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REGION I

Report Nos. 50-245/94-06
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License Nos. DPR-21 Category C
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Licensee: Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut 06141-0270

Facility Name: Millstone Nuclear Generating Station
Units 1, 2, and 3

Inspection At: Waterford, Connecticut

Inspection Conducted: January 24-28, 1994

Inspector: RL Nimitz 3/11/94
R. L. Nimitz, CHP date
Senior Radiation Specialist

Approved by: R. J. Bores 3/11/94
R. J. Bores, Chief date
Facilities Radiation Protection Section

Areas Reviewed: This inspection was an announced radiological controls inspection. Areas reviewed during the inspection included previous findings, program changes, organization and staffing, training and qualifications, efforts to maintain radiation exposures as low as is reasonably achievable (ALARA), external and internal exposure controls, and radioactive material and contamination controls. The inspection principally focused on the adequacy and implementation of radiological controls for the Unit 1 refueling outage and condenser retubing at Millstone Unit 1. The inspector also reviewed activities at Units 2 and 3 including spent fuel pool activities at Unit 2.

Findings:

The inspection revealed that, overall, very good radiological controls were implemented for the Unit 1 outage and the work activities reviewed at Units 2 and 3. Areas that were particularly noteworthy included the implementation of the revised 10 CFR Part 20, the

planning and coordination of work activities for the Unit 1 outage, radiological controls for Unit 1 condenser retube project, the general material condition of the station, control of radioactive and contaminated material, and routine radiological controls provided at Unit 2 and 3. The inspection findings indicated that station efforts in the ALARA area continue to be very good. Efforts to establish and implement a radiation protection manual and associated procedures were considered an excellent initiative. A weakness in use and control of respiratory protection equipment was identified involving use of sand blasting hoods. The licensee took immediate action on this matter to ensure that the requirements of 10 CFR Part 20, Subpart H (as appropriate), were implemented.

DETAILS

1.0 Individuals Contacted

1.1 Northeast Nuclear Energy Company

- *T. Burns, Supervisor, Health Physics Training
- *F. Dacimo, Director, Unit 3
- *R. Dougherty, ALARA Coordinator, Unit 1
- *D. Hagan, Radiation Protection Supervisor, Unit 2
- *D. Harris, Licensing Engineer
- *H. Haynes, Director, Unit 1
- *R. King, ALARA Coordinator, Unit 3
- *J. Laine, Radiological Engineering Supervisor
- *G. McElhone, Engineering Technologist
- D. Miller Jr., Vice-President, Millstone
- C. Palmer, Manager, Health Physics Support
- *D. Regan, Assistant Radiation Protection Supervisor, Unit 3
- *W. Robinson, Assistant Radiation Protection Supervisor, Unit 3
- *R. Sachatello, Radiation Protection Supervisor, Unit 3
- *P. Simmons, Radiation Protection Supervisor
- *T. Stafford, Assistant Radiation Protection Supervisor, Unit 1
- *P. Strickland, Manager Technical Training
- *J. Sullivan, Manager, Health Physics Operations
- *S. Torf, Engineer
- *S. Turowski, Acting Manger Health Physics Support
- *P. Weekley, Acting Director, Unit Services
- *C. Wend, Radiation Protection Supervisor, Unit 1
- *W. Whelan, Industrial Hygienist

1.2 USNRC

- R. Arrigi, Resident Inspector, Millstone Unit 3
- *R. DeLaespriella, Resident Inspector, Millstone Unit 2
- D. Dempsey, Resident Inspector
- K. Kolaczyk, Resident Inspector, Millstone Unit 1
- P. Swetland, Senior Resident Inspector, Millstone

1.3 Others

- *J. Goergen, Radiological Engineering Supervisor, Connecticut Yankee

* Denotes those individuals attending the exit meeting on January 28, 1994.

The inspector also contacted other licensee employees.

2.0 Purpose and Scope of Inspection

The following areas were reviewed during this announced radiological controls inspection.

