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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 10, 1980

Docket No. 50-298

Mr. J. M. Pilant, Director
Licensing & Quality Assurance
Nebraska Public Power District
P. O. Box 499
Columbus, Nebraska 68601

Dear Mr. Pilant:

Enclosed for your information is the Staff's evaluation for Cooper Nuclear Station of the actions you have taken to satisfy the Category "A" items of the NRC recommendations resulting from TMI-2 Lessons Learned. This evaluation is based on your submitted documentation and the discussions between our staffs at a site visit on March 26-27, 1980. A list of meeting attendees is also enclosed.

Based on our review, we conclude that you will have satisfactorily met all Category "A" requirements before resuming operations after the current refueling outage. The adequacy of certain modifications and implemented procedures will be verified by our Office of Inspection and Enforcement. Each of these is discussed in our evaluation.

Should you have any questions regarding our evaluation, please contact us.

Sincerely,

T. Ippolito

Thomas A. Ippolito, Chief
Operating Reactors Branch #3
Division of Operating Reactors

Enclosures:
1. Evaluation
2. Meeting Attendees

cc w/encls:
See next page

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EVALUATION OF LICENSEE'S COMPLIANCE WITH CATEGORY "A" ITEMS OF NRC RECOMMENDATIONS RESULTING FROM TMI-2 LESSONS LEARNED

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

Dated: April 10, 1980

I. INTRODUCTION

By letters dated October 17(1), November 20(2), December 3(3), 1979 and January 11(4), 1980, Nebraska Public Power District (licensee) submitted commitments and documentation of actions taken at Cooper Nuclear Station, to implement our requirements resulting from TMI-2 Lessons Learned. To expedite our review of the licensee's actions, members of the staff visited the licensee's facility on March 26-27, 1980. This report is an evaluation of the licensee's efforts to implement each Category "A" item which was to have been completed by January 1980.

The Cooper Station is currently in a refueling outage and certain items have not yet been completed. Accordingly, our review is based on planned actions, the completion of which will be verified by the Office of Inspection and Enforcement (IE).

II. EVALUATION

Each of the Category "A" requirements applicable to BWRs is identified below. the staff's requirements are set forth in Reference 5; the acceptance criteria is documented in Reference 6. The numbered designation of each item is consistent with the identifications used in NUREG-0578.

2.1.1 EMERGENCY POWER SUPPLY

The NRC requirement, as it is applicable to BWR's, is that provisions must be made such that the power-operated relief valves can be supplied emergency power when off-site power is not available. Further, for air-operated valves, emergency power must be available to the air compressors in order to provide a long term supply of air. The reactor water level instrumentation must also be capable of operating from emergency power.

The licensee's submittals indicated that he did not consider this item to be applicable to Cooper. At the NRR/IE site visit we related our requirements as summarized above.

The licensee stated at the site visit that all relief valves are supplied with redundant safety grade power. Motive air is supplied to these valves by redundant air compressors which are energized by safety grade power sources. Our on-site review indicates that the reactor water level instrumentation for safety system activation is powered by the on-site emergency power supplies.

Based on the above, we conclude that the licensee has satisfied the requirements of this item and that no modifications are required.

2.1.2 PERFORMANCE TESTING FOR BWR RELIEF AND SAFETY VALVES

The staff's position is that Boiling Water Reactor licensees shall functionally test the reactor coolant system relief and safety valves to demonstrate operability under expected operating and flow conditions. The Category "A" requirement is for the licensee to commit to perform an appropriate test program.

The licensee is a member of a GE BWR Owners Group and has committed (4) to a test program adopted by this Owners Group(7).

We conclude that the licensee has satisfied the Category "A" requirements for this item.

2.1.3.a Direct indication of Power-Operated Relief Valves and Safety Valve Position for BWR's

The staff's position is that BWR licensees shall provide a positive indication for reactor coolant system relief and safety valves. The valve position should be indicated and alarmed in the control room and derived from a reliable valve position detection device or a reliable indication of flow in the discharge pipe so that the operator is provided with an unambiguous indication of valve position. If the valve position indication is not safety grade, a reliable single channel direct indication powered from the emergency bus may be provided if backup methods of determining valve position are available. Further, the valve position indication should be seismically qualified consistent with the components or system to which it is attached. If seismic qualifications are not feasible by January 1, 1980, then justification should be provided and a schedule submitted for upgrading the system to meet the seismic requirements.

