

U.S. ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION I

RO Inspection Report No: 50-29/74-08 Docket No: 50-29
Licensee: Yankee Atomic Electric Company License No: DPR-3
20 Turnpike Road Priority: _____
Westboro, Massachusetts 01581 Category: C
Location: Yankee Nuclear Power Station (YNPS), Rowe, Mass.

Type of Licensee: 180 MWe, PWR (Westinghouse)

Type of Inspection: Announced, Environmental

Dates of Inspection: July 16-18, 1974

Dates of Previous Inspection: July 11 and 12, 1974

Reporting Inspector: *Charles O. Larkin*
for R. J. Bores, Radiation Specialist

8-6-74
DATE

Accompanying Inspectors: None

Other Accompanying Personnel: None

Reviewed By: *Charles O. Larkin*
for J. P. Storr, Senior Environmental Scientist

8-6-74
DATE

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SUMMARY OF FINDINGS

Enforcement Action (Environmental Monitoring)

None

Licensee Action on Previously Identified Enforcement Items
(Environmental Monitoring)

None identified

Design Changes

None

Unusual Occurrences

None

Other Significant Findings

A. Current Findings

None

B. Status of Previously Reported Unresolved Items (Environmental
Monitoring)

None identified

Management Interview

On July 18, 1974, following the inspection, a meeting was held in the conference room at Yankee Nuclear Power Station, Rowe, Massachusetts. The following individuals were in attendance:

Mr. R. J. Bores, Radiation Specialist, USAEC, RO:I
Mr. H. Autio, Plant Superintendent
Mr. W. Jones, Assistant Plant Superintendent
Mr. N. St. Laurent, Technical Assistant to the Plant Superintendent
Mr. J. Flanigan, Plant Health Physicist
Mr. J. Parillo, Engineer-in-Training

The following items were discussed:

A. Air Particulate Activities

The inspector stated that a number of anomalies were revealed in the radioanalytical results of the air particulate filters. The licensee stated that this area would be evaluated to ascertain the cause of these anomalies. (Paragraph 4.a)

B. Airborne Iodines

The inspector stated that there appeared to be several discrepancies between the licensee's FSAR and Technical Specifications as to how the airborne iodines were to be analyzed. The licensee stated that this matter would be reviewed and discrepancies eliminated. (Paragraph 4.b)

C. Quality Control in the Environmental Monitoring Program

The inspector stated that the licensee's current quality control program should be upgraded in the area of environmental monitoring. The licensee stated that this area would be examined and appropriate steps taken. (Paragraph 5)

D. Meteorology

The inspector stated that the current meteorology program fell short of those described in Regulatory Guide 1.23. The licensee stated that this area was being evaluated by the Yankee Nuclear Services Division, Westboro, and that their recommendations would be implemented. (Paragraph 6)

E. Non-radiological Monitoring

The inspector stated that the current Yankee Atomic program did not provide for pH or chemical monitoring of wastes discharged from the plant. The licensee stated that hearings for a discharge permit were scheduled for August, 1974, and the plant would implement those requirements as necessary to fulfill the conditions of the permit. (Paragraph 7)

F. Storage Tanks and Transformers

The inspector stated that his site tour included the transformer area and on-site storage tanks. The transformers did not appear to have adequate catch basins or cofferdams to prevent the run-off of oil (in the event of a leak or transformer rupture) into the river.

Similarly, the safety injection storage tank had no preventive measure to prevent borated water containing 10^{-5} microcuries/ml gross beta activity from entering the river in the event of tank leakage or rupture. The licensee stated that the problem was realized and that a solution was being sought. (Paragraph 8)

The inspector stated that no violations were found during this inspection.

DETAILS

1. Persons Contacted

Mr. H. Autio, Plant Superintendent
Mr. W. Jones, Assistant Plant Superintendent
Mr. N. St. Laurent, Technical Assistant to the Plant Superintendent
Mr. J. Flanigan, Plant Health Physicist
Mr. J. Parillo, Engineer-in-Training
Mr. T. O'Dou, Student Health Physicist
Mr. J. Robinson, Environmental Engineering Manager, Nuclear Services
Division, Westboro, Mass.
Mr. S. Farber, Radiological Engineer, Nuclear Services Division,
Westboro, Mass.
Mr. M. Strumm, Associate Radiological Engineer, Nuclear Services
Division, Westboro, Mass.

2. General

The inspection consisted of a review of the licensee's operational environmental monitoring program, encompassing both the radiological and non-radiological aspects of these programs. The licensee currently has no environmental monitoring requirements but has performed some radiological monitoring since 1960. Since January, 1974, the licensee had been following the radiological monitoring program detailed in Section 11.6 of the FSAR submitted to AEC:DL for approval. Areas examined during this inspection included a selective examination of sampling stations, sampling and analytical procedures, representative program results, interviews with personnel and observations by the inspector.

