

November 25, 1985

NRC REGION I  
INITIAL OPERATING LICENSE REVIEW REPORT  
MILLSTONE POINT UNIT 3

REPORT 50-423/85-67

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LIST OF ENCLOSURES

<u>Enclosure</u>	<u>Title</u>
1	Inspection Summary for Millstone Point Unit 3
2	Special Assessment of the Quality of Construction of Millstone Point Unit 3
3	Millstone Point Unit 3 Allegation Summary
4	Open Items with Potential Operating License Significance

## 1.0 INTRODUCTION

Millstone Unit 3 is an 1156 MWe, 4-Loop Westinghouse Pressurized Water Reactor, with loop isolation valves, housed in a subatmospheric, carbon-steel lined, concrete containment. It is on a site with two other nuclear power plants. However, Millstone 3 is not being treated as a third unit of a 3-unit site due to the different NSSS vendors for the other 2 units and the need to focus more attention on the more complex Unit 3 plant.

The Northeast Nuclear Energy Company (NNECo) represents the plant owners. NNECo began operation of Millstone Unit 1 in October 1970. NNECo and its sister company, Connecticut Yankee Atomic Power Company, operate Millstone 1, a General Electric Boiling Water Reactor (BWR); Millstone 2, a Combustion Engineering two-loop Pressurized Water Reactor (PWR); and Haddam Neck, a Westinghouse 4-loop PWR. An affiliated organization, Northeast Utilities Service Company (NUSCo), managed the construction of Unit 3. The architect engineer/constructor for Unit 3 is Stone and Webster.

Northeast Utilities (NNECo and NUSCo) has consistently demonstrated a good knowledge of the requirements for the design, construction, and operation of a nuclear facility. The licensee has provided good management oversight and control of design and construction activities.

Since 1973, NRC Region I has conducted more than 190 inspections of Millstone Unit 3. These inspections evaluated construction quality, preoperational testing, and preparations for facility operation. Overall, these inspections have found satisfactory to good performance.

## 2.0 CONSTRUCTION

### 2.1 Construction Status

The applicant considers construction of Millstone Point Unit 3 to be essentially complete. All 238 systems and all buildings have been turned over from Construction to Operations.

## 2.2 Construction Inspection

### Overview

Millstone 3 inspections have been based on programs and procedures (modules) developed and refined over the years. Construction and testing were observed on a sampling basis, with emphasis upon major activities.

NRC site inspections focused initially on the QA program for meeting the then-new 10 CFR 50 Appendix B. Overall, the inspections have addressed concrete, structures, piping, welding, non-destructive examination, electrical work, components, instrumentation, testing, maintenance, fire protection, surveillance, management controls, training, and preparations for plant operation. Enclosure 1 summarizes these inspections.

Inspections at Millstone Unit 3 were region-based until a Senior Resident Inspector was assigned in 1981, increasing direct observation, independent verification, and onsite presence. In August 1985, a second Resident Inspector was assigned to further increase the on-site coverage.

No serious weaknesses in construction quality have been identified. There has been strong NUSCo management control of the architect-engineer/construction-manager. A capable engineering-management team was established for the project by Northeast Utilities.

### Enforcement Record

No violations of Severity Level III or above have been identified. The total number of violations, 54, is significantly lower than for other Region I plants constructed during this time frame. This is shown below.

#### ENFORCEMENT COMPARISON

<u>Facility</u>	<u>CPPR</u>	<u>VIOL</u>	<u>INF</u>	<u>DEF</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>TOTAL</u>
Limerick	6/19/74	0	45	20	0	0	0	11	19	5	100
Shoreham	4/14/73	0	38	6	0	0	0	17	13	1	77
Susquehanna 1	11/2/73	0	47	15	0	0	0	18	19	3	103
Millstone 3	8/9/74	0	2	2	0	0	0	24	25	1	54

### Construction Team Inspections

Additional measures of construction quality were made through construction team inspections (CTIs) performed by Region I and a construction appraisal team (CAT) inspection by the Office of I&E.

In January 1981, the first Region I CTI addressed quality assurance, design control, project management, and materials procurement and storage. Several violations of NRC requirements were identified relating to QA and QC activities. The licensee corrected the problems and committed additional resources to these areas. As evidenced by SALP ratings, significantly improved performance resulted.

The second Region I CTI addressed design control, quality assurance and control of electrical, mechanical, and civil/structural construction. Minor violations were found. The overall conclusion was that the licensee's management was deeply involved in the construction of the facility and that the QA program was effective and strong.

A Construction Appraisal Team inspection was conducted in February-March, 1985 by the Office of Inspection and Enforcement. This effort consisted of independent inspection of selected hardware. The overall focus was on first evaluating finished product quality. Process control was pursued if problems were found. Although several violations and weaknesses were identified, the overall conclusion was that, for both installed hardware and documentation, construction activities were in accordance with requirements and licensee commitments.

The first CTI to examine the "as-built" plant was conducted in July-August, 1985 by the NRC with contractor assistance. This review, based in part on insights from the applicant's Probabilistic Safety Study (PSS), assessed whether significant discrepancies existed between the as-built plant and draft Technical Specifications, the Final Safety Analysis Report, and the Safety Evaluation Report. It was concluded that there was good conformance between the physical plant, NRC requirements, and applicant commitments.