To meet the above position, the licensee has installed pressure switches to monitor the position of each safety/relief valve. Information pertaining to the indication system was obtained during the NRR/IE site visit and is documented in the licensee's January 22, 1980 submittal. The installed valve position indicating system consists of a pressure activated switch mounted on the tailpipe downstream of each safety/relief valve. The signal output from pressure switch energizes three contacts. The first contact signal is inputed into the plant computer. The computer records the valve number that opened, valve position and the time or each event when the contacts open and reclose. The second contact lites indicator lights for "closed" and "open position" in the main control room above the individual valve control switch. The third contact provides an alarm signal on a dedicated annunciator panel.

The Cooper plant has eight safety/relief valves. All valves have the capability to be operated manually, however, six of these valves have been dedicated to the ADS function. The pressure switch monitoring system is not fully safety grade. The licensee has stated and we agree that the system is a reliable single channel system that provides valve position indication. The system is powered from the on-site Class 1E emergency AC power supply and is provided with an automatic transfer to a redundant Class 1E emergency AC power source in the event of a loss of one of the on-site power sources. Backup valve position indication information is provided by temperature monitoring and discussed in the emergency procedures so that the operator can make a diagnosis and take appropriate action. The backup temperature monitoring system consists of thermocouples mounted on each individual safety/relief and safety valve tailpipe downstream from the valve discharge point. The thermocouple readings are indicated on a temperature recorder and on the

plant process computer. Annunciation is provided on the alarm panels in the main control room. Power for this system is provided from a different Class 1E reliable power source so that in the event of a single failure of a power supplying the systems, at least one is available to provide the reactor operator with the valve status.

Our review of the licensee's submittal indicates that all components of the valve position indicating systems will meet our seismic requirements by January 1, 1981. The pressure switches have not been environmentally qualified. The licensee states that Cooper is currently participating in the GE-BWR owner's group environmental qualification program for pressure switches which will assure that our qualification requirements will be met. The licensee's schedule is consistent with our Category "B" requirements.

The licensee does not intend to provide pressure switches for their two safety valves that discharge directly to the containment atmosphere. They stated during our site visit that due to the configuration of the valve tailpipes, the pressure switches would not be functional after a safety valve lift and therefore, would not provide as an effective valve position monitor as the currently installed thermocouple monitoring system. The licensee stated that since the thermocouples are mounted in the tailpipe and exposed to the containment atmosphere, a long, delay response time would not result; therefore, it provides an effective means of monitoring valve position. To provide redundancy the licensee has committed to install another thermocouple in each of the safety valve tailpipes. With the addition of the redundant thermocouple we believe that the licensee has met the intent of our position.

Based on our review of the licensee's submittal, we conclude the licensee is in compliance with our basic objectives of providing direct indication of power-operated relief and safety valve position and with our requirements outlined in NUREG-0578 with respect to safety grade of components, seismic requirements, and environmental qualifications of components and is, therefore, acceptable.

2.1.3.b Instrumentation for Inadequate Core Cooling

The NRC requirements, licensee actions and our evaluation thereof for this item are being evaluated by the NRC Bulletins and Orders Task Force and will be reported separately.

2.1.4 CONTAINMENT ISOLATION

The NRC requirements are that the licensee is to: (a) carefully reconsider the determination of which systems should be considered essential or non-essential for safety, (b) modify systems as may be necessary, to isolate all non-essential systems by automatic, diverse, safety-grade isolation signals, and (c) modify systems, as may be necessary, to assure that the resetting of the containment isolation signals does not cause the inadvertent re-opening of containment isolation valves.

