MAY 25 1984

Docket No.: 50-423

Docket File

Mr. William G. Counsil
Senior Vice President
Nuclear Engineering and Operations
Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut 06141-0270

Dear Mr. Counsil:

Subject: Request for Additional Information for Millstone Nuclear Power Station, Unit 3

Enclosure 1 contains requests for additional information which the staff requires to complete its evaluation of the safety portion of your application for an operating license for Millstone 3.

You should provide written responses to these requests no later than September 14, 1984 so that this information may be included in the staff Safety Evaluation Report, Supplement 1, which will be issued on November 15, 1984.

Enclosure 2 contains the staff comments resulting from its review of the Millstone Nuclear Power Station, Unit 3 Control Room Design Review Implementation Plan (Program Plan). The staff intends to conduct an on-site in-progress audit of the control room design review during the month of June. The audit will encompass all elements of the control room review with particular emphasis on the Millstone 3 Task Analysis. No response to this information is requested.

For further information or clarification, please contact the Licensing Project Manager, Elizabeth L. Doolittle at (301) 492-4911.

Sincerely,

B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing

Enclosures:
As stated

cc: See next page

CONCURRENCES:

DL:LB#1	DL:LB#1
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5/25/84	5/25/84

Docket File

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

MAY 25 1984

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MILLSTONE

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ENCLOSURE 1

REQUEST FOR ADDITIONAL INFORMATION

MILLSTONE NUCLEAR POWER STATION, UNIT 3

NORTHEAST NUCLEAR ENERGY COMPANY

DOCKET NO. 50-423

Request for Additional Information
Millstone Nuclear Power Station, Unit 3
Docket No.: 50-423

810.1 Emergency Preparedness Branch

The staff's review of the March 1980 Evacuation Time Estimate (ETE) study conducted by Storch Engineers and submitted by Northeast Utilities as part of the emergency plan for Millstone Unit No. 3 has resulted in the following concerns being identified which need to be addressed in order to upgrade the ETE study in conformance with the guidance of Appendix 4 to NUREG-0654/FEMA-REP-1, Revision 1:

1. Provide further information as to how individuals without automobiles will be evacuated during an emergency.

2. Provide an estimate of the confirmation time(s) to verify that an evacuation has been completed.

492.7 Core Performance Branch

Q.492.4 mentioned Seabrook rather than Millstone 3 (page 4 of response to Q.492.4). We therefore do not have confidence that you performed the required review of the Westinghouse standard response on flow measurement to assure that it applies to your plant. In order to provide this assurance, please answer the following questions.

(1) The instrumentation uncertainties cited are the generic bounding values for Westinghouse instrumentation. Plant-specific instrumentation uncertainties exceeding the bounding values cited in the Westinghouse response should be identified and used for the plant-specific analysis. Identify any instrumentation which deviates from the Westinghouse instrumentation and provide the uncertainty value pertinent to this instrumentation and measurement arrangement with comparison to the Westinghouse generic value. The bases or sources for the uncertainty value should also be provided. The sources can be from purchase specifications, manufacturing specifications, calibration data provided by instrumentation vendor or obtained on site, published industry standard or other justifiable bases.

(2) For the RCS flow measurement, the Westinghouse generic response states: "It is assumed for this error analysis, that this flow measurement is performed within seven days of calibrating the measurement instrumentation, therefore, drift effects are not included (except where necessary due to sensor location)". Does your plant operating procedure have provisions that require the RCS flow measurement be performed within seven days of calibrating the measurement instrumentation? If not, what are the drift uncertainty values associated with each component such as ΔP Cell, local meter, RTD, thermocouple, process rack and sensors? What is the effect on the overall flow measurement uncertainty?

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492.7 Core Performance Branch

(3) The Westinghouse report states: "It is also assumed that the calorimetric flow measurement is performed at the beginning of a cycle, so no allowance has been made for feedwater venturi crud buildup"; and "If venturi fouling is detected by the plant, the venturi should be cleaned, prior to performance of the measurement. If the venturi is not cleaned, the effect of the fouling on the determination of the feedwater flow, and thus, the steam generator power and RCS flow, should be measured and treated as a bias, i.e., the error due to venturi fouling should be added to the statistical summation of the rest of the measurement errors".

