U. S. Nuclear Regulatory Commission
Region I

Report No. **50-309/90-14**

Docket No. **50-309**

License No. **DRP-36**

Licensee: **Maine Yankee Atomic Power Company**
83 Edison Drive
Augusta, Maine 04336

Facility Name: **Maine Yankee Atomic Power Station**

Inspection Conducted: **July 30-August 3, 1990**

Inspection At: **Wiscasset, Maine**

Inspectors: _____ 9/6/90
C. G. Amato, Emergency Preparedness Specialist, Region I — date

C. Marschall, SRI, Maine Yankee
L. Cohen, Emergency Preparedness Branch, Nuclear Reactor Regulation

Approved by: _____ 9/6/90
W. J. Lazarus, Chief, Emergency Preparedness Section, Facilities Radiological Safety and Safeguards Branch, Division of Radiation Safety and Safeguards — date

Inspection Summary: Inspection on July 30-August 3, 1990 (Inspection Report No. 50-309/90-14)

Areas Inspected: Routine, announced, emergency preparedness inspection and observation of the licensee's full-participation emergency preparedness exercise conducted on July 31, 1990. The State of Maine and surrounding towns participated. An ingestion pathway exercise followed the inhalation pathway exercise. The Federal Emergency Management Agency observed both exercises. A team of three Region I and NRC headquarters personnel observed the exercise.

Results: No violations were identified. Although three exercise weaknesses were identified (See Section 4.4), the state of emergency preparedness at Maine Yankee is adequate to provide protective measures for the public health and safety.

DETAILS

1.0 Persons Contacted

The following Maine Yankee Atomic Power Company (MY), Yankee Atomic Electric Company (YAEC) or State of Maine staff members attended the exit meetings on August 3, 1990.

R. Blackmore, Plant Manager, MY
E. Boulette, Vice President, Operations, MY
J. Crowder, Emergency Preparedness Trainer, MY
L. Diehl, Director, Government Affairs, MY
P. Dostie, State Nuclear Safety Inspector, Department of Human Services, Office of Nuclear Safety, State of Maine
S. Evans, Supervisor, Emergency Preparedness, MY
J. Hawxhurst, Senior Engineer, YAEC
R. Nelson, Manager, Technical Services, MY
S. Nichols, Licensing Section Head, MY
G. Pillsbury, Manager, Radiation Protection, MY
H. Siercks, On-Site Emergency Preparedness Coordinator, MY
J. Temple, Emergency Preparedness Coordinator, Corporate Office, MY
G. Whittier, Manager, Nuclear Engineering and Licensing, MY
W. Wicks, Supervisor, Specialty Training Group, Training Department, MY

The inspectors also interviewed and observed the actions of other licensee personnel including C. Frizzle, President MY.

2.0 Emergency Exercise

The Maine Yankee Atomic Power Station announced, full-participation, FEMA observed exercise was conducted on July 31, 1990, from 5:00 p.m. to 11:30 p.m. The State of Maine and 16 surrounding cities and towns participated. An ingestion pathway exercise followed this exercise which was observed by FEMA.

2.1 Pre-exercise Activities

The exercise objectives submitted to NRC Region I on August 16, 1989, were reviewed and, following revision, determined to be adequate to test the licensee's Emergency Plan. On September 19, 1989, the licensee submitted the complete scenario package for NRC review and evaluation. Region I representatives had telephone conversations with the licensee's emergency preparedness staff to discuss the scope and content of the scenario. As a result, minor revisions were made to the scenario which allowed adequate testing of the major portions of the Maine Yankee Atomic Power Station Emergency Plan and Implementing Procedures and also provided the opportunity for the licensee to demonstrate those areas previously identified by

the NRC as in need of corrective action. NRC observers attended a licensee briefing on July 31, 1990. Suggested NRC changes to the scenario made by the licensee were discussed during the briefing. The licensee stated that certain emergency response activities would be simulated and that controllers would intercede in exercise activities to prevent disruption to normal plant activities.