The second as-built CTI was conducted by NRC Region I in September 1985. It also included the Probabilistic Safety Study as a basis for inspection sample selection. In comparison with the earlier as-built review, this one was narrower in breadth and greater in depth. Inconsistencies between the as-built configuration and the designed acceptance criteria for support locations and capacity of the Control Room Pressurization system were noted. One train of this 200% system was found to be capable of maintaining Control Room positive pressure for about 56 minutes as opposed to the design of 1 hour. (The applicant initiated corrective actions and the system subsequently passed a retest). Since no similar deficiencies were noted in the other areas reviewed, the findings were not considered serious or indicative of a generic configuration control problem.

In summary, construction team inspections have provided added confirmation that Millstone-3 construction is acceptable.

#### Independent Nondestructive Examination (NDE)

Region I conducted independent NDE verification inspections in August 1983 and June 1985. Both inspections used the Region's mobile NDE laboratory. These inspections checked welding by independent NDE and compared the results to the applicant's NDE. The NDE inspections also included field chemical and physical analyses, and pipe wall thickness verifications. Inspection samples were selected to be representative of piping systems, components, pipe sizes, materials, shop and field welds, and ASME Class 1, 2, and 3 welds.

In general, the independent NDE results were in good agreement with the licensee's determinations. However, a radiographic technique problem with the Tubeco vendor's radiography was identified during the initial NDE review. The applicant concluded that there were no technical problems or safety concerns involved. Subsequently, the second Region I NDE review found additional problems (e.g., undocumented linear indications, excessive geometric unsharpness) on Tubeco radiographs. Stone & Webster then identified additional examples of the problems identified by Region I. No significant rework has been required to meet functional design requirements. However, in September 1985, the applicant found it necessary to request an exemption from ASME Section III requirements for 30 welds in the Recirculation Spray System because the pipes involved are embedded in concrete (containment floor and structure).

The nearly 3000 total Tubeco radiographs represent only a small portion of the overall site NDE effort and have been satisfactorily addressed. No significant problems with other construction NDE were found. With the corrective actions on the Tubeco problems, the licensee's NDE efforts provide a valid assurance of construction acceptability.

#### Construction Deficiencies

Under 10 CFR 50.55(e), the applicant reports significant deficiencies in design and construction. In general, construction deficiencies have been carefully analyzed by the licensee and their resolution has incorporated sound engineering practice. As of November 21, 1985, the applicant had reported 90 significant deficiencies, of which 10 were outstanding pending completion of licensee action and NRC review. Resolution of outstanding significant construction deficiencies is a recommended license condition for initial criticality. Three of the more significant construction deficiencies are discussed in the following.

A significant construction deficiency resulted from a fire in containment in September 1981. The containment liner was damaged in two locations. The larger area involved about 400 square feet of buckled liner plate which separated from its anchors and the surrounding concrete by up to 1.5 feet. Minor concrete surface spalling occurred, but core samples confirmed there was no loss of concrete structural integrity. Spalled concrete was replaced. Damaged liner sections were replaced. Adequate attachment to the liner anchor studs was confirmed. Periodic observation of the repairs was conducted by the NRC staff. Completion of repairs and the required verification and testing was accomplished in February 1985. The containment satisfactorily passed a Structural Integrity Test and the preoperational Integrated Leak Rate Test. During investigation of this event, liner stud spacing was found to be in question and was referred to NRR for review. At this time, NRR has not identified any unacceptable conditions on this related issue.

A significant construction deficiency on the main control board was reported in November 1983. Tensile tests on electrical wiring termination lugs found failures caused by improper lug attachment (crimping). Licensee inspection of about 150,000 lugs resulted in rework of over 6800. Rework was satisfactorily completed in April 1985.

Another significant deficiency was a series of injector pump and nozzle failures on both emergency diesels. The licensee then completely inspected all portions of the fuel oil systems. The inspection revealed contamination (later determined to be casting sand) of the fuel headers and jumper lines. Extensive flushing followed. Affected engine components were replaced. Fuel oil filter housings were modified to eliminate distortion which may have allowed by-pass flow around the filters. Subsequently, the two emergency diesels successfully completed preoperational and integrated system testing.

### 2.3 Third Party Audits and Evaluations

The applicant has participated in independent evaluation programs sponsored by the Institute of Nuclear Power Operations (INPO) and in the Joint Utility Management Audit (JUMA) program.

INPO evaluated Millstone 3 construction during August 1983. The evaluation addressed control of design processes, interfaces and verification, control of construction processes, workmanship, QA and QC, test planning and performance, and documentation. The overall results of this evaluation were favorable. NUSCO implemented corrective actions for those areas identified as needing improvement. NRC Region I reviewed the final report and found no need to pursue additional action.