- previous findings
- changes
- planning and preparation
- organization and staffing
- training and qualifications
- ALARA
- external and internal exposure controls
- radioactive material and contamination controls
- station conditions

3.0 Action on Previous Findings

3.1 (Closed) Unresolved Item (50-245/92-03-02)

NRC reviews identified that the licensee required radiation protection personnel, on an annual basis, to review radiation protection procedures for refresher purposes. It was not apparent that this practice was an effective method of retraining personnel on procedures. The licensee's radiation protection group subsequently issued departmental directives regarding procedure reviews and sign-offs. The directive also provided for analysis of training needs associated with procedures. The directive was later superseded by procedure, Radiation Protection Manual (RPM) 1.2.2, Revision 0, which provided guidance for review of procedures. Currently the licensee is developing Procedure DC-1 which will provide guidance on training of personnel on procedures and is expected to be issued in March 1994. The inspector will review the licensee's enhanced training program procedures during a future inspection. This item is closed.

3.2 (Closed) Violation (50-336/92-28-02)

The licensee did not adequately sample Unit 2 spent resin for shipment to ensure conformance with 10 CFR Part 61. The inspector reviewed this matter relative to the corrective actions outlined in the licensee's January 22, 1993, response to an NRC Notice of Violation, dated November 27, 1992. The inspector's review indicated the licensee implemented the corrective actions outlined in the January 22, 1993, letter. The licensee suspended shipments and subsequently developed and implemented a sampling device to provide for representative sampling of spent resin. The design of the device provides for minimization of personnel radiation exposure of individuals collecting samples. This violation is closed.

3.3 (Closed) Unresolved Item (50-423/93-18-01)

NRC review identified three individuals in the technical support group, performing survey meter calibrations, who had apparently not signed-off (indicating reading and understanding) applicable calibration procedures. Also, one individual, performing sample counting activities at Unit 3, did not appear to have been provided training on use of the counting room equipment.

Regarding the survey meter calibration matter, the inspector's discussions with one of the individuals and his supervisor, indicated that appropriate on-the-job training had been provided to the individuals but not documented. The inspector noted that the licensee immediately suspended the authority of the individuals to perform independent calibration of instrumentation. The individuals could only perform calibrations under direct supervision of an appropriately qualified individual with documented training. Subsequent licensee review indicated that the individuals, and the tasks they were performing, had not been brought to the attention of the Nuclear Training Department so that a formal training and qualification program, as appropriate, could be developed and implemented for these individuals. An appropriate program was subsequently developed and implemented for these individuals.

The inspector noted that the licensee subsequently reviewed and revised all on-the-job training modules to align them with the newly issued radiation protection manual and associated procedures. The licensee also developed a qualification matrix for each position within the technical support group. The licensee reviewed all positions within the organization and developed a standard handbook of knowledge and skills items. Applicable individuals were subsequently trained and tested (as appropriate) on the revised training modules. The licensee revised programmatic controls to ensure personnel receive appropriate training and such training is documented. Inspector discussions with applicable individuals indicated workers were knowledgeable in calibration program requirements.

Regarding the individual performing counting room activities, the inspector's discussions with a qualified technician indicated that the technician had been observed to satisfactorily perform counting room activities. The inspector subsequently determined records were available indicating that the individual had been provided appropriate training and qualification. However, the records had not yet been incorporated into the individual's file.

This item is closed.

4.0 Changes

The inspector reviewed changes at the licensee's facility, in the area of radiological controls, since the previous inspection. Areas reviewed were:

- organization and staffing
- procedures and programs
- facilities and equipment.

The inspector noted that the licensee implemented a major change in station procedures and programs since the previous inspection. Specifically, the licensee implemented the revised 10 CFR Part 20, effective January 1, 1994. The inspector's reviews of the programmatic changes and their implementation indicated that the changes were effectively implemented. Specific findings regarding the implementation are discussed in this report.

The licensee also implemented major changes in the computerized personnel exposure records system. The system appears to be functioning properly.

In addition, the inspector noted that two personnel changes were made in the radiation protection operations group. The changes are discussed in Sections 5 and 6 of this report. The changes did not adversely affect the radiological controls organization.

No safety concerns or violations were identified.

5.0 Organization and Staffing

The inspector reviewed the organization and staffing of the on-site radiological controls organization. The review was with respect to criteria contained in applicable Technical Specifications and licensee administrative documents.

The inspector evaluated licensee performance in this area by review of applicable documentation, discussions with cognizant individuals, and independent observation of on-going work activities during tours of the facility. The inspector also reviewed the Unit 1 Refueling Outage Organization to evaluate the method of licensee oversight of contracted radiological controls personnel and to evaluate staffing levels.