2.2 Exercise Scenario

The exercise scenario included the following events:

1. Spray Building ventilation system out of service;

2. Declaration of an Unusual Event due to reactor coolant system (RCS) leak into containment greater than 10 gallons per minute;

3. Declaration of an Alert as the result of the leak rate increasing to 150 gallons per minute;

4. Reactor trip by operators and shutdown with safety injection;

5. Loss of coolant accident (LOCA) inside containment;

6. Site Area Emergency declared as the result of a pipe rupture in containment;

7. Containment isolation;

8. Refueling Water Storage Tank water drawn down resulting in inability to establish containment sump recirculation;

9. Surge line break in the spray building resulting in a containment by-pass LOCA;

10. Loss of Emergency Core Cooling System (ECCS) capability;

11. Core uncovered and fuel over-heat;

12. Gap fraction and grain boundary fission product inventory released;

13. Elevated, monitored, unfiltered release to the environment;

14. General Emergency declared due to loss of reactor cooling water, LOCA outside containment, and a containment bypass LOCA;

15. Projected whole body doses and thyroid dose commitments calculated;

16. Development of Protective Action Recommendations;

17. Alternate sources of core cooling water identified and used;

18. Spray building flooded;

19. Containment sump suction and core cooling restored;

20. Long term core cooling established and release terminated; and,

21. Recovery planning.

2.3 Activities Observed

During the conduct of the licensee's exercise, NRC team members made detailed observations of the activation and augmentation of the Emergency Response Facilities (ERFs) and the Emergency Response Organization (ERO) staff, and actions of the ERO staff during operation of the ERFs. The following activities were observed:

1. Use of the correct control room procedures;

2. Detection, classification, and assessment of scenario events;

3. Direction and coordination of emergency response;

4. Notification of licensee and State of Maine personnel and communication of pertinent plant status information to State personnel;

5. Communications, information flow, and record keeping;

6. Assessment and projection of off-site radiological dose and consideration of protective actions;

7. Accident analysis; and,

8. Accident mitigation.

3.0 Classification of Exercise Findings

Emergency preparedness exercise findings are classified as follows.

3.1 Exercise Strengths

Exercise strengths are areas of the licensee's staff response that provide strong positive indication of their ability to cope with abnormal plant conditions and implement the Emergency Plan Implementing Procedures (EPIPs).

3.2 Exercise Weaknesses

Exercise weaknesses are areas of the licensee's response in which the performance was such that it could have precluded effective implementation of the EPIPs in the event of an actual emergency in the area being observed. Existence of an exercise weakness does not of itself indicate that overall response was inadequate to protect public health and safety.

3.3 Areas for Improvement

An area for improvement is an area which did not have a significant negative impact on the licensee's ability to implement the EPIPs and response was adequate. However, it should be evaluated by the licensee to determine if corrective action could improve performance.

4.0 Exercise Observations

The NRC team noted that the licensee's activation of the Emergency Response Organization, Emergency Response Facilities, and use of these facilities were generally consistent with their Emergency Plan and Emergency Plan Implementing Procedures. The following strengths, areas for improvement and weaknesses were identified.

4.1 Simulator Control Room

The following exercise strength was identified.

1. Very effective performance by the staff who closely tracked accident conditions and developed accident mitigating strategies for bringing the accident under control.

No exercise weaknesses were identified.

The following area for improvement was identified.

1. The authority for command and control between the Control Room and the Technical Support Center should be clarified. Uncertainty as to who was in charge led to the burnout of three pumps.

4.2 Technical Support Center (TSC)

The following exercise strengths were identified.

1. Very effective performance by the staff. Accident conditions were tracked and "what if" questions asked. The staff identified surge line failure within the spray building as a potential release path to the environment before this event occurred. They also, after this occurrence, recognized the need to flood the lowest spray building level in order to restore core cooling and terminate the release.