(a) How do you assure that the venturi is clean at the beginning of a cycle? Is the venturi cleaned at the beginning of every cycle?

(b) How do you detect the venturi fouling and to what extent of uncertainty can you detect fouling?

(c) Describe the design provisions and procedures to clean the venturi if fouling is detected.

(d) How do you determine the error on feedwater flow measurement due to the fouling effect if the venturi is not cleaned or if the venturi fouling is not detected?

(e) If the venturi is not cleaned prior to the calorimetric flow measurement because no fouling is detected, an error component should be added. The magnitude of the error component should depend on the minimum detectable value of fouling.

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210.46 Mechanical Engineering Branch

THe staff review of the FSAR Section 3.9.3 finds that asymmetric LOCA load effects resulting from postulated ruptures in the primary coolant loop have not been addressed. An acceptable basis for evaluating the asymmetric LOCA loadings is provided in NUREG-0609, "Asymmetric Blowdown Loads on PWR Primary Systems," which addressed the resolution of Generic Task Action Plan A-2. We require that you provide in the FSAR a discussion to specifically address the consideration of asymmetric LOCA loads with respect to satisfying the guidelines in NUREG-0609.

Request for Additional Information

Millstone Nuclear Power Station, Unit 3

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210.47 Mechanical Engineering Branch

During the review of the classification of the Feedwater System, Figure 10.4-6 Sheet 2 of 2, it was found that the following 3 lines have been incorrectly classified Safety Class 3. These lines should be classified Safety Class 2. The line numbers are:

3 FWA-004-139-3 (A-)

3 FWA-004-140-3 (B-)

3 FWA-004-141-3 (C-)

It is requested that the applicant revise Figure 10.4-6, Sheet 2 of 2 in a future FSAR Amendment.

Request for Additional Information

Millstone Nuclear Power Station, Unit 3

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480.32 Containment Systems Branch

480.6 In the unlikely event of a pipe rupture inside a major component subcompartment, the initial blowdown transient would lead to non-uniform pressure loadings on both the structure and the enclosed component(s). To assure the integrity of these design features, we request that you provide the following information for each subcompartment analyzed:

a. Provide the peak and transient loadings on the major components used to establish the adequacy of the supports design. This should include the load forcing functions (e.g., f (t), f_x(t), fy (t)) and transient moments (e.g., M (t), M_x (t), M_y (t)) as resolved about a specific, identified coordinate system.

b. Provide the projected area used to calculate these loads and identify the location of the area projections on plan and section drawings in the selected coordinate system. This information should be presented in such a manner that confirmatory evaluations of the loads and moments can be made.

c. For each compartment, provide a table of blowdown mass flow rate and energy release rate as a function of time for the break which was used for the component supports evaluation.

d. Describe and justify the nodalization sensitivity study performed for the major component supports evaluation, where transient forces and moments acting on the components are of concern.

e. Discuss the manner in which movable obstructions to vent flow (such as insulation, ducting, plugs, and seals) were treated. Provide analytical and experimental justification that vent areas will not be partially or completely plugged by displaced objects. Discuss how insulation for piping and components was considered in determining volumes and vent areas.

f. Provide justification for the initial atmospheric conditions assumed in the analysis. An acceptable approach would be to assume air at maximum allowable temperature, minimum absolute pressure, and minimum relative humidity.