JUMA provided utility senior management level audits of QA activities. Audit teams evaluated QA Program performance at the Berlin, Connecticut Corporate offices and at the Millstone site. The fifth audit cycle is currently in progress. NRC Region I is aware of improvements implemented as a result of JUMA audits in such areas as: (1) QA review of offsite committees; (2) control and timeliness of inspection/audit corrective actions; and (3) manpower utilization and organizational structure. At Millstone 3, this has led to a more defined approach to QA/QC coverage of preoperational and startup activities.

In lieu of an independent design verification audit, NNECo contracted Stone and Webster Engineering Corporation (SWEC), the AE for Millstone 3, to conduct an Engineering Assurance Program Technical Audit. That effort was inspected by the NRC Office of I&E. In general, the preparations for the audit were found to be in accordance with the approved program plan and to be of sufficient technical depth. In general, the audit implementation was found to be in accordance with the program plan. However, a number of items require NRC closure. Engineering audit open items are under review by NRR, including the adequacy of the licensee's Seismic II/I measures.

#### 2.4 Quality Assurance for Construction

The QA Program for construction of Millstone Unit 3 is described in the Northeast Utilities Quality Assurance Program (NUQAP) Topical Report. NRC review found this program acceptable. The licensee has used a three level construction verification program for this project. The first level, quality control, is performed by Stone and Webster Field Quality Control. Field Quality Control is independent of the construction staff. The second level, Quality Assurance Auditing, has been performed by the Stone and Webster Quality Assurance Auditing Division. The auditing division is independent of both the construction staff and the Field Quality control Staff. The third level, Construction Quality Assurance, is performed by the licensee's Quality Assurance Branch. The licensee's QA Branch conducts audits, surveillances, and in-process verifications to assure that the first and second levels are functioning as intended.

NRC monitored the licensee's construction QA program through the routine and special inspections identified in Enclosure 2. Weaknesses were identified during the early phases of construction. The licensee took prompt and effective corrective actions. Construction QA steadily improved and performed acceptably throughout the construction period. Overall, the quality organization had sufficient independence and authority to effectively monitor safety-related construction activities. The quality assurance audit and surveillance findings were generally meaningful and hardware oriented. Corrective actions were timely and responsive to the concerns identified in audits and surveillance findings.

Based on the above, Region I has concluded that the construction activities for Millstone 3 were conducted in accordance with a quality program which met or exceeded 10 CFR 50 Appendix B and applicable industry standards.

### 3.0 PREOPERATIONAL TESTING

#### 3.1 Testing Status

Pre-core load testing is essentially complete. As of November 20, 1985, the licensee had 13 tests (of 318) to complete. (This is mostly retesting.) Licensee conditions are recommended for the items considered significant.

#### 3.2 Inspection History and Findings

The preoperational test inspection program began in August 1984. It was conducted by both region-based specialists and the resident inspectors. This inspection program is over 99% complete, with the remaining inspection being review of licensee results and retests. Except for the recommended license conditions, no significant concerns are outstanding.

#### 3.3 Third Party Audits and Evaluations

Two third party reviews were conducted regarding the applicant's preoperational testing activities and preparations for operations, as summarized below:

- Management Analysis Company (MAC) evaluated the project plan and schedule. MAC concluded that the NNECo approach to plant startup is viable and the schedule is achievable. MAC also made recommendations pertaining to construction activities; however, no quality problems were noted.
- An INPO Startup Assistance visit was conducted in April 1985. NPO assessed the station organization and administration, operations, maintenance, technical support, training and qualification, preoperational testing, and chemistry.

NRC Region I reviewed the results of these independent audits and determined that the conclusions were consistent with NRC findings.

#### 3.4 Testing Quality Assurance

Quality Assurance and Quality Control performed both monitoring and auditing functions during preoperational testing. NRC inspection and observation concluded that the program was well defined and properly implemented.

The technical adequacy of test procedures has been acceptable and the personnel performing tests have been well qualified.

NRC review has determined that the test results review and approval process and the applicant's resolution of test exceptions and deficiencies have been well documented and supported.

#### 4.0 PREPARATIONS FOR OPERATION

##### 4.1 Overview

Preparations for fuel load are being closely monitored by Region I, including facility staffing, personnel qualifications and training, procedure development and implementation, and organizational interfaces. Fuel has been received and is stored onsite.

##### 4.2 Inspection History and Findings

###### 4.2.1 Facility Operations - Staffing and Programs

NRC Operator Licensing examinations, utilizing the plant specific simulator, began in May 1985. From these examinations, 2 of 5 RO candidates and 9 of 16 SRO candidates received licenses. Meetings were held with the applicant to discuss the failures. The second group of candidates, examined in September 1985, achieved better results: 3 of 5 RO candidates and 11 of 14 SRO candidates received licenses. (See Section 4.3 for additional details.)

General facility procedures and policies are established in support of operations. General operating procedures and administrative policies have been in place and followed throughout the preoperational testing program. Controls for tagging, jumpers and lifted leads, temporary modifications, log maintenance and design change process have been in use. However, the overall licensee effort to provide procedures for plant operations has been behind. A meeting was held with the licensee on this matter, and the licensee has developed an action plan to approve and issue required procedures for each operating mode.