2. The staff foresaw the need for alternate water sources once containment sump suction was lost and the Refueling Water Storage Tank water inventory was almost depleted.

3. The TSC Coordinator directed the use of fire water to flood the spray building.

4. There was good command and control, frequent staff briefings and manager's meetings. Instrumentation and Calibration staff were interactive and suggested options to the TSC Coordinator. Data was well displayed and current at all times.

No exercise weaknesses were identified.

The following exercise areas for improvement were identified.

1. The tracking board for Operational Support Center (OSC) emergency repair teams, while adequate, should be improved. The left side of the OSC team tracking board in the OSC should be duplicated and wall mounted in the TSC.

2. No use was made of available core damage assessment data.

4.3 Operations Support Center (OSC)

The following exercise strength was identified.

1. There were very good operational and radiation control briefings for emergency repair teams about to enter the plant.

No exercise weaknesses were identified.

The following areas for improvement were identified.

1. The OSC Coordinator may be over extended; at times he was trying to handle several tasks at the same time.

2. OSC activation was slow and was accomplished 52 minutes following the Alert declaration and 42 minutes after the TSC was activated.

3. Plant access control resulted in delayed t[illegible]es.

4. Emergency repair team members did nc[illegible]ir insights as to in-plant problems and potential correctiv[illegible]ctions.

4.4 Emergency Operations Facility

The following exercise strength was identified.

1. Protective Action Recommendations were comm unicated to the State of Maine Emergency Operations Center in a timely manner (two to five minutes following Maine Yankee approval).

2. The EOF radiological dose assessor was very active and did frequent "what if" dose calculations.

3. Security officers controlling access to the Emergency Response Facilities screened all emergency response personnel as to their fitness-for-duty.

4. Plant page announcements made throughout the exercise were very detailed and included the status of Protective Actions taken by the State of Maine.

The following exercises weaknesses were identified.

1. The Emergency Coordinator did not exhibit the ability to maintain adequate command and control at all times (50-309/90-14-01).

2. The EOF was unaware of or did not understand plant conditions. For example, the staff failed to recognize a containment by-pass release, containment isolation, and did not correlate containment pressure and containment high range radiation monitor readings with the decision criteria for a Protective Action Recommendation (PAR) (50-309/90-14-02).

3. A non-conservative and delayed PAR was made by the Radiological Evaluation Assistant (REA) who recognized containment isolation but stressed off-site doses in developing a PAR. The Emergency Coordinator approved these non-conservative PARs (50-309/90-14-03).

5.0 Response to Delayed and Non-Conservative PAR

5.1 The licensee recognized the delayed and non-conservative PAR, and undertook a root cause analysis. The inspectors also began an independent assessment of the cause(s) and identified three causes. They are: (1) inadequate training; (2) incomplete procedure (PAR development flow chart); and (3) communication of plant status information to the EOF staff. The Radiological Evaluation assistant (REA) training lesson plan clearly stresses that conservative PARs shall be made but does not include specifics as to plant conditions. The REA was not trained to identify containment by-pass. The PAR logic diagram addresses containment integrity but does not note containment by-pass. Plant information was not communicated to the EOF in a timely manner or in a form understandable to the EOF staff. Plant data was transmitted to the EOF using Plant Status Forms. Neither the TSC Coordinator or Plant Manager briefed the EOF as to plant status in a timely manner. As a result, the EOF staff was unaware of the containment by-pass until the Plant Manager belatedly explained plant conditions and associated these with the logic diagram paths. When this was done the second PAR was made; it was evacuation. Before the end of the inspection period, the licensee briefed the inspectors as to their findings which were in agreement with the NRC's.

5.2 The licensee has committed to conduct an NRC observed remedial drill the week of September 24, 1990 involving the EOF and TSC to demonstrate the adequacy of corrective measures. Maine Yankee submitted a report to the NRC on August 8, 1990 detailing the findings of their root cause analysis and the corrective actions and schedule for their completion.

