — Anchor supports to be modified changed from three to four in two places on the page.

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Page 7 of 17	Anchor supports to be modified changed from <u>three</u> to <u>four</u> in two places in sub-paragraph c).
Page 12 of 17	"Table 4 on page 8" changed to "Table 4 on page 9".
Page 17 of 17	The first paragraph of Section 10.0 has been revised to clarify the extent of the support modifications that have been or will be modified prior to plant startup.

Sincerely,

G. A. Trevors
Division Manager
Nuclear Support

/rg
Attachment

cc: U.S. Nuclear Regulatory Commission
Regional Administrator - Region IV

NRC Resident Inspector
Cooper Nuclear Station

code qualification of all supports associated with reactor coolant pressure boundary piping prior to startup from the present outage. This task is complete.

An extensive review and evaluation of the total population of original design essential piping supports presently in service at CNS has been performed. Operability of existing supports was evaluated and compared with the results of the HPCI operability evaluation, on a statistically valid sampling basis, by both system and support attribute. As a result of this methodology, all existing essential supports at CNS were found to be enveloped by the HPCI results, except those with unique attributes, specifically deadweight supports and welded pipe support anchors. One hundred percent of deadweight supports and welded pipe support anchors were then reviewed. During this review, it was revealed that certain deadweight supports could experience uplift during design basis seismic events. It was also discovered that certain welded pipe anchors were overstressed. While it is believed that sophisticated analytical efforts could be performed, resulting in reduced loads leading to a conclusion that existing deadweight supports and welded pipe anchors are acceptable, such a solution was not deemed to be cost or time effective. Accordingly, the District has reviewed all deadweight supports and modified the seventeen which experience uplift to accommodate the uplift forces. Also, all welded pipe anchors have been reviewed and the four anchors that were overstressed will be modified prior to startup.

The detailed evaluation supporting the conclusion that other existing essential piping systems are operable is provided in Attachment 2 (Cygna Doc. No. TR-88037A-3).

Accordingly, the existing situation at CNS for essential piping systems is as follows:

- All pipe supports associated with the reactor coolant pressure boundary are fully code qualified.
- All piping supports associated with the HPCI discharge line are fully code qualified.
- All deadweight supports (17) experiencing uplift during design basis seismic events have been modified to accommodate such loads.
- All welded pipe anchors (4) that were overstressed will be modified prior to startup.
- All pipe supports designed subsequent to the initial CNS design were previously analyzed and documented, resulting in a conclusion that they are not within the scope of the identified nonconforming condition.
- All other essential supports have been statistically evaluated on the basis of the HPCI Pump Discharge System Operability Evaluation. With statistical certainty, the essential piping systems are considered to be operable.

system. The general result is that the HPCI pump discharge supports are considered to be the bounding case, and therefore, the HPCI results can be extrapolated to the remaining Class IS systems.

In addition, the sample size was expanded to ensure that at least 10% of each type of support was included and that at least one support of each type, where they exist, was included from each system. The support types considered are as follows:

1. Spring Hangers (SH)
2. Snubbers (SN)
3. Anchors (AN)
4. Box Frames (BF)
5. Struts (ST)
6. Miscellaneous Components
   (Includes U-bolts, straps, rod hangers, welded attachments).

Further, it was recognized that certain attributes commonly used in pipe support design had the potential to cause concerns. These attributes were identified partially by the results of the review of the HPCI pump discharge pipe supports and partially by the use of previous experience. The attributes identified were:

1) Rigid Frames
2) Welded Anchors
3) Deadweight Supports Experiencing Uplift Loads
4) Nozzles

The support type and attribute review revealed the following significant observation:

- o Uplift on deadweight supports and overstressed welded pipe anchors were potentially critical to the operability assessment of Class IS systems.

The nonconforming deadweight support SW-H182 (ISO No. 2851-1) was a rod hanger on the Service Water System. The vertical seismic (SSE) load exceeded the deadweight reaction. This resulted in uplift on a rod hanger which provides minimal resistance to upward loads.