ENCLOSURE 2

COMMENTS ON THE

DETAILED CONTROL ROOM DESIGN REVIEW PROGRAM PLAN

DOCKET NO. 50-423

NUCLEAR REGULATORY COMMISSION

STAFF COMMENTS

ON THE

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3

DETAILED CONTROL ROOM DESIGN REVIEW

PROGRAM PLAN

BACKGROUND

Licensees and applicants for operating licenses shall conduct a Detailed Control Room Design Review (DCRDR). The objective is to "improve the ability of nuclear power plant control room operators to prevent accidents or cope with accidents if they occur by improving the information provided to them" (NUREG-0660, Item I.D). The need to conduct a DCRDR was confirmed in NUREG-0737 and Supplement 1 to NUREG-0737. DCRDR requirements in Supplement 1 to NUREG-0737 replaced those in earlier documents. Supplement 1 to NUREG-0737 requires each applicant or licensee to conduct a DCRDR on a schedule negotiated with the Nuclear Regulatory Commission (NRC).

NUREG-0700 describes four phases of the DCRDR and provides applicants and licensees with guidelines for its conduct.

The phases are:

1. Planning
2. Review
3. Assessment and Implementation
4. Reporting.

Criteria for evaluating each phase are contained in draft NUREG-0801.

A Program Plan is to be submitted within two months of the start of the DCRDR. Consistent with the requirements of Supplement 1 to NUREG-0737, the Program Plan shall describe how the following elements of the DCRDR will be accomplished:

1. Establishment of a qualified multidisciplinary review team
2. Function and task analyses to identify control room operator tasks and information and control requirements during emergency operations

Coordination of Control Room Improvements With Other Programs

Supplement 1 to NUREG-0737 requires that control room improvements be coordinated with changes from other programs; e.g., safety parameter display system (SPDS), operator training, Regulatory Guide 1.97 (R. G. 1.97), and emergency operating procedures (EOPs).

The Program Plan states that the DCRDR will be integrated with other control room improvement activities. This integration will be accomplished during the walk-through and verification stage of task analyses, during walk-throughs to verify hardware modifications and enhancement resolutions of HEDs, and during the writing and dynamic validation of emergency operating procedures.

The applicant should ensure that design improvements introduced as the result of other control room improvements are reviewed to meet the same standards of good human factors engineering as improvements that result from the DCRDR. The applicant will need to provide evidence of these coordination efforts and details of their accomplishment to verify that the design improvement coordination requirement of Supplement 1 to NUREG-0737 is met.

CONCLUSIONS

Based upon our review of the Millstone 3 DCRDR Program Plan, we conclude that Northeast Nuclear Energy Company plans to conduct a detailed control room design review that generally meets the intent of NUREG-0737, Supplement 1. Our major concern is that the methodology used to conduct the task analyses may not result in the appropriate identification of operator information and control requirements. If operator information and control needs are not objectively identified during the task analyses, a key ingredient of the DCRDR will be missing. As a result, the requirements of Supplement 1 to NUREG-0737 for identification of operator information and control requirements and comparison of those requirements with an inventory of control room instruments and controls to determine missing controls and displays will not be met.

The staff intends to conduct an in-progress audit of the Millstone 3 DCRDR at a time negotiated with the Division of Licensing Project Manager. This audit will encompass all elements of the control room review with particular emphasis on the scope, method and results of the Millstone Unit No. 3 task analysis effort.

the operating license schedule requirements. The applicant should ensure that their approach to prioritizing the significance of HEDs is not adversely influenced by operating schedules.

Selection of Design Improvements

Supplement 1 to NUREG-0737 requires selection of control room design improvements that will correct significant HEDs. It also states that improvements that can be accomplished with an enhancement program should be done promptly.

The applicant has identified three categories of design improvements. These are:

- Enhancements
- Class improvements, and
- Individual discrepancy corrections.

The applicant's stated intent is to attempt to find HED solutions within the first two categories. While not stated, the assumed criteria for this intent are reduced cost and less schedule impact than with individual HED fixes. This approach appears to state a bias toward enhancement type HED corrective actions that may not produce appropriate HED solutions.

HED solutions that the applicant's review team selects for implementation will be noted on an HED status summary sheet and will be available in the applicant's DCRDR data base. The applicant should be extremely cautious of selecting a design improvement solely on the basis of reduced cost to implement. A thoughtful review of the operational advantages of all potential solutions should be performed for each HED.