3. Organization and Administration

The licensee stated that the environmental monitoring program was administered and supervised by the Environmental Engineering Department, Mr. J. Robinson, Manager, of the Yankee Nuclear Services Division, Yankee Atomic Electric Company, Westboro, Mass. Mr. S. Farber has the responsibility in the radiological areas and Mr. W. Davis in the non-radiological areas. Both individuals report to Mr. P. Littlefield, who reports to Mr. Robinson. The review and evaluation of environmental data for all the Yankee nuclear plants are performed by this group.

Sample collection for radiological analyses is supervised by Mr. J. Flanigan at YNPS. Mr. Flanigan reports through Mr. Billings, Health Physics and Chemistry Supervisor, to Mr. Autio, Plant Superintendent. The licensee stated that samples for radiological analysis were collected by the chemistry and health physics technicians with the exception of the aquatic samples (fish, aquatic vegetation,

and sediments) which were collected by Aquatec, Inc. The radiological analysis of all environmental samples had been performed by Teledyne Isotopes, Inc., Westwood, N.J., for about the past 5 or 6 years. Aquatec, Inc., South Burlington, Vermont also performed selective studies in regard to temperature of the Deerfield River, thermal discharges, entrainment of organisms, and fish impingement at YNPS.

4. Radiological Monitoring Program

a. Air Particulates

The review of the licensee's procedures and records and discussions with the licensee revealed that the five named air sampling stations listed in the FSAR had been in operation since December 11, 1973. Two of the air sampling stations had been in operation since 1960. Air samples per se were not taken during the early stages of operation but rather gum paper was used to sample dust fall from the air. The records further revealed that gross alpha, and gross beta analyses were performed on each particulate filter with gamma spectral and Sr-90 analyses being performed on monthly composites of the filters from each station since the beginning of 1973.

The inspector examined a number of sampling stations and observed that the air particulates were collected on Gelman Type E, 47 mm fiberglass filters. The flow rates were nominally 30 liters/minute and the volumes of air sampled were measured by temperature compensating dry gas meters. The licensee stated the dry gas meters were calibrated when installed in late 1972 and the present plans called for periodic maintenance and recalibration of the sampling system. The inspector noted that the sampling heights were approximately three feet above the ground and that this close proximity may result in heavy dust loading of filters. The licensee stated that this matter would be evaluated.

The review of the air particulate analyses indicated that an increase in gross beta activities was evident since February, 1974. This increase (from about 0.06 to about 0.2 picocuries/m³) was seen at other facilities during this time and was attributed to Chinese nuclear tests in 1973. Zr-95 in concentrations greater than 0.004 picocuries/m³ was also seen since December, 1973, on air particulate filter composites. (This nuclide was reported by other facilities as well and was attributed to the same cause as above.) The presence of other nuclides were consistently reported in the air particulate composites including Co-60, Mn-54, Be-7, Cs-137 and Ag-110m. Comparison of the reported activity concentrations of these nuclides with those

reported in the main stack vent revealed little difference in magnitude. In some instances the environmental sample had reported activity concentrations (approximately 1 picocurie/m³) greater than those in the stack. The inspector determined that the licensee did a quick measurement of alpha and beta activities of these filters before sending the filters to Teledyne for complete analysis. The licensee stated these filters were counted in the same counter used to measure in-plant samples, i.e., wipe survey samples, effluent samples, etc. The inspector noted that the latter samples may be orders of magnitude greater than the environmental samples. The possibility of contaminating the latter samples in this counter was discussed. The licensee stated that this would be evaluated as the source of the unusual environmental air particulate results.

b. Airborne Iodines

The inspector examined the airborne iodine sampling programs, including the kinds of collectors used and method of analyses. The licensee utilizes 2 inch deep by 47 mm diameter cartridges manufactured by Barneby-Cheney using triethylene diamine (TEDA) activated charcoal. The licensee anticipates using the same type of cartridges from Nuclear Consulting Services, Inc. (NUCON), who the licensee stated, would perform collection efficiencies for both elemental iodine and methyl iodide on each batch. A preliminary report on collection efficiencies, reviewed by the inspector, revealed that the 2 inch by 47 mm cartridge was comparable to the 1 inch by 2 1/4 inch diameter, Cesco B cartridge for elemental iodines and that the former was superior to the Cesco B cartridge for organic iodines under the conditions of the test. The current test program did not evaluate the collection efficiency for inorganic iodines.