The licensee's classification of essential systems was based on a determination of which systems are required or could be of direct aid in mitigating the consequences of an accident. All other systems which penetrate the primary con-

tainment are non-essential. The licensee's letter dated November 16, 1979(8) includes an identification of each penetration, classification as essential (engineered safety function) or non-essential, and identification of the isolation signals for each. As stated in NUREG-0578 our goal is to use information provided by licensees to develop a consistent set of guidelines for the selection of essential and non-essential systems. Accordingly, the licensee has satisfied this aspect of the requirements for this item.

Our review of the licensee's submittal indicates that all non-essential systems receive diverse containment isolation signals. We find that the licensee has satisfied this aspect of the requirements for this item.

The licensee has identified 14 switches which will be replaced during the current refueling outage to assure that resetting of the containment isolation signal will not result in the inadvertent reopening of isolation valves. Thus all containment isolation valve switches will be spring-return-to-neutral which is an acceptable control logic.

Based on the above, we conclude that the licensee has adequately conformed to the requirements of this item. IE will verify the adequacy of procedures and the completion of design changes as discussed above.

2.1.5.a <u>Dedicated Penetrations for External Recombiner of Post-Accident External Purge System</u>

The staff's position is that licensees whose plant uses external recombiners or purge systems for post-accident control of combustible gas in the containment atmosphere should provide a containment isolation system that is dedicated to that function only. The system's design should be redundant and meet our single failure requirements to that criterion 54 and 55 of the General Design Criteria are met and that the system is sized to satisfy the flow requirements of the recombiner or purge system. This requirement is applicable to those plants whose licensing basis includes requirements for external or purge systems for post-accident control of combustible gas in the primary containment.

The Cooper Plant is designed to use a Containment Inerting (CI) system. This system is used prior to each startup to provide and maintain the oxygen concentration in the primary containment atmosphere to less than 5 percent to ensure that combustion of the hydrogen and oxygen cannot occur. Based on information provided, we have determined that the CI system consists of the following major subsystems: the containment purge and exhaust subsystem the containment inerting subsystem and the containment inerting makeup subsystem. These subsystems are used during normal plant operations and do not perform any safety functions. Only those components associated with maintaining the containment isolation integrity (up to and including second containment isolation valve) are safety related and have been designed to seismic Category I requirements and suitable redundancy.

The licensee stated during the NRR/IE site visit that the atmospheric containment atmosphere dilution (ACAD) purge system for Cooper was not included in the plants licensing design basis even though the plant operates with an inerted containment. The licensee stated that the requirement for post-accident control of combustible gas in the primary containment could be met by providing a redundant ACAD system which consists of the following major sub-

systems: The containment pressure bleed subsystem and the containment dilution subsystem. These subsystems are designed to be safety related; all components are Seismic Category I, and all active components are redundant.

The ACAD system performs the safety function of limiting initial hydrogen concentration to less than 4 percent in order to preclude a flammable mixture in the primary containment on a long term basis following a LOCA. The ACAD system could be used during emergencies and has been designed to Seismic Category I requirements; electrical components meet applicable portions of IEEE-279, and have suitable redundancy and interconnections so that a single failure of an active component will not render the system inoperable. The ACAD system is functionally independent from the normal CI system except as indicated below and its components include air receivers, compressors, redundant lines and valves and associated instrumentation. The ACAD system injects air into the containment using dedicated redundant lines that are connected to the large vent and purge lines that communicate with the torus and drywell compartments. Solenoid actuated isolation valves for each of the redundant torus and drywell lines (4 lines total) have remote control switches located in the main control room. In addition, redundant analyzers for hydrogen have been provided as part of the Containment Atmosphere Monitoring (CAM) system for each the drywell and torus, and are designed to meet our seismic requirements.

The ACAD system is designed to be used in conjunction with the system that has been provided to vent the containment through the standby gas treatment system using components designed to engineered safety feature standards. Separate lines and isolation valves have been provided to reduce containment pressure buildup resulting from use of the ACAD system.