6.C Licensee Action On Previously Identified Items

The following inspector follow-up items were identified during a previous inspection. Based on observations made by the NRC inspectors, review of the Emergency Plan and Implementing Procedures and interviews with Maine Yankee staff, the status of those items is as follows.

(Closed) 50-309/89-04-01: Staffing and structure of emergency preparedness activities lead to an over-extension of available staff.

Emergency preparedness is an activity assigned to the Licensing Staff of the Licensing and Nuclear Engineering Group. The staff has been increased to two, plus a supervisor. One staff member is assigned to off-site activities and is located at the licensee's headquarters in Augusta. The other staff member is the on-site Emergency Preparedness Coordinator. This individual is a formerly licensed Senior Reactor Operator. In addition, a full-time emergency preparedness trainer has been assigned to the Training Department. The eleven member Yankee Atomic Service Division staff is available to support Maine Yankee's emergency preparedness activities.

(Closed) 50-309/89-04-02: Assignment of Maine Yankee personnel to emergency response organization (ERO) positions was not always clear and some individuals were assigned more than one responsibility.

Assignments are now clearly stated. An individual is assigned to only one ERO position. An adequate number of personnel are available to fully staff the ERO, with at least two qualified persons and an alternate available to fill each ERO key managerial and decision making position.

(Open) 50-309/89-04-03: Training of Radiological Evaluation Assistant (REA) was ineffective. Effectiveness of REA training has not improved based on performance during this exercise (see Section 4.5 and 5.1 above).

(Closed) 50-309/89-04-04: The licensee failed to offer to the State of Maine the results of the licensee/State interface adequacy determination as required by 10 CFR 50.54(t).

The required audit was completed, the interface determined to be adequate and the State, cities and towns were offered the report.

7.0 Emergency Preparedness Improvement Program

7.1 Last year, the licensee evaluated their emergency preparedness activities and identified improvement areas. As a result, improvement activities were undertaken in five functional areas. Activity areas included emergency preparedness management, the Emergency Plan and Implementing Procedures, Emergency Response Facilities and equipment including the Public Emergency Alerting System upgrade, emergency preparedness training, and exercises and drills. Based on the scope of the improvement plan and the number of tasks completed, the inspectors concluded the licensee has developed a sound approach and was proceeding to complete the improvement plan.

Based on the above review, this portion of the licensee's emergency preparedness program is acceptable.

8.0 Organization and Management Involvement

8.1 Responsibility for Emergency Preparedness (EP) is assigned to the Manager, Licensing and Nuclear Engineering. This manager maintains contact with EP matters through informal daily meetings, and additional weekly and monthly meetings and is active in off-site training. The Vice President for Licensing and Engineering is considering increasing EP training activities, particularly through monthly training drills and is seeking ways and means to stress the importance of EP to licensee staff. The Maine Yankee President reviews all internal, NRC and FEMA recommendations and approves responses.

8.2 EP is considered an activity and not an organizational unit. A supervisor is assigned to EP which is a component of the Licensing Staff. In addition to the supervisor, there are two Emergency Preparedness Coordinators (EPC). One is designated the off-site EPC with an office in the Corporate Headquarters at Augusta. The other EPC is the on-site EPC, who is a former Senior Reactor Operator. The off-site EPC has extensive EP experience. Radiation Protection maintains the Emergency Response Facilities and also does a monthly inventory. The Document Control Center distributes controlled copies of the Emergency Plan and Implementing Procedures. Additional support is provided by the Yankee Atomic Service Division (YASD) which will assign, upon request, one or more of their 11 Emergency Preparedness staff to the site, executive offices or address problems at their Bolton, Massachusetts office. Operations input needed to develop scenarios is provided by the members of the Scenario Development Committee who are licensed Senior Reactor Operators. The EPCs interface with the plant, plant security and training, as well as governmental representatives.