The next step of the assessment was an effort to identify the impact of the noted rod support nonconformance on the operability of the affected portion of the Service Water piping system. Past experience has shown that isolated support failures do not necessarily result in a loss of piping operability if the support load can be redistributed to adjacent neighboring supports without a significant impact on the validity of the associated piping stress analysis. Such an evaluation was conducted for that portion of the Service Water system containing the nonconforming support.

Jelco Piping Isometric No. 2851-1 was reviewed to determine the piping suspension scheme in the vicinity of Support No. SW-H182. The vertical support on this system is provided by five rod hangers, three spring hangers and one strut. A review of the loads for the remaining rod

hangers showed that several adjacent rod hangers would also experience uplift. Therefore, it was not feasible from a time and cost standpoint to redistribute the vertical load to adjacent supports in order to justify operability of Support No. SW-H182 and it was decided to develop the necessary vertical restraint modifications on this portion of the Service Water System to prevent uplift from occurring on any of the rod hangers.

In order to assess the potential generic implications and extent of the problem of uplift on deadweight supports, all remaining Class IS pipe supports and isometrics were then reviewed. The loads on all deadweight supports on the eleven essential systems listed in Table 1 were checked to determine if seismic uplift would occur. This check was performed for DW + OBE and DW + 2(OBE). When a support with uplift was identified, the adjacent vertical supports were reviewed to determine if the upward seismic loads would be redistributed. If the vertical seismic load could not be redistributed, or two adjacent deadweight supports experienced uplift, the affected piping system was identified as a potential problem, and set aside for a detailed evaluation, and for potential development of support modifications. As a result of this evaluation, seventeen supports were identified for modification. The modification work has been completed. A summary of the deadweight support review is provided in Table 2.

TABLE 2

DEADWEIGHT SUPPORTS

System	Number with Uplift	Modifications Required
SW	18	12
MS/BS	6	1
RCIC	3	0
RBCCW	9	3
RHR	1	1
	37	17

During the critical attribute review of anchors, an additional problem was identified in that welds from the support structure to the pipe did not meet operability criteria for four pipe supports. All of the other essential pipe anchors have been reviewed and meet the operability criteria. Once again, the decision was made to modify the four anchor supports rather than perform additional analyses of the piping systems. The modification work will be completed prior to startup.

Thus, of the six support types and four support design attributes identified as potential concerns, two attributes raised concerns. For these two attributes, deadweight supports and welded pipe anchors, 100% of the population of these two attributes were reviewed. All of the deadweight supports that experienced uplift and all of the welded pipe anchors that were overstressed will be within code requirements prior to

that loads were traceable since pipe support calculations exist. The remainder of the supports on the Class IN/IS systems were evaluated in accordance with USAS B31.1.0, under design loads, and either met the code in the as-found condition or were modified to meet the code. Seventeen (17) support modifications were necessary to bring the Class IN/IS piping systems to code compliance. This work is complete.

In conclusion, the District believes that interim operation of the Cooper Nuclear Station is justified based on the following:

1) All Class IN/IS, Reactor Coolant Pressure Boundary pipe supports are qualified to the requirements of USAS B31.1.0-1967.

2) The HPCI pump discharge piping supports are fully qualified to B31.1.0-1967.

3) The HPCI pump discharge piping, with the pipe supports in the as-found condition, has been shown to meet the requirements of a valid set of operability criteria.

4) The operability criteria have been proven to provide adequate margin to ensure that the essential, safety-related piping systems will be capable of performing their design functions under all design basis conditions. That is, the systems will be operable per the CNS Technical Specification requirements.

5) A sample of the supports on the balance of Class IS piping systems has been analyzed. A total of at least 10% of each type of hanger and 10% of the hangers on each system have been reviewed. Supports in this sample met the same operability criteria applied to the HPCI system. Thus, the HPCI hangers are considered to be representative of the hangers in the remaining IS systems. Thus, it is concluded that the remaining IS systems are operable as was shown in the case of HPCI.