The licensee stated in the NRR/IE site visit that the ACAD purge system at Cooper would be used for post-accident combustible gas control. The design of the containment penetrations associated with ACAD have been reviewed and it has been verified that isolation provisions of the ACAD system are single failure proof except where it connects to the CI system. A separate line and isolation valve for the drywell and torus has been provided to reduce containment pressure if needed. When these lines are used for post-accident venting, the outboard, normal containment isolation purge valve must be opened to allow a flow path to the SGTS. At this time, complete reliance is placed on the remaining inboard containment isolation valve to maintain the containment integrity. The licensee has committed to reevaluate the need for a design change to preclude venting the containment through the SGTS in the event of a failure of the inboard isolation valve.

Based on our review, we conclude that the licensee has satisfied the Category "A" requirements for this item. Any required modifications will be completed as a Category "B" item. This is acceptable.

2.1.5.c Recombiner Procedures

The NRC requirements for this item apply only to those plants that include hydrogen recombiners as a design basis for licensing. We have determined that this item is not applicable to the Cooper Plant.

2.1.6.a Systems Integrity

The NRC objective is to eliminate or prevent the release of significant amounts of radioactivity to the environment via leakage from engineered safety systems and auxiliary systems, which are located outside reactor containment. The requirements are to implement practical measures to reduce leakage, report leakage measurements to the NRC and establish a preventive maintenance program to maintain leakage at as-low-as practicable levels.

Based on our review of the licensee submittal and discussion with the licensee during the NRR/IE site visit, we find that the licensee has tested and measured leak tightness of safety systems, reduced leakage, developed and implemented leak reduction, and preventive maintenance program, and reported measured leak rates to the NRC. The licensee has incorporated the leak tightness inspection program into daily plant equipment inspections; i.e., during walk through the plant. Based on our review, we conclude that the licensee has satisfied the requirements of this Category "A" item.

2.1.6.b Plant Shielding Review

The Category "A" requirements for this item are to perform a design review of current plant shielding to identify where corrective actions are needed to permit personnel access to vital areas, and to protect safety equipment.

The licensee has performed a general plant shielding review and identified potential problem areas. The licensee stated that personnel exposures, based on plant radiation (TID) sources, will be within required limits in the control room, Technical Support Center (TSC) and Operational Support Center (OSC). The post-accident sampling stations will be relocated, and some vital areas of infrequent access may also require shielding modifications.

Minor shielding modifications of the existing sampling systems have been completed. Review of safety systems for degradation, based on TID sources, is presently in progress. TID zone maps of safety system components will be provided to NRC for review.

Based on the above, we conclude that the licensee has conducted a shielding review which satisfies the basic intent of this item. Further review of the complete shielding evaluation, documentation of safety equipment degradation, and review of necessary modifications will be conducted as a Category "B" item.

2.1.7.a Auto Initiation of AFW

2.1.7.b AFW Flow

These items (2.1.7.a and 2.1.7.b) are unique to PWRs and are not applicable to the Cooper Plant.

2.1.8.A Post-Accident Sampling

The NRC objective is to quantify the degree of core damage in the course of an accident by radiological and chemical analysis of samples of reactor coolant and containment atmosphere. The Category "A" requirements are: (a) to review the design of reactor coolant and containment sampling system to determine the capability of personnel to obtain a sample (within 1 hour) under accident conditions without exposing an individual in excess of 3 Rem and 18 3/4 Rems to the whole body or extremities; (b) to review operational procedures of the radiological spectrum and chemical analysis facilities to determine the capability to quantify radioisotopes that are indicators of the degree of core damage; and (c) to describe proposed plant modifications.

An operational review of the existing reactor coolant and containment atmosphere sampling facilities has been completed. New emergency sampling procedures have been approved and implemented. Minor shielding modifications of the existing sampling systems have been completed to permit collecting samples under lesser than TID accident conditions.

Major modifications of the sampling system (for TID accident conditions) will require relocation of sampling stations outside of the containment. The analysis of pressurized and unpressurized reactor coolant samples and dissolved O_2 and H_2 has been evaluated and sampling apparatus is being designed. The coolant samples can be taken directly from the primary loop, cleanup, and RHR systems.

Continuous monitoring of containment atmosphere for O_2 and H_2 presently exists. Sampling of containment atmosphere presently exists, however, design modifications of the sampling location will be necessary in order to collect samples under TID conditions.