Verification That Design Improvements Provide Necessary Correction and Do Not Introduce New HEDs

The Program Plan does not address these issues as separate elements of the control room review, however, it is stated that resolutions of HEDs will be "... verified on the control room mock-up" (p. 46), and "Any hardware modifications or enhancement resolutions will be verified by an additional walk-through of the core team" (p. 55). These activities indicate an understanding of the importance of assuring that any modifications do provide the necessary correction without introducing new HEDs, but the Program Plan does not provide sufficient detail to allow the staff to fully evaluate the proposed process.

and that the applicant should ensure that the surveys are performed in time to correct deficiencies in the control room design before plant startup.

The Millstone 3 control room survey, if executed with reasonable diligence and adequately documented for audit traceability, should meet the intent of NUREG-0700 guidelines and is expected to satisfy the requirements of Supplement 1 to NUREG-0737.

Assessment of HEDs

Supplement 1 to NUREG-0737 requires that HEDs be assessed to determine which HEDs are significant and should be corrected.

The applicant has proposed an approach for evaluating HEDs on their potential to adversely affect emergency operations. Four prioritization categories have been proposed by the applicant.

- Priority 1 Safety significant HEDs which have the potential to impact the management of emergency operations;
- Priority 2 HEDs which are related to operational/reliability issues;
- Priority 3 HEDs of minor consequence to operations; and
- Priority 4 HEDs which are not emergency in nature and which have no history of causing operational problems.

The prioritization categories appropriately place highest priority on HEDs that are judged to adversely affect the management of emergency conditions. The staff urges caution in assigning HEDs to the lower priority categories. Although these categories are reserved for HEDs that have only a minor affect on operational safety or reliability (Priority 3) and that are judged as not affecting emergency operation and not previously documented as causing problems (Priority 4), NNECo should be cognizant of the possibility that some HEDs may be identified which have not yet caused a problem but which are serious enough that some remedy is necessary. This may especially be the case when an apparently insignificant HED is evaluated in relation to other HEDs.

There is some concern with the applicant's statement (p. 40) that "... those items that will not be implemented prior to issuance of an operating license will be prioritized for resolution." The resolution and implementation objectives of the applicant's DCRDR team should be focused on the priority categories which they have defined. If the applicant's review team imposes additional requirements, such as operating license schedule considerations, prior to assigning HEDs to the four priority categories, then the team has potentially undermined the technical independence of the HED assessment process. The review team should prioritize HEDs and then schedule HED resolution and implementation within each prioritization category to support

The inventory process ordinarily should be performed separately from the task analysis. Then a comparison of the inventory of controls and instruments is made with the information and control requirements identified as a result of the task analyses.

The Program Plan does not propose a discrete approach to identifying existing control room controls and displays, i.e., a discrete inventory process. The applicant's approach appears to combine both the inventory and task analysis. It is not clear that this approach will provide objective independence between determination of operator information and control requirements and determination that suitable instruments and controls are provided in the control room.

The applicant should ensure that the Millstone 3 DCRDR objectively compares display and control requirements throughout the control room with a control room inventory to identify missing controls and displays. An objective comparison is needed to fulfill the requirement of Supplement 1 to NUREG-0737 for comparison of operator instrument and control needs with the control room inventory.

Control Room Survey

Supplement 1 to NUREG-0737 requires that a control room survey be conducted to identify deviations from accepted human factors principles. NUREG-0700 provides guidelines and criteria for conducting a control room survey. The objective of the control room survey is to identify for assessment and possible correction, the characteristics of displays, controls, equipment, panel layout, annunciators and alarms, control room layout, and control room ambient conditions that do not conform to good human engineering practices.

The applicant has proposed an approach to performing a systematic survey of the control room which utilizes NUREG-0700, Section 6, "Guidelines Criteria." The criteria will be converted to Millstone 3 plant-specific checklists.