6) The sample was expanded to include unique attributes of hanger types and of individual piping systems. Two unique attributes were identified that could affect system operability. First, there was seismic uplift on certain deadweight supports. All deadweight supports were reviewed, and as a result, seventeen supports were modified to withstand these uplift loads. Second, four overstressed welded pipe anchors were identified. Again, all welded pipe anchors were reviewed and the four will be modified prior to startup.

7) A review of all supports on the Core Spray System validates the conclusion that, indeed, the HPCI pump discharge supports are representative of the remaining Class IS systems, since the Core Spray pipe supports met all operability criteria in its as-found condition.

The District finds the above basis satisfactory to justify interim operation of the Cooper Nuclear Station, until the plant can be upgraded to meet code requirements.

break and following cooldown to ensure that all operational cases were enveloped. This evaluation concluded that the maximum temperature experienced by the HPCI System would be 120F. It is believed that the maximum thermal operating modes of the other Class IS systems are also conservative in the existing piping analyses. Therefore, the loads on the other Class IS systems are conservatively high, and could be reduced by a detailed analysis, which would lower stress levels in pipe supports.

- o Pipe Stress Combinations

  The pipe stress combinations used for the functionality evaluation were the same as those used in the original analysis, although the use of a higher damping factor, as justified above, did affect the SSE loads.

- o Pipe Support Stress Allowables

  As shown on Table 4 on page 9, the pipe support code allowables are based on current AISC Code allowables with certain increases (1.5 times allowable for welds). The increases are the same as those allowed for piping and components in Appendix C of the Updated Safety Analysis Report.

- o Pipe Support Load Combinations

  The following load combinations for pipe support functionality were considered:

  1. DW + TH MAX + SSE

  2. DW + SSE

  Where:

  DW = deadweight load
  TH MAX = Thermal load at maximum temperature (120F)
  SSE = Maximum Possible Earthquake

  These are considered to be the worst case load combinations required in the original design basis.

- o Piping Stress Allowables

  The piping stress allowables are listed in Table 3 on page 8. The allowable stresses are equal to those used in the original design basis.

6.3 Results of HPCI Pump Discharge Piping Operability Evaluation

The calculated stress in each member of the 32 pipe supports (in the as-found condition) on the HPCI discharge piping was compared to the operability criteria allowable stresses listed in Section 6.1 above. The as-found HPCI pump discharge line was determined to be within the allowables of the operability criteria.

long-term plan will contain a list of affected systems and assign a priority to the code qualification effort by completing the most critical systems first, considering operational and radiation exposure constraints. Finally, the long-term plan will contain specific scheduled dates for completion of milestones.

10.0 CONCLUSION

The District has modified all piping supports associated with the reactor coolant pressure boundary (Class IN supports) and all HPCI discharge line supports to meet the design basis. All deadweight supports which could render the systems inoperable when subject to uplift forces during a design basis seismic event were modified to ensure operability. All overstressed welded pipe anchors will be modified to ensure operability prior to plant startup. The District has determined that all other safety-related systems will remain operable with existing pipe support designs. Therefore, all systems will perform their intended safety function during and following a design basis earthquake.

This conclusion, for supports which are not fully in compliance with the Design Basis, is based on a set of operability criteria which have been shown to provide an adequate margin of safety to prevent the failure of a system to perform its safety function. These operability criteria were applied to the HPCI pump discharge piping system and extrapolated, through a sample, to the remaining essential systems. The operability criteria were also verified on the Core Spray System. The results of detailed structural calculations demonstrate that the as-found condition of the HPCI pipe supports and of the sample supports is adequate to ensure the operability of the systems.

Since all systems are operable in accordance with the CNS Technical Specifications, the District believes that interim operation, until systems can be brought into code compliance, does not endanger the health and safety of the public.

The District will develop and implement a long-term plan to upgrade all Class IS piping supports at CNS to meet the Design Basis for the plant.