The licensee stated, that coolant or containment samples can be collected and the required analysis completed within two hours.

All necessary major modifications of the sampling systems (Category "B") will be completed by January 1, 1981. Based on the above, we conclude that the licensee has satisfied the requirements of this Category "A" item.

2.1.8.B High Range Radiation Monitors

The NRC objective is to have available adequate instrumentation to follow the course of the accident. The Category "A" requirements are to have procedures quantifying effluent releases in case existing instrumentation would go off scale ("provisional fix"). This includes a description of System/Method employed, and description of procedures for conducting all aspects of the measurement/analysis for noble gases, radioiodines, and particulate effluents.

The licensee has developed procedures to quantify effluent release rates up to 10,000 Ci/sec for noble gases from all potential release points. The existing effluent monitoring instrumentation has been modified to permit taking grab samples via existing vent samplers or monitors, to be evaluated with a dose rate instrument in a low background area. Calcu-

lations to convert dose rate readings to release rates are provided in the emergency sampling procedure. The licensee stated that the results can be repeated and communicated to the control room every ten to 15 minutes.

The grab sample, after being evaluated for gross NG concentration, may then be analyzed isotopically. Sample apparatus has been constructed to allow for quick grab sampling of noble gases, radioiodines, and particulates on all vent releases (stack, turbine building vent and radwaste building vents). Interim procedures for sample collection, analysis and personnel protection have been developed and implemented.

Design modifications and installation of additional shielding to sampling locations will be necessary for personnel protection to collect effluent samples containing TID sources.

Description of proposed effluent monitoring system modifications will be submitted for NRC approval prior to installation.

In containment high range monitors will be provided and all Category "B" requirements will be met.

Based on the above, we conclude that the licensee has satisfied the requirements of this Category "A" item.

2.1.8.C Improved Iodine Instrumentation

The NRC Category "A" requirements are that each licensee shall provide equipment and associated training and procedures for accurately determining the airborne iodine concentration in areas within the facility where personnel may be present following an accident.

Based on our review of the licensee's submittal and discussion with licensee representatives during the site visit, we have determined that: a) Permanent air samplers (equipped with SCA), capable to assess iodine concentrations, are installed at the air intake ducts to control room and to TSC. This instrumentation provides continuous air monitoring, b) The licensee has also available 12 portable air samplers equipped with charcoal cartridges (silver zeolite cartridges are available for emergency use) and with particulate filters. Samples can be readily removed, purged and isotopically analyzed in laboratory counting room.

The licensee stated that air samples from all vital areas can be collected and analyzed for iodine concentration within 15 minutes.

Interim procedures for air sample collection, preparation and analysis as well as for personnel protection and training have been developed and implemented.

Thus, we find that the licensee has satisfied the Category "A" requirements for this item.

2.2.1.a Shift Supervisor Responsibilities

The NRC requirement for this item is to revise, as necessary, the responsibilities of the Shift Supervisor such that he can provide direct, command oversight of operations and perform management review of ongoing operations that are important to safety and not be distracted from these important responsibilities by administrative details.

The licensee has revised Plant Procedure 1.2 "Station Organization and Responsibilities" and 1.4 "Station Rules of Practice" to satisfy this requirement.

We conclude that the licensee has satisfied the requirements of Item 2.2.1.A to provide revised responsibilities and authority for the Shift Supervisor. Verification of the adequacy of the licensee's procedures will be performed by IE and will be documented by appropriate Inspection Reports.

2.2.1.b Shift Technical Advisor

The NRC requirement is for the licensee to provide an on-shift technical advisor (STA) to the shift supervisor to serve the two functions of accident assessment and operating experience assessment. As a supplement to the operating staff, the STA must be able to report to the control room within 10 minutes to assist in diagnosing an off-normal event.