The inspector's review indicated that the licensee implemented an adequately defined and staffed Unit 1 outage radiological controls organization. There was generally very good supervisory and management oversight of work activities.

No changes that would adversely affect the organization were identified. The licensee announced that the Manager, Radiation Protection Operations would be leaving his position in February 1994. A replacement had not yet been named.

No safety concerns or violations were identified.

6.0 Training and Qualification

The inspector reviewed the training and qualifications of radiological controls contractor personnel supporting Unit 1 outage work activities; the training and qualification of radiation workers; and the experience, training, and qualifications of personnel recently selected as new supervisors and new assistant radiation protection supervisors in the Unit 1 radiation protection operations group.

In addition, the inspector reviewed the training of personnel on the revised 10 CFR Part 20 (as appropriate). The inspector reviewed the training of the following groups in the revised 10 CFR Part 20.

- station visitors
- non-radiological controlled area (RCA) workers
- radiological controlled area workers
- radiation protection technicians
- radiation protection exempt staff (e.g., radiation protection supervisors)

The above reviews were with respect to applicable Technical Specification requirements and 10 CFR 19, Instructions to Workers.

The inspector reviewed a selection of vendor technician training and qualification documentation and determined that contractor radiological controls personnel, hired to augment the organization during the outage, met or exceeded the minimum training and experience requirements. The individuals selected were providing direct oversight of radiological work activities. The inspector noted excellent efforts to train and qualify radiation protection personnel for the Unit 1 outage. The licensee provided excellent training on specialty topics (e.g., reactor cavity work, hot particles, and industry experience).

The inspector's review of radiation worker training records indicated selected personnel observed in the radiological controlled area had received appropriate radiation worker training.

Regarding training of personnel on the revised 10 CFR Part 20, the inspector considered overall training and qualification efforts to be excellent.

The inspector noted that the licensee implemented a new initiative at the Unit 2 radiological controlled area access control point. The initiative involved the use of video training on personnel use of alarming dosimeters. The video provides continuing instruction on the use of the devices and supplements that provided to all radiation workers through the general employee radiation worker program.

The following matters were brought to the licensee's attention.

- The inspector noted that the licensee was not able to provide documentation indicating Assistant Radiation Protection Supervisors were knowledgeable and properly qualified in the newly issued Radiation Protection Manual and accompanying procedures. Inspector discussions with, and questioning of selected assistant supervisors, indicated they had read and were knowledgeable of the manual and procedures. The licensee subsequently updated training records to reflect that exempt staff had reviewed applicable new Radiation Protection Manual procedures. This observation appeared to be a documentation oversight.

The inspector's review indicated procedures specified a "yearly" update of records, consequently, no apparent procedure violations were identified. The inspector noted that the licensee was extensively revising procedures that control training and qualification of personnel on new procedures and procedure changes. The revisions, to be issued about March 1994, would provide enhanced guidance regarding documentation of procedure training and knowledge.

- The licensee has two populations of female employees within the restricted area (i.e., non-monitored and monitored females). It was not clear that non-monitored females (i.e., those not routinely provided a personnel radiation exposure monitoring device within the restricted area), were aware that they had the option of declaring their pregnancy to limit their potential radiation exposure even though they were not monitored. (Note that individuals may receive low levels of exposure and not meet criteria for provision of personnel monitoring devices as specified in 10 CFR Part 20.) Training documentation provided to the females addressed declaration of pregnancy but did not appear to highlight this point. The licensee indicated this matter would be reviewed.

No safety concerns or violations were identified.

7.0 ALARA Efforts

The inspector reviewed selected aspects of the licensee's ALARA Program. The principal focus of the review was the observation of on-going work activities at Unit 1 to determine if work was performed in a manner to maintain personnel radiation

exposures as low as reasonably achievable (ALARA). The review was with respect to general guidance and criteria contained in the following.

- 10 CFR 20.1101, Radiation Protection Program
- Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Is Reasonably Achievable
- Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable

The evaluation of the licensee's performance was based on discussions with cognizant personnel, independent inspector observations during tours of the station, observations of on-going work activities, and review of documentation.

The inspector independently reviewed the following work activities from an ALARA and radiological controls perspective.

- hydro-lasing of Unit 1 reactor vessel nozzles
- repair of the Unit 1 reactor vessel flange leak-off line
- Unit 2 rod-let work within the spent fuel storage pool
- condenser tube replacement at Unit 1.