Based on the above review, this portion of the licensee's emergency preparedness program is acceptable.

9.0 Knowledge and Performance of Duties (Training)

9.1 Emergency Response Organization (ERO) training is the responsibility of the Maine Yankee Training Department. The policies, procedures and practices stated in this Department's Training Manual apply to EP training (EPT). One technical trainer is assigned this responsibility. Off-site training of Emergency Planning Zone emergency workers is done on a team basis. Team members include the off-site EPC, and staff from the State of Maine's Departments of Health Engineering and Emergency Management. Security Officers are contractor employees and are trained by the contractor's training group. Reactor EP is given by the Operator Training Section and is based on job task analysis.

9.2 The Emergency Preparedness Supervisor reviews and approves lesson plans and examinations. The training schedule goal is training uniformly throughout the year. Training is currently scheduled within three months of the annual exercise. Rescheduling of individuals for training has been a problem, but this need is diminishing. EP format includes lectures, practical training and drills. Examinations may be written, oral or practical. The EP trainer places heavy reliance on oral and practical examinations. In the event of failure (operators excepted), remedial action is based on the trainer's discretion. Participation in drills and practicals are required for ERO qualification (seven drills of various types are scheduled for 1990). A review of the qualification list indicated at least two or more MY staff members were qualified for ERO managerial and decision making positions in addition to an alternate.

9.3 Barrier breech analysis and containment by-pass are noted in the EP Over-View course. The two Radiological Evaluation Assistants, one of whom is an engineer, are not trained to evaluate plant conditions to the degree required to develop Protective Action Recommendations based on all plant conditions. At this time, the Radiation Protection trainer provides training for dose assessors and field monitoring teams. This training responsibility will be transferred to the EP trainer as may the lecture portions of operator EP.

9.4 All reactor simulator training scenarios involve Emergency Action Level Classification and a simulated call to the off-site authorities. Protective Action Recommendation development is discussed. There are six training cycles per year and operators receive four hours of EP classroom training per cycle. Weekly simulator training evaluation includes EP. If an operator fails, he or she is removed from the shift roster until requalification is effected. In the past, there had been requalification problems with respect to accident

classification due to operator misinterpretation of the classification tables. These tables were modified to reflect the operator's suggestions. There is still a problem associating measurable variables with Emergency Action Levels (EALs). Operators are told if in doubt classify using the EAL tables, then review the measurable variables and classify conservatively.

9.5 Armed and unarmed nuclear security officers (NSOs) are given General Employee training and are respirator trained and fitted. They are not radiation worker trained. NSOs are trained in accountability, search and rescue, procedures for the rapid ingress and egress of fire company vehicles and ambulances, and some NSO are fire brigade qualified. All security emergency notifications to the NRC are made by the control room.

Based on the above review, this portion of the licensee's emergency preparedness program is acceptable.

10.0 **Independent/Reviews Audits**

10.1 The 1989 audit report developed to meet the requirements of 10 CFR 50.54(t) was hand delivered to the State of Maine during April 1989 and the cities and towns surrounding the site were notified as to it's availability during November 1989. The 1990 audit was not completed at the time of this inspection.

Based on the above review, this portion of the licensee's emergency preparedness program is acceptable.

11.0 **Off-Site Activities**

11.1 Approximately 100 training and interface meetings were held with State of Maine, City and Town officials. Emergency response information is distributed in brochures. Approximately 16,000 brochures were distributed to all households, institutions, motels, schools and large employers within the Emergency Planing Zone (EPZ). The annual mass media briefing meeting is scheduled for later this year and a press information briefing packet has been developed. The Emergency Action Levels were reviewed with off-site officials during June 1990.