Licensee training programs have been established. Training programs had been previously established at the site to support the operating units. The establishment and implementation of Unit 3 programs was thereby facilitated. Region I review of training, emergency preparedness, in-house environmental monitoring, and plant protection for Unit 3 has found these programs acceptable overall.

Operational staffing conformance to license conditions on operating staff experience and engineering expertise on shift, and to technical specification requirements will be confirmed upon license and technical specification issuance and frequently thereafter.

#### 4.2.2 Quality Assurance (Operations Phase)

The details of the QA/QC inspection and surveillance activities during normal operations are under development and should be completed well before these overview activities are to be conducted. Essentially, these QA/QC overview activities are similar to those at Units 1 and 2. Should any specific Unit 3 differences affect the associated procedures, the licensee intends to make appropriate and timely revisions. Routine inspections will address QA/QC overview of operational activities. No special license conditions are needed to establish regulatory overview.

#### 4.2.3 Emergency Preparedness

Significant portions of the emergency plan are common to the Millstone site, which includes two operating reactors as well as Millstone 3. Specific emergency planning information regarding Millstone 3 was submitted to NRR by the applicant and is to be addressed in a supplement to the SER. FEMA findings are also to be addressed in an SER supplement.

The Region I Emergency Preparedness appraisal was completed in July 1985. No major problems were identified. No significant problems were identified during the review of the applicant's drill on May 15, 1985. The applicant's Emergency Operating procedures have been reviewed and found acceptable.

The Millstone site annual emergency exercise was conducted on November 7, 1985. Preliminary indications are that performance was acceptable.

No emergency preparedness item is considered to be appropriate for establishment of a special license condition.

#### 4.2.4 Radiological Controls

The existence of operational programs for radiological controls at Millstone Units 1 and 2 has simplified the establishment of such programs at Unit 3. NRC inspections have identified no concerns that impact plant operation. Completion of radwaste system preoperational testing, upgrading of the FSAR description of the radwaste system, and establishment of radwaste procedures are open items. It is our evaluation that these items will be satisfactorily completed by the time radwaste system operation is required, and that no special license conditions are necessary to establish enforcement controls.

#### 4.2.5 Security and Safeguards

The staff has reviewed and approved the Physical Security Plan. Preoperational inspection of the security program implementation began in February 1985. Some minor items still need to be completed. Open security items are expected to be satisfactorily resolved prior to license issuance. No special license conditions are considered necessary to establish regulatory coverage.

#### 4.2.6 Fire Protection

NRR and Region I coordinated the NRR fire protection and the Region I Appendix R-type audits conducted in August 1985. Several fire protection items remain open based on inspection during the week of November 4, 1985 (e.g., proving that the gaseous fire suppression systems can provide design concentrations, and fire damper operability.) The licensee plans to resolve all items before license issuance, and the open items are being closely followed by Region I. License conditions are recommended for the significant fire protection open items.

#### 4.2.7 Technical Specifications (TSs)

Inspections in July 1985 and September 1985 found good conformance between the as-built plant, TSs, FSAR, and SER. Follow-on NRC contractor and NRC Region I inspections of plant procedures began on November 11, 1985. Results are being tracked closely. License conditions on procedure establishment are recommended, based on the licensee's phased approach to development of procedures for specific operating modes.

#### 4.2.8 Startup Test Program

The licensee's Startup Program procedures are substantially behind. A corrective action plan to provide all program and supporting procedures prior to reaching the TS modes involved is being pursued by the licensee. License conditions on procedure establishment are therefore recommended.

### 4.3 Operator Licensing

Initial cold license operator examinations were conducted during May 1985. A second set of examinations followed in September. The simulator was used during the examinations. The initial set of examinations resulted in an approximately 50% failure rate. The failures tended to be concentrated in the simulator portion of the operating test. A meeting with the candidates who failed the test

was held by NRC supervisors to both further understand what transpired and to explain how examiners expect the candidates to perform for upcoming tests. Some of the failures can be attributed to the fact that the simulator was very recently placed in service and a comprehensive training program integrating the simulator was not in place for the candidates. Consequently, the candidates may not have been sufficiently familiar with both the simulator and the newly developed emergency operating procedures. Further analysis of the operator training program indicated that another weakness may be poor communications between the training organization and the operations department in that there was not a mutual understanding regarding operating philosophy and training needs, and the technical feedback, required to assure that the training desired is being achieved, was lacking. An example was the confusion generated regarding the role of the shift supervisor (SS) and the supervising control room operator (SCRO) which caused some problems in examining the senior reactor operator candidates (SRO) since the two positions had divided responsibilities. The licensee did not anticipate that the SS may in fact not be in the control room or readily available at all times and that the SCRO may have to perform both functions. Consequently, emphasizing the duties of the SCRO as being a subset of SS duties resulted in confusion. This, coupled with some problems with symptom oriented emergency procedures, which again reflected some communications problems between operations and training, resulted in the high failure rate. A management meeting was held to discuss these problems and subsequently, the examinations conducted in September and the retake examinations given in October reflected an improvement in training and performance on the simulator. Meetings were held between the NRC examiners and the candidates before the second set of examinations to explain scope and conduct of the test.