Review of the licensee's air iodine results revealed that all five of the sampling stations were in operation since December 11, 1973 and that two of the stations had been in operation for several years prior. Prior to October, 1973, the iodine collection cartridges had been analyzed as a monthly composite of the weekly cartridges from each station. Subsequent to that time each weekly cartridge was analyzed individually. The review of the data showed no instances in which the I-131 activities were greater than the Minimum Detectable Activity (about 0.02 picocuries I-131/m³). Current analysis of the charcoal cartridges is performed by Teledyne, by low background beta counting of the iodine after its chemical removal from the charcoal.

The inspector noted that the methods of iodine analysis, as indicated in the licensee's records, the FSAR and the Proposed Technical Specifications, were not consistent. The licensee stated that continuation of the above analysis was planned and that the FSAR and Technical Specifications would be reviewed and made consistent.

c. Environmental Gamma Radiation

The licensee stated that the environmental gamma radiation was measured on a monthly basis at 22 locations (including 3 on the restricted area boundary) with $\text{CaSO}_4:\text{Dy}$ loaded Teflon (DPFE) thermoluminescent dosimeters (TLDs). Four phosphors were used in each monitoring badge with appropriate filtering to assure a uniform response versus gamma energy. The dosimeters are annealed and read by Health Physics personnel at the plant. Calibration of the system (performed using 7-14 mrad exposures from an uranium plaque standard) was done monthly.

The inspector reviewed all of the environmental TLD data and found typical monthly exposures were in the range of 6 to 10 mR. Film badges were also used at each location along with the TLD badges. Review of the film data added little information because of the lack of sensitivity to low level exposures.

The inspector noted that the levels of environmental gamma radiation were not included in the licensee's 6-month environmental reports.

d. Water

The inspector reviewed the licensee's water sampling program, including the sampling procedures and analytical techniques. The water sampling program was initiated in 1960 when water from several locations was analyzed for gross alpha and gross beta activities. The review of the results of this program indicated that the licensee had been sampling water at eight specified locations as of January, 1974. Records indicated that seven locations had been sampled for the past two years. Water samples were analyzed for gross alpha, gross beta, H-3, Sr-90 and by gamma spectral analysis. Typical results were: Gross alpha, less than Minimum Detectible Activity (MDA); gross beta, from < MDA to 4 picocuries/l; Sr-90, < MDA to 2 picocuries/l; gamma emitting nuclides, all < MDA; and H-3 all MDA (less than 2,000 picocuries/l) except for Sherman Spring. Beginning in January, 1974, H-3 was analyzed by a gas counting technique resulting

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in a much lower MDA (70 picocuries/l) for H-3. Typical values since that time were 220-270 picocuries/l, within the expected range for surface water.

In April, 1964, the licensee reported a leak in the ion exchange pit resulting in the release of radioactivity to the environment. The licensee subsequently was cited for exceeding the 10 CFR Part 20 limits for H-3 to unrestricted areas. The Part 20 limit for H-3 in water is 3×10^{-3} microcuries/ml or 3 microcuries/l. The concentration released during March and April, 1965, was reported as 15 microcuries/l.

This H-3 activity found its way into Sherman Spring, which has a flow rate estimated by the inspector to be several gallons per minute. The concentration of H-3 in Sherman Spring has declined over the years from a maximum of 15 microcuries/l to the current level of about 0.01 microcuries/l or 0.3% of the 10 CFR 20 limit. There was no indication of any additional leakage from the pit after it was repaired in 1965.

e. Soil and Vegetation

The inspector reviewed the licensee's soil and vegetation sampling program and noted that this program extended back to 1960. The licensee has been sampling soil and vegetation at nine locations three times annually. The licensee's routine procedure involves sending one-half of each sample to the radiological contractor for analysis and maintaining the remaining portion for future use or reference, if needed. The results of the radiological analyses were reviewed. Gross alpha, gross beta, Sr-90 and gamma spectral analyses were performed for each of the samples. K-40, Be-7 and Ra-226 were the principal gamma emitting nuclides found in terrestrial vegetation samples. The inspector noted that the Ra-226 activities were generally much higher than the gross alpha activities. The reason for this was not evident since both Ra-226 and Th-228 (also reported present in most of the vegetation samples) are both alpha emitters. For soil samples the chief gamma emitter was K-40.

f. Bottom Sediments

The licensee's records indicated that bottom sediments have been sampled in the Deerfield River (eight downstream locations and six upstream locations) three times annually. The licensee stated that at least three kilograms of sediment were taken at each location so that a portion of the sample could be retained by the licensee for future reference. Sampling was done by Ekman dredge, shovel, etc., depending on location of sample and

river conditions. The radiological data indicated that gross alpha, gross beta, Sr-89, Sr-90 and gamma spectral analyses were performed on each sample.