The licensee stated(4) that shift manning will be augmented by assigning an engineer from the normal plant engineering staff to each shift to satisfy the accident assessment function of the STA. At the NRR/IE site visit the licensee indicated that he would like to exercise the option of assigning an additional SRO to the minimum shift manning to perform this function should the lack of availability of qualified engineers dictate. We indicated that this alternative was acceptable to the staff as an interim solution to the STA requirement for accident assignment. The operating experience assessment function will be performed by station professional personnel.

Based on our review and discussions at the site visit we conclude that the licensee has satisfied the Category "A" requirements for this item.

2.2.1.c Shift and Relief Turnover Procedures

The NRC requirement is for the licensee to assure that procedures are adequate to provide guidance for a complete and systematic turnover between the off-going and on-coming shift to assure that critical plant parameters are within limits and that the availability and alignment of safety systems are made known to the on-coming shift.

The licensee has revised Procedure 1.4 to implement this item.
We conclude that the licensee has satisfied the requirements of Item 2.2.1 to provide new procedures. Verification of the adequacy of the implemented checklists and logs will be performed by IE and will be documented by appropriate Inspection Reports.

2.2.2.a Control Room Access

The NRC requirement includes implementing procedures to limit access to the control room and establishing clear lines of authority in the control room in the event of an emergency.

The licensee has revised Procedure 1.3.32 to implement this item. We conclude that the licensee has satisfied the requirements of Item 2.2.2.a. Verification of the adequacy of the implemented procedures will be performed by IE and will be documented by appropriate Inspection Reports.

2.2.2.b TSC

The NRC requirement is that each licensee establish and maintain an onsite TSC separate from and in close proximity to the control room. The TSC should have reliable communication systems and plant as-built technical data to provide information to those individuals knowledgeable and responsible for engineering and management support to reactor operations in the event of an accident. Further, the licensee must describ the long range plan to upgrade the TSC to meet the Category "B" requirements.

The licensee has designated the computer room adjacent to the control room as the onsite TSC. During the NRR/IE site visit we toured the TSC. The center is habitable to the same degree as the control room. Direct telephone communications have been provided. Access to permanent plant records, as-built drawings and procedures is available.

We conclude that the licensee has satisfied the Category "A" requirements for this item.

2.2.2.c OSC

The NRC requirement is to establish an area in which shift personnel can report for further instructions from the operations staff.

The licensee has designated the Instrument and Control Shop, Maintenance Shop, Radiochemistry Laboratory and the Health Physics Office area as the onsite OSC. Each of these areas has telephone communications capability with the control room and the TSC. The licensee's Emergency Plan includes the existence of this center.

Based on our review, we conclude that the licensee has satisfied the requirements for this item.

NRR ITEM: REACTOR COOLANT SYSTEM VENTING

As specifically related to BWRs, the Category "A" requirements for this item is to provide current design information to demonstrate that noncondensable gases can be vented from the primary coolant system, including isolation condensers.

The licensee's submittal dated October 17, 1979, provided design information on the capability of the Cooper Station design for remotely venting non-condensables from the reactor coolant system. Reactor vessel head high points can be vented by relief valves which discharge to the suppression pool; a vessel head vent to the rad waste system; a vessel head vent to one of the main steam lines; and steam driven HPCI and RCIC pumps which discharge to the suppression pool. Each of these are operable from the control room.

Based on our review, we have determined that the licensee has provided sufficient design information to satisfy the Category "A" requirements for this item.

References

1. Letter, NPPD (Pilant) to NRC (Eisenhut), October 17, 1979.

2. Letter, NPPD (Pilant) to NRC (Eisenhut), November 20, 1979.

3. Letter, NPPD (Pilant) to NRC (Eisenhut), December 3, 1979.

4. Letter, NPPD (Pilant) to NRC (Denton), January 11, 1980.

5. Letter, NRC (Eisenhut) to ALL OPERATING NUCLEAR POWER PLANTS, September 13, 1979.

6. Letter, NRC (Denton) to ALL OPERATING NUCLEAR POWER PLANTS, October 30, 1979.

7. Letter, BWR OWNERS GROUP (Keenan) to NRC (Eisenhut), December 14, 1979.

8. Letter, NPPD (Pilant) to NRC (Thomas), November 11, 1979.

ATTENDEES

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