Three categories of checklists represent three levels of design detail. The three checklist categories are component, set, and panel. Noncompliance with a checklist item will result in an annotation on the survey checklist with an HED form being completed for the noncompliant item. The checklist form will also carry the HED number for cross referencing. A thorough team review both before and at the conclusion of the survey is planned to ensure the completeness of the content of the checklist categories. The applicant's control room survey documentation appears to recognize the need for audit traceability during the DCRDR.

The applicant plans to hold in abeyance the environment, communications, and computer surveys; primarily for construction schedule reasons. These important surveys are proposed for completion prior to commerical operation and will be documented in an addendum to the DCRDR Summary Report. The staff believes that these surveys should be completed on an earlier schedule

The applicant states that task analysis will identify specific instruments and controls required for the accomplishment of Millstone 3 tasks. It is the NRC staff position that the applicant should identify and describe operator tasks and derive the associated information and control requirements for emergency operations. Operator information and control needs should be determined from the system function and task requirements specified in the generic and plant- specific ERGs. It is important to recognize that information and control requirements should be derived from the analysis of system function and task requirements, not from existing instruments and controls that are installed in the control room.

It is not clear from the Millstone 3 Program Plan what process will be used to identify the operator information and control needs that are associated with each task. An objective, independent determination of the operator information and control needs for each operator task should be done before instrument and control specifications are developed. Review of the sample forms provided in the Program Plan does not indicate that an objective identification of operator information and control needs will be accomplished or adequately documented.

The example Task Element Table sheet (Figure 12 of the Program Plan) identifies a piece of information, "Increasing Containment Recirculation Sump Level," needed for an operator decision. However, this example does not provide sufficient detail about the characteristics of the information that must be provided to the operator so that the operator can make the required decision; e.g., the range of values of the variable, the accuracy of reading required, acceptable operating tolerances, and expected rate of change in value of the variable. The information characteristics for each task element should be defined independently before determination of the means that will be used to provide the information to the operators, before specification of instruments and controls, and before judging the suitability and adequacy of instruments and controls already installed in the control room.

The applicant should closely review the task analysis methodology to ensure that operator information and control requirements to perform operator tasks are determined and documented to support the specification of instruments and controls. The Program Plan does not describe this process in sufficient detail to determine that the Millstone 3 DCRDR will meet the requirement of NUREG-0737, Supplement 1, to perform function and task analyses to identify operator tasks and information and control requirements during emergency operations.

Control Room Inventory

Supplement 1 to NUREG-0737 requires the applicant to make a control room inventory and to compare the operator display and control requirements determined from the task analyses with the control room inventory to determine missing controls and displays.

The qualifications of the applicant's proposed multidisciplinary review team provide a detailed picture of each team member's responsibilities and subject expertise. The applicant has assessed the role of human factors in the DCRDR and has assigned a critical role to human factors specialists in all phases of the DCRDR.

The applicant states that it will conduct an orientation program for the multidisciplinary DCRDR review team to provide a common basis of understanding for review team members. Topics to be covered during the orientation include human factors, plant familiarization, and CRDR familiarization.

It appears that the applicant's multidisciplinary DCRDR review team will have a suitable diversity of expertise and proper instruction and orientation to conduct a high quality DCRDR. Based upon review of the qualifications, organization, and management structure of the Millstone 3 DCRDR review team, it is expected that the applicant will satisfy the requirement of Supplement 1 to NUREG-0737 to establish a multidisciplinary review team to conduct a DCRDR.

The applicant should document all DCRDR review team activities and the participation of each review team member throughout the course of the DCRDR.

Operating Experience Review

The Operating Experience Review, consisting of a review of historical documentation, an operating personnel survey, and follow-up interviews should provide valuable information to be integrated with the other DCRDR activities. It is important that all operating personnel be encouraged to provide input to the control room review.

Function and Task Analysis

Supplement 1 to NUREG-0737 requires the applicant to perform systems function and task analyses to identify control room operator tasks and information and control requirements during emergency operations. Furthermore, Supplement 1 to NUREG-0737 recommends the use of function and task analyses that had been used as the basis for developing emergency operating procedures technical guidelines and plant-specific emergency operating procedures to define these requirements.