## 5.0 ALLEGATIONS

Allegations of poor quality construction and other areas of concern are generally received and handled by the NRC Regional Office. Relatively few allegations have been received pertaining to Millstone Unit 3. Those have included concerns regarding safety-related and non-safety-related areas. Each allegation was assessed by regional management and the regional response was determined by an evaluation of the allegation's actual or potential safety significance. Potentially significant allegations were either investigated by the Office of Investigations or reviewed during inspections by regional personnel.

Before March 1985, no formal allegation program existed at the Millstone 3 site. Until that time, Northeast Utilities had received only 12 allegations or worker concerns and did not see a need to formalize the reviews. Allegations were referred to SWEC for investigation. SWEC personnel from Boston conducted the investigation and reported the findings to the applicant for review and necessary action.

There was an increase in the number of allegations to the NRC in 1985. In response to Region I concern about this, the applicant established a formal allegation program on March 22, 1985. A formal allegation investigation team whose membership is based on the nature of the concern(s), with a NUSCo or NNECo team leader, was established. Formal documentation of allegations, investigations, and results is required. The records are available for NRC review. The Vice President-Generation Engineering and Construction Division (VP-GEC) and the Senior Vice President-Nuclear Engineering and Operations (SVP-NEO) are responsible for implementing this program. A full time Allegations Manager who reports to the VP-GEC is stationed onsite. A contractor (NUS), independent of current management, is stationed as allegation receiver onsite. This individual is available to receive any safety concern about Millstone 3. A memo explaining the new allegation program was distributed to all station employees on July 19, 1985.

Allegations made to the NRC about Millstone 3 are listed in Enclosure 3.

- Inspection effort has been completed for most allegations and closeout review is in progress. To date, there is one open safety concern: About 200 EA-180 limit switches on safety-related valves may have been improperly assembled. The licensee reported this problem to the NRC about a year before the allegation was made and is addressing this issue.
- Investigation is complete by OI for two allegations and is in process for one other. No significant safety concerns have been identified yet.

## 6.0 SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE (SALP)

### 6.1 Overview

The performance at Millstone 3 has been assessed five times by the NRC. In general, aggressive licensee management involvement in facility activities has been noted. The applicant's response to NRC concerns has generally been timely and positive. Licensee performance has, in general, been satisfactory to good.

### 6.2 SALP Synopses

The first SALP (March 1980 through February 1981) found performance to be average or above average in 13 of 16 areas evaluated. Increased inspection was prescribed for the Quality Assurance, Reporting, and Training areas. The applicant committed to greater efforts in these areas.

The second SALP (July 1980 through June 1981) found performance to be above average in 10 of 12 areas, including Training and Reporting. Quality Assurance also improved and was rated average. One area, Design and Design Changes, was rated below average based on weaknesses in control of the A/E's effort. Proposed corrective actions were adequate, and strong control over the A/E has since been noted.

The third SALP addressed performance from September 1981 through August 1982. During this period, the NRC altered the SALP categories. The applicant was rated "Category 1" in 7 areas, "Category 2" in one area, and "Category 3" in one area. The "Category 3" (minimally satisfactory) area involved the storage and installation of safety-related equipment. Corrective actions were acceptable. The SALP Board also found a need for greater involvement on the part of A/E and NUSCO management in resolving longstanding deficiencies.

The fourth SALP (September 1982 through August 1983) found performance in all seven areas rated to be either "Category 1" or "Category 2." Improvement was noted in the resolution of deficiencies.

The fifth SALP (September 1983 through August 1984) rated six areas as "Category 1" and two areas as "Category 2." Improvement of previous "Category 2" performance to "Category 1" performance was found in two of three such functional areas. The third such area also showed improvement. Piping and Supports was the only area where performance was considered to be declining. Its overall performance level was nonetheless considered adequate. Aggressive licensee management involvement in facility activities was noted, as was responsiveness to and cooperation with the NRC, good facility programs, and sound understanding of technical issues. A concern that some items (e.g., a few CDRs) could be dispositioned more swiftly carried over from the previous SALP, but the problems noted were minor.

The sixth SALP (September 1983 through August 1984) is being processed for final review and forwarding to the applicant.

#### 7.0 FUTURE ACTION

In addition to normal inspection coverage, Region I plans to assess, during a team inspection early in the plant operations phase, the licensee's operating staff performance during power operation.

#### 8.0 SUMMARY AND CONCLUSIONS

- The facility has been constructed substantially in accordance with an approved quality program, and the Region has no significant outstanding construction concerns which are not being recommended as potential license conditions.
- The applicant's preoperational test program has been rigorous and effective.
- The applicant's procedures to support startup and operations are late. Special attention to resolution of this problem is being provided by Region I.