The inspector also reviewed ALARA plans for the following Unit 1 work activities.

- Unit 1 condenser tube replacement: This task was projected to result in an aggregate total effective dose equivalent (TEDE) of about 26 person-rem.
- Unit 1 in-service inspections (drywell): This task was projected to result in an aggregate TEDE of about 45 person-rem.
- Unit 1 in-service inspections (reactor cavity/refuel floor): This task was projected to result in an aggregate TEDE of about 13 person-rem.
- Unit 1 in-service inspections (reactor building): This task was projected to result in an aggregate TEDE of about 11 person-rem.
- Unit 1 motor operated valve replacement: This task was projected to result in an aggregate TEDE of about 8 person-rem.

Inspector's review of ALARA activities at Units 1, 2, and 3 indicated continuing excellent efforts to reduce aggregate exposure. The following ALARA observations were made.

- ALARA goals were reasonable and based on comprehensive evaluation of work scope and prior historical data.
- The licensee implemented very good initiatives to reduce radiation exposure of personnel working within the drywell at Unit 1. Of particular note was the implementation, for the first time, of general area shielding throughout the drywell. The shielding reduced general area radiation dose rates in most areas by about 50 %. Also, a large number of cameras to view on-going work activities was installed. In addition, portable head-sets were used for communications. Use of the cameras and head-sets reduced unnecessary exposure.
- The licensee's radiation protection personnel initiated action to suspend Unit 1 work activities whose aggregate personnel radiation totals or radiation dose rates were inconsistent with expectations.
- The licensee informed the inspector that preliminary results indicated that Unit 1 exhibited the second lowest aggregate radiation exposure (1993) for comparable facilities.
- Aggregate radiation exposure at Unit 2 for 1993 was 69.6 person-rem which was the second lowest exposure value in Unit 2's operating history.
- The licensee continues to use the reactor vessel flange shield, and other techniques, at Unit 3 to minimize personnel exposure. The licensee was implementing an initiative to install camera systems inside Unit 3 containment to monitor equipment during full power operations. The inspector noted that the licensee sustained a larger than expected aggregate radiation exposure at Unit 3 in 1993 (about 400 person-rem). The licensee attributed a major portion of the exposure to emergent work (e.g., replacement of four reactor coolant pumps and removal of a stuck reactor head stud) and radiation dose rates in the containment that were 10-200 times that typically encountered. The licensee was evaluating the causes of the increased radiation dose rates.

The following items for enhancement were identified.

- The inspector's review of work activities and accumulated personnel radiation exposure values identified that "miscellaneous work" for the Unit 1 outage accounted for about 25 person-rem. The majority of this work was below the licensee's criteria for performance of an ALARA review (1 person-rem). The

inspector indicated that review of this miscellaneous work, relative to reduction of exposure over the life of the station, may identify potential cost-effective ALARA actions to reduce exposure. The 25 person-rem reflected about 10 % of the outage aggregate radiation exposure at Unit 1. The licensee indicated this matter would be reviewed.

No safety concerns or violations were noted. Licensee planning and preparation for major work tasks were very good.

8.0 External and Internal Exposure Controls

The inspector reviewed the implementation and adequacy of radiological controls at Units 1, 2 and 3.

The inspector toured the radiologically controlled areas of the plant and independently reviewed the following elements of the licensee's external and internal exposure control program:

- posting, barricading and access control, as appropriate, to Radiation, High Radiation, and Airborne Radioactivity Areas;
- High Radiation Area access point key control;
- personnel adherence to radiation protection procedures, radiation work permits, and good radiological control practices;
- use of personnel contamination control devices;
- use of dosimetry devices;
- use of respiratory protection equipment;
- adequacy of airborne radioactivity sampling and analysis to plan for and support ongoing work;
- timeliness of analysis of airborne radioactivity samples including supervisory review of sample results;
- installation, use and periodic operability verification of engineering controls to minimize airborne radioactivity;
- records and reports of personnel exposure;
- adequacy of radiological surveys to support pre-planning of work and on-going work;
- adequacy of supply, maintenance, calibration, and performance checks of survey instruments; and
- hot particle controls.

The review was with respect to criteria contained in applicable licensee procedures and the revised 10 CFR Part 20, Standards for Protection Against Radiation.

