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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CONFORMANCE TO REGULATORY GUIDE 1.97

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL.

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

DOCKET NO. 50-336

1.0 INTRODUCTION

Northeast Utilities was requested by Generic Letter 82-33 to provide a report to NRC describing how the post-accident monitoring instrumentation meets the guidelines of Regulatory Guide (R.G.) 1.97 as applied to emergency response facilities. The licensee responded to the generic letter on April 15, 1983. The response to Item 6.2 of the generic letter was submitted on February 29, 1984. Additional information was provided by letters dated April 9, 1984, August 7, 1986, June 15, 1987, and June 20, 1988.

A detailed review and technical evaluation of the licensee's submittals was performed by EG&G Idaho, Inc., under a contract to the NRC, with general supervision by the NRC staff. This work was reported by EG&G in Technical Evaluation Report (TER), "Conformance to Regulatory Guide 1.97: Millstone-2," dated September 1989 (attached). We have reviewed this report and concur with the conclusion that the licensee either conforms to, or has adequately justified deviations from, the guidance of R.G. 1.97 for each post-accident monitoring variable except for the variables accumulator tank level and pressure, containment sump water temperature, residual heat removal (RHR) system flow, RHR heat exchanger outlet temperature, high pressure injection system flow, low pressure injection system flow, containment spray flow, chemical volume and control system (CVCS) letdown flow-out, component cooling water (CCW) temperature to engineered safety features (ESF) system, CCW flow to ESF system, wide range steam generator level, and heat removal by the containment fan heat removal system.

2.0 EVALUATION CRITERIA

Subsequent to the issuance of the generic letter, the NRC held regional meetings in February and March 1983 to answer licensee and applicant questions and concerns regarding the NRC policy on R.G. 1.97. At these meetings, it was established that the NRC review would only address exceptions taken to the guidance of R.G. 1.97. Further, where licensees or applicants explicitly state that instrument systems conform to provisions of the regulatory guide, no further staff review would be necessary for those items. Therefore, the review performed and reported by EG&G only addresses exceptions to the guidance of R.G. 1.97. This safety evaluation addresses the licensee's submittals based on the review policy described in the NRC regional meetings and the conclusions of the review as reported by EG&G.

3.0 EVALUATION

We have reviewed the evaluation performed by EG&G contained in the attached TER and concur with its bases and findings, except for the findings contained in TER sections 3.3.1d and 3.3.19 concerning a) accumulator tank level and pressure and b) containment sump water temperature. As identified in the TER, the licensee has not provided an acceptable justification for deviations from the guidance of R.G. 1.97 the variables c) RHR system flow, d) RHR heat exchanger outlet temperature, e) high pressure injection system flow, f) low pressure injection system flow, g) containment spray flow, h) CVCS letdown flow-out, i) CCW temperature to ESF system, j) CCW flow to ESF system, k) wide range steam generator level, and l) heat removal by the containment fan heat removal system.

a) In TER section 3.3.1d EG&G concluded that for the variable accumulator tank level and pressure, the licensee should designate either level or pressure as the key variable to directly indicate accumulator discharge and provide instrumentation for that variable that meets the requirements of 10 CFR 50.49.

   The staff, however, is currently generically reviewing the need for environmentally qualified Category 2 instrumentation to monitor accumulator tank level and pressure. We will therefore report on the acceptability of this item when the generic review is complete.

b) In TER section 3.3.19 EG&G concluded that for the variable containment sump water temperature, the licensee should provide the recommended instrumentation for the functions outlined in Regulatory Guide 1.97 or identify other instruments (such as the residual heat removal heat exchanger inlet temperature) that satisfy the regulatory guide. The staff, however, is currently generically reviewing the need for environmentally qualified Category 2 instrumentation to monitor containment sump water temperature. We will therefore report on the acceptability of this item when the generic review is complete.

c) R.G. 1.97 recommends Category 2 RHR system flow instrumentation to monitor the operation of the RHR system. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The licensee has also provided instrumentation that monitors the pump motor current. The justification provided by the licensee for not environmentally qualifying the RHR system flow instrumentation is that valve prepositioning and surveillance testing assures system availability prior to an accident.

   The staff finds this justification unacceptable, as the flow cannot be determined by pump amperage alone. The licensee should provide RHR system flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

d) R.G. 1.97 recommends Category 2 RHR heat exchanger outlet temperature instrumentation to monitor the operation of the RHR system. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The justification provided by the licensee for not environmentally qualifying the RHR heat exchanger outlet temperature instrumentation is that the heat exchanger outlet temperature can also be trended by the reactor coolant temperature and surveillance testing and valve lineup checks assure operation of the RHR system prior to an accident.