ENCLOSURE 1

A. NRC INSPECTION SUMMARY AT MILLSTONE UNIT 3

- 1973 Two inspections (582 hours) of construction QA.
- 1974 Three inspections (120 hours) of structural foundation work.
- 1975 Eight inspections (310 hours) of construction and QA/QC.
- 1976 Nine inspections (341 hours) of construction and QA/QC.
- 1977 Twelve inspections (330 hours) of construction and QA/QC.
- 1978 Six inspections (116 hours) of construction and QA/QC.
- 1979 Twelve inspections (257 hours) of construction and QA/QC, including special inspection of design documentation for safety-related piping.
- 1980 Eight inspections (323 hours) of construction and QA/QC, including a special inspection of poor work practices and QC by a subcontractor (Graver Tank Company) at both Millstone 3 and Beaver Valley 1.
- 1981 Thirteen inspections (1200 hours) of construction and QA/QC activities (including the initial CTI).
- 1982 Fifteen inspections (1421 hours) of construction and QA/QC, including one special inspection of construction deficiencies in rock anchors and a special inspection of the Prompt Public Notification System.
- 1983 Twenty-two inspections (1868 hours) of construction and QA/QC, including one inspection by the NRC Mobile NDE Laboratory.
- 1984 Twenty-three inspections (2832 hours) of construction, preoperational testing, and QA/QC including a team inspection focused on management, design control, QA, and construction control.
- 1985 Sixty-five inspections (8572 hours) as of early November 1985. These focused on construction completion, testing and test results review, and preparations for operations. There were four inspections by the Office of Inspection and Enforcement (CAT and Engineering Assurance Program reviews), one as-built team inspection using an NRC consultant, and one as-built team inspection using NRC Region I personnel.

ENCLOSURE 2

SPECIAL ASSESSMENT OF THE QUALITY OF  
CONSTRUCTION OF MILLSTONE UNIT 3\*

- A. Over 18,000 man-hours of NRC field inspection have been expended on Millstone 3. The inspections have addressed the applicable inspection programs and specific concerns raised during Unit 3 construction.
- B. Special inspections conducted by the Region include:
- Regional CAT (1981) - There was a total of 25 findings; 8 violations, 17 unresolved. The majority of the findings were administrative.
  - NDE Van (1983) - There were 2 violations; one for penetrameters across weld areas of interest, and the other for film densities exceeding code requirements.
  - HVAC (1984) - Special audit regarding Bahnson Company (HVAC equipment supplier). There were 3 findings; 2 of which had been previously identified by SWEC Field Quality Control:
    1. Self tapping screws used in place of high strength bolts (identified by SWEC).
    2. Stove bolts and wing nuts used instead of high strength bolts (identified by SWEC).
    3. Low strength bolts used in areas where high strength bolts were specified (identified by NRC).
  - CTI (1984) - There were a total of 13 observations; 6 violations, 4 unresolved, and 3 IFIs.
  - CAT (1985) - Enforcement actions:
    1. Licensee's program for design control.
    2. Programs for post turnover test not effectively implemented.
    3. Design document control.

\*Note: Much of the data in Sections E, F, and G of this enclosure was compiled by the applicant's QA organization based on an informal request made by the Region I staff to the applicant's Construction Quality Assurance Supervisor. That information is essentially as presented by the utility staff without being verified correct by the NRC.

- NDE Van (1985) - 2 violations were noted for unacceptable radiographic indications and failure to control unique identification numbers on controlled drawings.

There were no Severity Level III or higher violations and no Enforcement Meetings for the construction of Millstone Unit 3.

- C. The quality control and quality assurance organizations have adequately controlled the quality of work at Millstone. Northeast Utilities (NU) Construction Quality Assurance retained review and approval rights for all contractors' inspections and work procedures. These quality assurance reviews and approvals assisted in maintaining high quality for construction activities. The quality program at Millstone has identified quality problems early in the work process and has achieved timely and effective corrective actions and reinspections.
- D. Throughout the years, Region I has received adequate responses from the applicant to inspector concerns. Further, it has been observed that the applicant has exercised strong control of the quality of the work by the major contractor, Stone and Webster, and of subcontractors.
- E. The Millstone project has a three-level quality program concept as described below.

The three-level construction verification program utilizes the defense-in-depth concept. The first level, QC inspection, is performed by Stone and Webster Field Quality Control, which is independent from the construction forces. Quality Control is responsible for verifying that the product meets the specified design requirements. The second level, QA auditing, is performed by Stone and Webster's Quality Assurance Auditing Division, which is independent from the construction forces and Quality Control. The third level, Construction QA, is a section within the NU Quality Assurance Branch, which is entirely independent from all Stone and Webster organizations. Construction QA audits, performs surveillances, and makes in-process verifications to assure that the quality programs of the first and second level organizations function as required. In addition, NU reviews specifications, site procedures, and other required documents furnished by Stone and Webster to assure that quality requirements have been incorporated.

The Quality Assurance organization is staffed with highly-qualified personnel. The staff consists of graduate engineers with several years of engineering or nuclear industry experience, graduate technical scientists or technologists with several years of nuclear industry experience, and non-degreed technicians with several years of nuclear experience. Several of the key individuals are additionally SNT-TC-1A certified, ASNI N45.2.6 inspectors, ASME VT 1 through 4 certified, or have been previously licensed at a nuclear facility. This quality organization is functionally and administratively independent of the Millstone 3 project organization. The organization remains in close contact with the NU engineering departments for consultation and technical assistance when needed.

