



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

SAFETY EVALUATION BY THE
OFFICE OF NUCLEAR REACTOR REGULATION
NORTHERN STATES POWER COMPANY
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NOS. 1 AND 2
GENERIC LETTER 82-28
INADEQUATE CORE COOLING INSTRUMENTATION SYSTEM
NUREG-0737, ITEM II.F.2

In response to the staff's Generic Letter No. 82-28 "Inadequate Core Cooling Instrumentation (ICCI) System" dated December 10, 1982, Northern States Power Company (NSP) has proposed a system for detecting and monitoring inadequate core cooling (ICC) conditions including Subcooling Margin Monitor (SMM), Core Exit Thermocouples (CET), and reactor vessel level instrumentation system (RVLIS). The staff, in conjunction with its contractor, Oak Ridge National Laboratory (ORNL), has reviewed the NSP submittals dated March 14, 1983 and April 2, July 6, and September 21, 1984 describing the proposed system.

Reactor Coolant Inventory Tracking System (ITS)

The (RVLIS) proposed is a differential pressure (dp) measurement concept in accordance with the generic Westinghouse dp system proposal. The standard Westinghouse vessel level display units will be installed in the control room, but because of their size, will not be installed on the control board. The four display units will be installed in the vicinity of the incore thermocouple panels near the control room entrance with level indicators receiving an analog signal from the RVLIS system. The work will be completed in both units by December 31, 1985. In addition, the same reactor vessel level display format will be available to control room operators on Cathode Ray Tubes (CRTs) fed from the emergency response facility computer. The RVLIS system installation is scheduled for completion by May 30, 1985 and December 31, 1985 for Unit 1 and Unit 2, respectively. These schedules were established taking into account the following factors: (a) earliest possible delivery date for meeting NRC required specifications, and (b) the 10-year inspection outage for each unit (this outage will last approximately three months and is of sufficient duration to complete the required in-containment work).

Based on our review, we find that the NSP proposal of its generic Westinghouse dp system and the RVLIS installation schedule are acceptable. However, we will require that NSP provide the implementation letter report described in Enclosure 1 in order that we can complete our review for approval of the RVLIS implementation.

Subcooling Margin Monitor (SMM)

NSP has installed subcooling meters for the Prairie Island plants. At the present time, there are three indications (channels) of subcooling margin. The plant process computer, a Westinghouse model P-250, supplies the operators with one indication, which is margin to saturation in °F and is displayed on the

operator's console on a CRT. The remaining two indications of subcooling margin are the control board mounted Combustion Engineering model 001 subcooled margin monitors. These indicators are fully environmentally and seismically qualified input instrumentation. The inputs are four of the qualified incore thermocouples (auctioneered highest of the four) and an RCS wide range pressure channel per instrument. These feature a digital display of margin to saturation in either psig or degrees Fahrenheit.

Subcooling monitors with fully qualified inputs are operable in Unit Nos. 1 and 2 and procedures have been modified to direct operators to use this monitor in lieu of the alternate plant process computer display.

Based on our review, we find that the proposed SMM system with two fully qualified indicators for each Prairie Island plant is acceptable.

Core Exit Thermocouples (CET)

The core exit thermocouples have been undergoing a large upgrading project which included many new components and design changes. The core exit thermocouples system has been modified so that eight thermocouples are now environmentally and seismically qualified instrument channels, and the remaining 28 serve as non-qualified indications. The range of all 36 thermocouples has been increased to a range of 32°F to 2250 °F. The in-containment reference temperature boxes have been eliminated and replaced with qualified boxes mounted in a protected environment outside containment. All in-containment wiring has been changed to environmentally qualified wiring, as have all the connectors. New containment penetrations have been installed to transmit the thermocouple signals through the containment shell. New instrument racks were installed to convert the thermocouple signals to interface with the subcooling monitors and the technical support center.

The 28 non-qualified thermocouples can be displayed on the control room indicators and by the plant process computer. The eight qualified thermocouples can be displayed on the subcooling monitors, and in the technical support center.

NSP has resolved the containment penetration connector problems (signals are being lost at the penetration connector interface).

A minimum of 16 (four per quadrant) qualified thermocouples per unit will be available in conjunction with the plant process computer upgrade and safety parameter display system modification project now in progress. The schedule for completion of this work will be in accordance with the implementation of Regulatory Guide 1.97, Revision 2, requirements (3 months after Cycle 11 operation (August 10, 1986) for Unit 1, and 4 months after Cycle 10 operation (November 23, 1985) for Unit 2).

Based on our review, we find that the commitment to upgrade the core exit thermocouple system for CET backup display is acceptable.

Conclusion

Based on our review of the NSP response to Generic letter No. 82-28, we have concluded that the use of the proposed generic Westinghouse approach to RVLIS is acceptable. However, some concerns described in Enclosure 1 should be resolved before we can conclude that the design of the final ICCI system conforms to NUREG-0737 design requirements.

With regard to the implementation of RVLIS, Enclosure 1 describes the implementation letter report content (in six items), which should be provided by the licensee for staff review.

Enclosure:
As stated

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Enclosure 1

Implementation Letter Report Content

- (1) Notification that the system installation, functional testing, and calibration is complete and test results are available for inspection.
- (2) Summary of licensee conclusions based on test results, e.g.:
 - (a) the system performs in accordance with design expectations and within design error tolerances; or
 - (b) description of deviations from design performance specifications and basis for concluding that the deviations are acceptable.
- (3) Description of any deviations of the as-built system from design descriptions given in NUREG-0737 Item II.F.2 with any appropriate explanation.
- (4) Submit model Technical Specifications changes to include all ICC instrumentation for accident monitoring that would be required by NUREG-0737 Item II.F.2 and STS.
- (5) Request for NRC approval of the plant-specific installation.
- (6) Confirm that the EOPs used for operator training will conform to the technical content of NRC approved EOP guidelines (generic or plant specific).