The applicant plans to perform a function and task analysis based upon the application of generic Emergency Response Guidelines (ERGs) developed by the Westinghouse Owners' Group and based upon the system review/task analysis that supports the development of the generic ERGs. The applicant states that they will perform a plant-specific functional analysis using the generic ERGs. In doing this functional analysis, they expect to develop plant-specific functional flow diagrams and establish plant-specific operator tasks to be analyzed.

DISCUSSION

The Northeast Nuclear Energy Company (NNECo), a wholly owned subsidiary of Northeast Utilities (NU), submitted its Millstone Nuclear Power Station, Unit 3, Control Room Design Review Implementation Plan, to the Nuclear Regulatory Commission on November 10, 1983 as its DCRDR Program Plan for Millstone Nuclear Power station, Unit 3. The staff has reviewed the Plan with assistance from its contractor Lawrence Livermore National Laboratory.

The staff concurs with the applicant's plan to include the auxiliary shutdown and transfer panels in the DCRDR. To the extent practicable, without delaying completion of the DCRDR, it should also address any control room modifications and additions (such as controls and displays for inadequate core cooling and reactor system vents) made or planned as a result of other post-TMI actions and the lessons learned from operating reactor events such as the Salem ATWS events. Implications of the Salem ATWS events are discussed in NUREG-1000 and required actions are described in Section 1.2, "Post Trip Review - Data and Information Capability," of the enclosure to Generic Letter 83-28.

NNECo states in the Program Plan (p. 2) that "...this plan is the basis upon which Millstone Unit No. 3 will do their review and upon which to judge that a thorough CRDR has been conducted." The applicant should recognize that while the Program Plan provides an important basis upon which the staff will judge the thoroughness of the Millstone 3 control room review, it does not constitute the only basis for staff evaluation. The Program Plan does not contain the degree of specificity necessary to assure that additional audit tools will not be needed.

The following comments apply to specific elements of the Millstone 3 DCRDR.

Qualifications and Structures of the DCRDR Team

The DCRDR review team will consist of a core review team which will be supplemented by a discipline support group that will provide individual expertise as required. The review team is under the management of the Northeast Utilities Service Company (NUSCo) CRDR Project Manager and the NUSCo CRDR Project Engineer. The CRDR Project Engineer coordinates all aspects of the review team activities and reports directly to the CRDR Project Manager.

The core review team will include operations, control systems, nuclear engineering, and human factors specialists. Additional discipline support expertise includes specialists in licensing, PRA/Safety analysis, electrical engineering, instrumentation engineering, training, operations, and human factors.

3. A comparison of display and control requirements with a control room inventory

4. A control room survey to identify deviations from accepted human factors principles

5. Assessment of human engineering discrepancies (HEDs) to determine which HEDs are significant and should be corrected

6. Selection of design improvements

7. Verification that selected design improvements will provide the necessary correction

8. Verification that improvements will not introduce new HEDs

9. Coordination of control room improvements with changes from other programs such as SPDS, operator training, Reg. Guide 1.97 instrumentation, and upgraded emergency operating procedures.

A Summary Report is to be submitted at the end of the DCRDR. As a minimum it shall:

1. Outline proposed control room changes

2. Outline proposed schedules for implementation

3. Provide summary justification for HEDs with safety significance to be left uncorrected or partially corrected.

The NRC will evaluate the organization, process, and results of the DCRDR. Evaluation will include review of required documentation (Program Plan and Summary Report) and may also include reviews of additional documentation, briefings, discussions, and on-site audits. In-progress audits may be conducted after submission of the Program Plan but prior to submission of the Summary Report. Preimplementation audits may be conducted after submission of the Summary Report. Evaluation will be in accordance with the requirements of Supplement 1 to NUREG-0737. Additional guidance for the evaluation is provided by NUREG-0700 and draft NUREG-0801. Results of the NRC evaluation of a DCRDR will be documented in a Safety Evaluation Report (SER) or SER Supplement.

Significant HEDs should be corrected. Improvements which can be accomplished with an enhancement program should be done promptly.