To date, Northeast Utilities Construction Quality Assurance personnel have, conducted over 450 audits. These have confirmed that the first two levels of the quality program are working effectively.

Northeast Utilities Service Company also audits the corrective actions on problems identified by S&W Quality Assurance audit reports. Additionally, Nonconformance Reports having a "Use-As-Is" or "Repair" disposition are sent to NUSCo Construction Quality Assurance for review and concurrence. If there are any questions about any item in the S&W reports, the NUSCo Construction Quality Assurance Organization takes investigative action. This has been effective in assuring Northeast Utilities management that S&W corrective actions are satisfactory.

The quality assurance program implementation at the Millstone 3 station is also subject to review and/or verification by five independent outside organizations:

-- The American Society of Mechanical Engineers (ASME)

Stone and Webster Construction, Inc. has received and maintained its ASME certification to install nuclear pressure retaining components. ASME teams audit every three years, with welding being one of the major areas covered.

-- National Board of Boiler and Pressure Vessel Inspectors

Members of the Board participate in the ASME surveys and in the decision to grant the certificate. In addition, members of the National Board certify the Authorized Nuclear Inspectors who perform the ANI inspections described below.

-- Hartford Steam Boiler Inspection and Insurance Company

Hartford maintains a staff of Authorized Nuclear Inspectors (ANIs) onsite as required by the ASME Code. These inspectors monitor ASME related activities and have the authority to assign construction hold points. In addition, Hartford supervision performs semi-annual audits of applicable S&W activities associated with ASME Code welding.

-- Joint Utility Management Audits (JUMA)

Northeast Utilities has been a participating member in a Joint Utility Management Audit Group since the early 1980s. This group manually audits Northeast Utilities' activities. The JUMA audits of Northeast Utilities are conducted by senior supervisory quality assurance personnel from other utilities.

-- Institute of Nuclear Power Operations (INPO) - Construction Project Evaluation (CPE)

The INPO Construction Project Evaluation was developed as a standard method of evaluating Utilities' nuclear construction programs.

Northeast Utilities supports the INPO CPE and has actively participated in the development and trial of the Phase I evaluation.

The above organizations' evaluations, auditing, and verifications of the project have all been positive. The ASME audits have resulted in the extension of S&W ASME Certification of Authorization. The onsite Authorized Nuclear Inspector has verified the ASME work is done in accordance with the Code requirements. The semi-annual audits by Hartford have not identified a major problem. JUMA audits and INPO evaluations have concluded that the Millstone 3 QA program is effective and is being effectively implemented.

INPO evaluations and JUMA audits go beyond verifying conformance with established programs and make recommendations for improvements. Northeast Utilities has evaluated the INPO and JUMA recommendations and has adopted many of them. The results of these outside agencies' evaluations and audits have been beneficial. They have reported to the Company's management from a different perspective. This has further increased the confidence the company has in its quality assurance program which, in turn, leads to a higher degree of confidence in quality.

- F. The Northeast Utilities Quality Assurance Section has the authority to stop work independent of the Construction organization and has not shown a reluctance to do so when conditions warrant this action. The following summarizes stop work actions initiated by Northeast Utilities Construction Quality Assurance Organization:

<u>Year</u>	<u>Description</u>	<u>Remarks</u>
1974	Insufficient and unapproved QA program	NUSCo overall QA program evaluation revealed that there was an insufficient number of QA/QC procedures present to control Category I work.
1975	Drawing control	Apparent lack of control of revised/changed or new drawing issued for construction use in the field.
1982	Drawing control	Drawings and documents changing drawing were not properly maintained in the field station. This station not within program requirements.

- G. Northeast Utilities Construction Quality Assurance has an onsite staff of Quality Assurance personnel which conducts routine onsite audits, in-process verifications (IPVs), and surveillance of Millstone 3 construction. A summary of the results of the documents are as follows.

<u>Year</u>	<u>Number of Audits</u>	<u>Number of Findings</u>	<u>Number of IPVs</u>	<u>Number of Findings</u>
1974	3	8	0	0
1975	41	43	0	0
1976	24	38	0	0
1977	27	45	0	0
1978	18	24	0	0
1979	27	27	0	0
1980	9	13	3	14
1981	41	27	3	4
1982	43	100	19	18
1983	41	135	19	29
1984	21	103	7	14
1985*	<u>11</u>	<u>62</u>	<u>5</u>	<u>18</u>
	306	625	56	97

\*As of 5/30/85.

<u>Year</u>	<u>Number of Surveillance Reports</u>	<u>Number of Findings</u>
1975	90	4
1976	116	7
1977	193	42
1978	307	44
1979	196	22
1980	114	34
1981	404	91
1982	379	197
1983	436	161
1984	1126	372
1985*	<u>720</u>	<u>263</u>
	4081	1237

\*As of 7/31/85

Additionally, Northeast Utilities Quality Assurance, Procurement Section, has performed audits of the NSSS supplier, Westinghouse, and Stone and Webster as follows:

<u>Year</u>	<u>Number of Audits</u>	<u>Number of Findings</u>
1974	12	4
1975	20	21
1976	12	10
1977	9	5
1978	9	25
1979	17	33
1980	20	26
1981	28	65
1982	20	46
1983	13	8
1984	6	1
1985*	9	0
	<u>169</u>	<u>244</u>

\*As of 8/10/85.