g. Maple Syrup

The licensee has been sampling maple syrup for radiological analysis at two locations each year. Sr-90 and gamma spectral analyses were performed on each sample. Review of the results for the past several years indicated the presence of Ra-226 (0.23 to 2.3 picocuries/l), K-40 (2.5 to 9.9 picocuries/l) and Sr-90 (0.26 to 0.41 picocuries/ml).

h. Fish and Aquatic Plants

The licensee stated that fish and aquatic plants were sampled three times annually at two downstream and one upstream locations by Aquatec, Inc. Fish samples were analyzed by Teledyne for ^{235}U , Sr-90 and gamma emitters. Aquatic plants were analyzed for Sr-90 and gamma emitters. The results of this program were reviewed since the fourth quarter 1973.

i. Milk

The licensee stated that the milk sampling program was begun in late 1973. The licensee stated that milk samples were collected monthly from one farm two miles from the site (nearest farm) and another 13 miles away. The licensee's records indicated that milk was analyzed for Sr-90, gamma emitting nuclides and I-131 (by radiochemical separation and low background beta counting). The review of the results indicated that I-131 was <0.5 picocuries/l and Sr-90 was in the range of 6-8 picocuries/l.

5. Quality Control

The inspector discussed with the licensee the quality control exercised by the licensee over the radiological analysis and environmental sampling programs. The following areas were included in this discussion: (a) Greater licensee familiarity with the analytical procedures and calculation of results by contractors, (b) Closer review of radiological data and the resolution of anomalous data, including a determination of the effect of dust loading on air particulate results and the use of in-plant equipment to count environmental samples, (c) More efficient use of spike and split samples to yield a more meaningful evaluation of contractor work and (d) Use of HCl with sodium bisulfide to keep ions in liquid samples from plating out on the container walls. The licensee stated that these areas would be evaluated and appropriate action would be taken.

6. Meteorology

The inspector reviewed the meteorology program being conducted at YNPS. The current meteorological instrumentation is located on a 140 foot tower. (The tower height is comparable to that of the building vent stack.) The licensee is recording wind speed and wind direction with a Climet CI25 system from the 30 foot level only. Temperature sensors measure the temperatures at the 30 and 140 foot levels and yield a ΔT value between those heights. The licensee stated that TRC (The Research Corporation of New England) performed the routine calibration of the instrumentation and data reduction for YNPS. The inspector noted that most of the airborne releases would be released at the 140 foot level and inquired as to the licensee's plans to add wind speed - wind direction instrumentation at this level. The licensee stated that the relatively poor reliability of this instrumentation had stimulated the licensee to keep it at the lower level for ease of maintenance. The licensee further stated that the area of meteorology was being evaluated for all of the Yankee plants by the Nuclear Services group at Westboro. He stated that the recommendations of that group would be followed.

7. Non-radiological Monitoring

The inspector questioned the licensee as to the extent of the non-radiological monitoring and study programs being conducted. The licensee related that currently the only chemical monitoring performed on plant wastes was pH measurements of the demineralizer discharges. The licensee stated that a hearing for a discharge permit was scheduled for August, 1974 with the US EPA and the Commonwealth of Massachusetts. The licensee indicated that a number of discharge monitoring conditions would be imposed by the permit and would be implemented by the licensee. The inspector reviewed a report prepared for the licensee by Aquatec, Inc., detailing temperature variations of the Deerfield River and fish catch studies. Preliminary studies were also conducted of plankton mortality and fish impingement. At the present time there are no on-going studies being conducted on the river by the licensee.

8. Storage Tanks and Transformers

As part of this inspection a site tour was conducted, including the intake and discharge areas, the chemical, diesel fuel and waste storage tanks, and the transformer area. The inspector noted that diesel fuel and radwaste tanks were adequately diked to prevent any spillage or leakage from entering the river. Similarly the acid and caustic storage tanks were provided with means of

preventing releases to the environment. The transformers, however, were located such that any oil release as a result of a rupture or leak would find its way into the river. The grade sloped to the river and was provided with a drainage ditch to carry rainwater (and any leakage) to the river. The 125,000 gallon safety injection storage tank is located up-grade from the transformers. The tank contains approximately 117,000 gallons of 10^{-5} microcuries/cc gross beta activity water with greater than 2200 ppm boron. In the event of a leak or spill from this tank, this water would also drain down into the river. The water could cause a chemical toxicity problem to aquatic organisms in the river, as well as exceed 10 CFR 20 radioactivity levels for releases. The licensee stated that the transformer problem was already being evaluated and the latter problem would have to be evaluated with it.