The staff finds this justification unacceptable, since sources of coolant other than the RHR could also be cooling the core, and the reactor coolant temperature would not necessarily be usable in determining the quantity of heat removed by the RHR heat exchanger. The licensee should provide RHR heat exchanger outlet temperature instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

e) R.G. 1.97 recommends Category 2 high pressure injection system flow instrumentation to monitor the operation of the safety injection system. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The licensee has also provided instrumentation that monitors the pump motor current. The justification provided by the licensee is that valve prepositioning and surveillance testing assures system availability prior to an accident.

The staff finds this justification unacceptable, as the flow cannot be determined by pump amperage alone. The licensee should provide high pressure injection system flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

f) R.G. 1.97 recommends Category 2 low pressure injection system flow instrumentation to monitor the operation of the safety injection system. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The licensee has also provided instrumentation that monitors the pump motor current. The justification provided by the licensee is that valve prepositioning and surveillance testing assures system availability prior to an accident.

The staff finds this justification unacceptable, as the flow cannot be determined by pump amperage alone. The licensee should provide low pressure injection system flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

g) R.G. 1.97 recommends Category 2 containment spray flow instrumentation to monitor the operation of the containment cooling system. The licensee has provided instrumentation which conforms to the Category 2

recommendations of R.G. 1.97 except for environmental qualification. The licensee has also provided instrumentation that monitors the pump motor current. The justification provided by the licensee is that valve prepositioning and surveillance testing assures system availability prior to an accident.

The staff finds this justification unacceptable, as the flow cannot be determined by pump amperage alone. The licensee should provide containment spray flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

h) R.G. 1.97 recommends Category 2 CVCS letdown flow-out instrumentation to monitor the operation of the CVCS. The licensee has provided instrumentation to monitor this variable, but has not provided any details about this instrumentation. The licensee states pressurizer level or differential pressure across the letdown filter can be used to backup the CVCS letdown flow-out instrumentation.

The staff finds this justification unacceptable. as the licensee has not adequately described the instrumentation to monitor this variable. The licensee should provide CVCS letdown flow-out instrumentation that meets all the Category 2 criteria of R.G. 1.97.

i) R.G. 1.97 recommends Category 2 CCW temperature to ESF system instrumentation to monitor the operation of the cooling water system. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The justification provided by the licensee is that surveillance testing assures system availability prior to an accident.

The staff finds this justification inadequate and unacceptable. The licensee should provide CCW temperature to ESF system instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

j) R.G. 1.97 recommends Category 2 CCW flow to ESF system instrumentation to monitor the operation of the cooling water system. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The licensee has also provided instrumentation that monitors the pump motor current. The justification provided by the licensee is that valve prepositioning and surveillance testing assures system availability prior to an accident.

The staff finds this justification unacceptable, as the flow cannot be determined by pump amperage alone. The licensee should provide CCW flow to ESF system instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

k) R.G. 1.97 recommends Category 1 wide range steam generator level instrumentation, with a range from the tube sheet to the separators to monitor the operation of the steam generators. The instrumentation provided by the licensee has a range from the top of the tube bundles to the separators. Thus, the length of the tube bundles is not measured.

The justification provided by the licensee is that the auxiliary feedwater system is automatically initiated on a low level signal and is of sufficient capacity to restore the level to normal conditions even with a single failure. The main feedwater pumps can be manually ramped back to 5 percent flow to accomplish this also. Primary side temperature and pressure and main and auxiliary feedwater flow rates are available to verify the secondary side availability as a heat sink. The licensee also states that there is sufficient inventory to maintain an adequate heat sink with no feedwater flow for 22 minutes.

The licensee is anticipating a decision on replacing the steam generators by the end of the 1991 refueling outage. Should the steam generators be replaced, the licensee will include wide range level indication. Should the licensee decide not to replace the steam generators, there is no commitment to provide the wide range level indication.

Based on the alternate instrumentation, the staff finds that continued operation, until wide range steam generator level instrumentation is installed, is acceptable. However, deferring a decision committing to install this instrumentation until 1991 is unacceptable. The licensee should commit to and install Category 1 wide range steam generator level instrumentation regardless of steam generator replacement.