Stone and Webster QA and QC have also issued nine stop work orders and conducted 221 audits and 1348 field monitoring inspections during the construction of Millstone 3.

ENCLOSURE 3

MILLSTONE UNIT 3 ALLEGATIONS

1. (Closed) Improper construction practices and alcohol and drug abuse by craft. Concerns were not substantiated; however, the applicant took additional measures to ensure good construction practices (1983).
2. (Closed) Improper design specifications in use. Concerns were not substantiated; alleged subsequently withdrew concerns (1983).
3. (Closed) Improper changes to construction specifications and improper welding on HVAC; improper procurement practices; and craft drug abuse. The HVAC concern was substantiated. Adequate corrective and preventive actions were taken by the applicant. No safety significance was identified (1983).
4. (Closed) Improper welding on non-safety-related pipe supports. The concern was not substantiated (1983).
5. (Closed) Possible poor quality weld on safety-related pipe. The concern was not substantiated (1984).
6. (Closed) Improper design and qualification of fire protection system for safety-related charcoal filter beds. The concern was not substantiated (1984).
7. (Closed) Improper QC documentation and poor welding of instrumentation pipe supports. The concern was not substantiated (1984).
8. (Closed) Improper enhancement of QC signatures on drawings. The concern was substantiated. There is no safety significance since no technical changes were made. The applicant implemented appropriate administrative controls to prevent the practice (1984).
9. (Closed) Improper supports (Hilti bolts undersized). The concern was reviewed by the applicant and Region I and was not substantiated (1984).
10. (Open) Improper changes to cable pull tickets. The concern was substantiated. There is no safety significance. The applicant took adequate corrective and preventive actions. Closeout documentation in progress (1985).
11. (Open) Individuals were reassigned to prevent identification of problems. The concern was not substantiated. Closeout documentation is in progress (1985).
12. (Open) Turnover of EA-180 limit switches was effected without adequate inspection. NRC followup confirmed that about 200 EA-180 limit switches on safety-related valves may have been assembled improperly. The applicant's corrective action is in progress as part of his environmental qualification program. The licensee reported this problem to the NRC about a year before the allegation was received, and the allegation is being closed because it did not identify any unaddressed safety issue.



13. (Open) Field changes approved without adequate research or checking. The concern was substantiated. No safety significance was identified. The applicant took adequate corrective actions. Closeout documentation is in progress (1985).
14. (Open) Electrical FQC inspections and records are inadequate. Concern was not substantiated. Closeout documentation is in progress (1985).
15. (Open) FQC inspectors are not qualified. The concern was not substantiated. Closeout documentation is in progress (1985).
16. (Open) I&C (electrical) inspection procedures are not established. The concern was not substantiated. Closeout documentation is in progress (1985).
17. (Open) Worker concerns are not responded to. The applicant's allegation response program adequacy was questioned by Region I and upgraded by the applicant. Closeout documentation is in progress (1985).
18. (Open) Electrical FQC inspectors require training (not qualified). The concern was not substantiated. Closeout documentation is in progress (1985).
19. (Open) Improper floor coatings and painter qualifications. The applicant investigated the issue and found no evidence of safety significance. NRC review identified no safety inadequacy. Closeout documentations in process (1985).
20. (Closed) Alteration to painter qualification test plate. OI investigation is complete; concern was substantiated. The applicant has provided Region I with their QC data confirming the adequacy of coatings in the field. This information is being evaluated (1985).
21. (Open) Improper welding inspections. The applicant investigated these issues and found no substantiating evidence. NRC review is in process (1985).
22. (Open) Improper ASME paper review. Preliminary review by Region I is complete, with no safety significant findings. Referred to OI for inquiry. OI review is complete; report submission is in progress (1985).
23. (Open) Improper preparation of pipe prior to insulating. The applicant reviewed the concern and found no substantiating evidence. Region I reviewed the issue and also found no substantiating evidence. Closeout documentation is in progress (1985).
24. (Open) Worker harassment following identifying of a safety concern to NRC. No safety concerns are presently involved. The individual was referred to DOL. Closeout of the allegation is in process (1985).
25. (Open) Pipe was improperly aligned to a pump. The concern was not substantiated. Closeout documentation is in process (1985).

26. (Open) Worker alleged he was included in a layoff because he identified safety concerns to the NRC. The individual was advised of the need to contact DOL. Preliminary checks did not identify any safety substance to the concerns. Further review is in progress. The layoff issue is being referred to the Office of Investigations for a preliminary inquiry. (1985)

ENCLOSURE 4

RECOMMENDED LICENSE CONDITIONS

1. Demonstrate operability of gaseous fire suppression system prior to initial criticality.
2. Adopt final approved procedures for Operational Modes 1-4 one week prior to entering the mode for which the procedures are required.
3. Provide satisfactory engineering resolution for all significant construction deficiencies [10 CFR 50.55e(e) reports] prior to initial criticality.