The evaluation of the licensee's performance was based on discussions with cognizant personnel, independent inspector observations during tours of Millstone Units 1, 2

and 3, observations of on-going work activities, and review of documentation. The inspector's review principally focused on review of outage activities at Millstone Unit 1.

The inspector independently reviewed on-going work activities and performed independent radiation surveys, as appropriate, to verify radiological survey information and evaluate the adequacy of radiological controls. The inspector's review included Unit 1 outage work activities and work activities at Unit 2 associated with spent fuel storage pool work activities. The inspector also reviewed radiological controls provided for Unit 1 reactor cavity diving activities.

The inspector's review indicated generally very good radiological controls were implemented for the work activities reviewed. There was good supervisory oversight of activities. The licensee implemented effective radiological surveys for potential zinc-65 contamination at Unit 1.

The following program weakness was brought to the licensee's attention.

- The inspector's review of the use and control of respiratory protection equipment determined that contractors, performing sand blasting activities at Unit 1, had provided their own blasting hoods. The inspector's review indicated that the hoods were being used in accordance with the manufacture's recommendations. However, the inspector determined that there were no apparent respiratory protection program controls to ensure that the hoods (or any other contractor provided respiratory protective equipment) were used in accordance with the applicable requirements of 10 CFR Part 20, Subpart H, Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas.

The inspector's review indicated that the licensee was not making allowance for the use of the hoods in that airborne radioactivity levels were low and that the hoods were being used for dust protection.

The licensee's radiation protection personnel took immediate action to review this matter to ensure that the requirements of Subpart H (as appropriate) were implemented for contractor provided respiratory protective equipment.

The following area for enhancement was brought to the licensee's attention.

- The inspector's review of on-going Unit 2 spent fuel pool work identified unclear guidance regarding specific radiological surveys to be performed on removal and handling of material and equipment removed from the spent fuel pool. Specifically, it was unclear as to what constituted "removal" from the pool and what type of radiological surveys were to be performed for material

partially removed from the pool. The licensee's radiological controls personnel concurred with this observation and initiated a review of it.

The inspector's review of the licensee's implementation of the revised 10 CFR Part 20 identified the following matters which did not appear to be discussed or included in the licensee's procedurally described program.

- The program did not appear to identify the need for performance of surveys, as appropriate, to determine eye-dose equivalent.
- The program did not appear to provide guidance to ensure that calculated dose assessments were incorporated into individual exposure history files.
- The licensee's program provided for, and acknowledged that minor personnel contaminations may occur during work tasks. However, program guidance appeared to exempt personnel from bio-assays for certain levels of nasal contamination. It was unclear as to the basis for the exemption.

The licensee's radiological controls personnel indicated the above matters would be reviewed.

Within the scope of this review, no violations were identified. The licensee implemented generally, effective radiological controls for the work activities reviewed.

9.0 Radioactive Material Control and Contamination Control

The inspector reviewed the adequacy and effectiveness of radioactive material, contaminated material, and contamination controls at Units 1,2 and 3. The following matters were reviewed.

- personnel frisking practices
- use of proper contamination control techniques at work locations, including control of hot particles
- posting and labeling (as appropriate) of contaminated and radioactive material
- efforts to reduce the volume of contaminated trash including steps to minimize introduction of unnecessary material into potentially contaminated areas
- adequacy of contamination surveys to support planning for and support of on-going work.

No safety concerns or violations were identified. The inspector's review indicated contamination controls were effective.

10.0 Station Tours

The inspector toured the station periodically during the inspection. The following observations were made and brought to the licensee's attention.

- The inspector's review indicated overall housekeeping was very good.
- The licensee recently re-lamped Unit 2. The new lighting was considered a very good initiative.
- Overall industrial safety matters (e.g., use of safety belts) appeared good. One area (Unit 3 spent fuel pool cooling pump room) exhibited apparent elevated noise levels when pumps were running. The licensee reviewed this matter and posted the area as hearing protection required.

The above safety observations were brought to the licensee's attention.

11.0 Exit Meeting

The inspector met with licensee representatives (denoted in Section 1.0) on January 28, 1994. The inspector summarized the purpose, scope and findings of the inspection. The licensee acknowledged the findings and made no substantial comments regarding them. No written material was provided to the licensee.