12.0 **Prompt Alerting System**

12.1 In order to meet the requirements of 10 CFR 50.47(b)(5) and the specifications of FEMA, the licensee has developed, installed and upgraded the Public Emergency Alerting System (PEAS). PEAS is comprised of fixed sirens, Tone Alert Radios (TARS) and route alerting. The number of fixed sirens was increased to 39 and the controls for four sirens were upgraded. These sirens

were audibly tested on June 19th and 20th, 1990. All 31 sirens tested activated upon command. A design report which will include detailed results of this test will be sent to FEMA Region I. The current number of TARS, 522, will be increased to a total of 800 to 900. The number of primary route alerting routes has been reduced to eight, five of which are further than ten miles from the plant but within the EPZ.

12.2 During this inspection, an inadvertent sounding of the originaliy installed nine sirens took place due to a computer malfunction. The Maine State Police implemented the inadvertent siren sounding procedure and promptly notified the Emergency Broadcast Stations and NOAA weather radio. In the inspector's judgement, this was a satisfactory real world test of the procedure and the effectiveness of State Police training to recognize the need to use it, and use it correctly in a timely manner.

Based upon the above review, this portion of the licensee's emergency preparedness program is acceptable.

13.0 **ojected Dose Calculations**

13.1 There are three methods available at Maine Yankee to perform projected dose calculation (PDCs). Two are computer programs and the other is a nomogram. The computer programs are COED and METPAC. METPAC uses a straight line Gaussian model and is used in the Emergency Operations Facility (EOF). COED uses a sector averaging meteorological model and calculates plume center line doses. COED is available in the control room, the Alternate Emergency Operating Facility (AEOF), and in the EOF as a back-up to METPAC. The nomogram can be used to determine plume center line doses up to one half mile from the plant. Beyond this distance, the EOF or AEOF staffs would scale half mile doses to greater distances or obtain atmospheric dispersion coefficients from the dose projection procedures and hand calculate doses.

13.2 Iodine to noble gas ratios used in these calculations are a function of the release pathway. If the pathway is not identified, then one of three default ratios available in METPAC will be used. The default release duration is two hours. There is a single, near site meteorological tower provided with back-up power from a vital bus. In the event this tower fails, arrangements have been made to obtain meteorological information from commercial sources or nearby airports.

Based on the above review, this portion of the licensee's emergency plan is acceptable.

14.0 Emergency Response Facilities (ERFs)

14.1 The ERFs (with the exception of the Control Room) are non-dedicated and are located in the Staff Building next to, but outside of, the protected area. The inspectors observed, during the course of the exercise, that the office space was rapidly reconfigured to ERF configuration. Plans, procedures, drawings, maps, and forms were readily available. Implementing procedures were current. Communications systems functioned including the plant computer terminal and the Safety Parameter Display System.

Based on the above observations, this portion of the licensee's emergency plan is acceptable.

15.0 Pager and Call-in Tests

15.1 Pagers are tested every Sunday afternoon. Unannounced, quarterly call-in tests are conducted during which responders are asked to state their time of arrival at the ERF to which they are assigned. The inspectors reviewed results for two tests. Data indicated that 66% of off-site personnel would have been available in 60 minutes and 63% in 30 minutes. An average of nine personnel did not respond.

Based on the above review, this portion of the licensee's emergency plan is acceptable.

16.0 Licensee Critique

The NRC team attended the licensee's exercise critique on August 3, 1990 during which the licensee's lead controllers and observers discussed observations of the exercise. The licensee's critique was constructive and thorough. The Protective Action Recommendation problem was discussed at length and preliminary results of the licensee's root cause analysis were presented. The licensee indicated these observations would be evaluated and appropriate corrective action taken (see Section 5.1).

17.0 Exit Meeting

Following the licensee's self critique, the NRC team met with the licensee's representatives listed in Section 1 on August 3, 1990 to discuss findings as detailed in this report. The NRC team leader summarized the observations made during the exercise. The licensee was advised that three exercise weaknesses were identified. The NRC team also determined that within the scope and limitation of the scenario, the licensee's performance demonstrated that the state of emergency preparedness was adequate to provide protective measures for the health and safety of the public.