1) R.G. 1.97 recommends that the containment fan heat removal system be monitored for operation by plant specific Category 2 instrumentation. The licensee has provided instrumentation which conforms to the Category 2 recommendations of R.G. 1.97 except for environmental qualification. The licensee monitors the containment air recirculation and cooling system (CARCS) by monitoring the temperature of the inlet and outlet of the cooling water (reactor building closed cooling water system) heat exchangers. The licensee also monitors the flow from the fan blowers. The justification provided by the licensee is that redundancy in design, surveillance testing, valve position verification, and Category 1 containment pressure instrumentation are adequate to assure system operation.

The staff finds this justification unacceptable, as the containment pressure instrumentation cannot distinguish between the containment spray system operation and CARCS operation. The system testing and verification will assure a state of system readiness, but cannot show proper system operation under accident conditions. The existing instrumentation is acceptable except for the lack of environmental qualification. The licensee should provide instrumentation, for the purpose of monitoring containment cooling, that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

4.0 CONCLUSION

Based on the staff's review of the enclosed TER and the licensee's submittals, we find that the Millstone Nuclear Power Station Unit No. 2 design, is acceptable with respect to conformance to R.G. 1.97, Revision 2, except for the instrumentation associated with the variables a) accumulator tank level

and pressure b) containment sump water temperature c) RHR system flow, d) RHR heat exchanger outlet temperature, e) high pressure injection system flow, f) low pressure injection system flow, g) containment spray flow, h) CVCS letdown flow-out, i) CCW temperature to ESF system, j) CCW flow to ESF system, k) wide range steam generator level, and l) heat removal by the containment fan heat removal system.

a) The acceptability of instrumentation for accumulator tank level and pressure will remain open pending the outcome of the staff's review of the need for environmentally qualified instrumentation to monitor this variable. The staff's conclusion will be reported on when the generic review is complete.

b) The acceptability of instrumentation for containment sump water temperature will remain open pending the outcome of the staff's review of the need for environmentally qualified instrumentation to monitor this variable. The staff's conclusion will be reported on when the generic review is complete.

c) It is the staff's position that information provided by the RHR system flow instrumentation is valuable to the operator in evaluation of the proper operation of the RHR system. It is also the staff's position that the licensee shall provide RHR system flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

d) It is the staff's position that information provided by the RHR heat exchanger outlet temperature instrumentation is valuable to the operator in evaluation of the proper operation of the RHR system. It is also the staff's position that the licensee shall provide RHR heat exchanger outlet temperature instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

e) It is the staff's position that information on the high pressure injection system flow is valuable to the operator in evaluation of proper safety injection system operation. It is also the staff's position that the licensee shall provide high pressure injection system flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

f) It is the staff's position that information on the low pressure injection system flow is valuable to the operator in evaluation of proper safety injection system operation. It is also the staff's position that the licensee shall provide low pressure injection system flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

g) It is the staff's position that information on the containment spray flow is valuable to the operator in evaluation of proper containment cooling system operation. It is also the staff's position that the licensee shall provide containment spray flow instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

h) It is the staff's position that information on the CVCS letdown flow-out is valuable to the operator in evaluation of proper CVCS operation. It is also the staff's position that the licensee shall provide CVCS letdown flow-out instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

i) It is the staff's position that information on the CCW temperature to ESF system is valuable to the operator in evaluation of proper cooling water system operation. It is also the staff's position that the licensee shall provide CCW temperature to ESF system instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

j) It is the staff's position that information on the CCW flow to ESF system is valuable to the operator in evaluation of proper cooling water system operation. It is also the staff's position that the licensee shall provide CCW flow to ESF system instrumentation that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

k) It is the staff's position that instrumentation provided by the wide range steam generator level monitoring instrumentation is needed by the operator in the evaluation of the availability of the steam generators as heat sinks. Continued operation, using alternate instrumentation until wide range steam generator level instrumentation is installed, is acceptable. It is also the staff's position that the licensee should commit to and install wide range steam generator level monitoring instrumentation which fully complies with the Category 1 criteria of R.G. 1.97.

l) It is the staff's position that information on the heat removal by the containment fan heat removal system is valuable to the operator in evaluation of proper containment cooling system operation. It is also the staff's position that the licensee shall provide instrumentation, for the purpose of monitoring containment cooling, that is environmentally qualified in accordance with the provisions of 10 CFR 50.49 and R.G. 1.97.

An appropriate implementation schedule will be developed by the project manager via discussion with the licensee. Once the schedule is established, the licensee is required to inform the Commission, in writing, of any significant changes in the established completion schedule identified in the staff's safety evaluation and when the action has actually been completed.

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