UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
631 PARK AVENUE
KING OF PRUSSIA, PENNSYLVANIA 19406

MAR 8 1977

Docket No. 50-213-684

Connecticut Yankee Atomic Power Company
ATTN: Mr. D. C. Switzer
President
P. O. Box 270
Hartford, Connecticut 06101

Gentlemen:

Subject: Region I Inspection Report No. 50-213/77-03

This refers to the inspection conducted by Dr. C. J. Paperiello of this office on February 15, 16, and 17, 1977 at your Connecticut Yankee Nuclear Power Station of activities authorized by NRC License No. DPR-61 and to the discussions of our findings held by Dr. Paperiello with Messrs. Graves, Traggio, and Kangley of your staff at the conclusion of the inspection.

Areas examined during this inspection are described in the Office of Inspection and Enforcement Inspection Report which is enclosed with this letter. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

In addition our Mobile Laboratory was also brought to your site and used by the inspector to make certain independent measurements. The basic purpose of these independent measurements is to verify your capability for analyzing radioactive effluents, and to achieve and maintain comparable methods of analyses between your facility and the NRC. The complete data from these measurements will be reported in a subsequent Inspection Report.

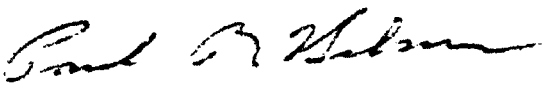
Within the scope of this inspection, no items of noncompliance were observed.

In accordance with Section 2.790 of the NRC's "Rules of Practice", Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document

Room. If this report contains any information that you (or your contractor) believe to be proprietary, it is necessary that you make a written application within 20 days to this office to withhold such information from public disclosure. Any such application must be accompanied by an affidavit executed by the owner of the information, which identifies the document or part sought to be withheld, and which contains a statement of reasons which addresses with specificity the items which will be considered by the Commission as listed in subparagraph (b)(4) of Section 2.790. The information sought to be withheld shall be incorporated as far as possible into a separate part of the affidavit. If we do not hear from you in this regard within the specified period, the report will be placed in the Public Document Room.

No reply to this letter is required; however, should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,



Paul R. Nelson, Chief
Fuel Facility and Materials Safety
Branch

Enclosure: Region I Inspection Report No. 50-213/77-03

cc w/encl:
R. Graves, Plant Superintendent

IE:I Form 12
(Jan 75) (Rev)

U. S. NUCLEAR REGULATORY COMMISSION

OFFICE OF INSPECTION AND ENFORCEMENT

REGION I

IE Inspection Report No: 50-213/77-03 Docket No: 50-213

Licensee: Conn. Yankee Atomic Power Company License No: DPR-61

P. O. Box 270 Priority: -

Hartford, Connecticut 06101 Category: C

Safeguards Group: -

Location: Connecticut Yankee Nuclear Power Station, Haddam, Connecticut

Type of Licensee: PWR, 1825 MWt, W

Type of Inspection: Routine, Announced, Confirmatory Measurements

Dates of Inspection: February 15, 16, 17, 1977

Dates of Previous Inspection: February 1-4, 1977

Reporting Inspector: /P Stohr 3/8/77
Dr. C. J. Paperiello, Radiation Specialist DATE

Accompanying Inspectors: None
DATE

DATE

DATE

Other Accompanying Personnel: /P Stohr 3/8/77
Mr. T. Jackson, Co-op Student DATE

Reviewed By: /P Stohr 3/9/77
J. P. Stohr, Chief, Environmental and Special Projects Section. DATE

## SUMMARY OF FINDINGS

### Enforcement Action

#### Violations

None identified.

#### Infractions

None identified.

#### Deficiencies

None identified.

### Licensee Action on Previously Identified Enforcement Items (Confirmatory Measurements)

Not applicable.

### Design Changes

Not applicable.

### Unusual Occurrences

None reported.

### Other Significant Findings

A. Current Findings

1. Acceptable Items

   Of the 20 analytical results compared on split radioactive samples, 17 were in agreement and 3 in possible agreement with NRC values. (Details, Paragraph 4.a)

2. Unresolved Items

   77-03-01 Contractor laboratory gamma analysis accuracy. (Details, Paragraph 5)

B. Status of Previously Identified Unresolved Items

The following items have been resolved as noted:

1. 74-11 Detail 4
   Charcoal cartridge changeover. (Details, Paragraph 6)

2. 74-11 Detail 3
   Calibration of gamma spectrometer. (Details, Paragraph 4.b)

3. 74-11 Detail 3
   Sr discrepancy. (Details, Paragraph 4.c)

4. 74-11 Detail 3
   Composite storage. (Details, Paragraph 7)

5. 76-02 Detail 6
   Laboratory QA program. (Details, Paragraph 3.b)

6. 76-02 Details 2 and 3
   Verification test results. (Details, Paragraph 4.b)

7. 74-11 Detail 3
   Tritium discrepancies. (Details, Paragraph 8)

8. 76-10 Detail 1
   Analysis of IHSL spiked gamma sample. (Details, Paragraph 4.b)

C. Deviations

None identified.

Management Interview

At the conclusion of the inspection a meeting was held at the site with representatives of the licensee. Attendees at this meeting consisted of personnel whose names are highlighted (i.e.*) in paragraph 1 of the Details Section of this report. The inspector summarized the purpose and the scope of the inspection (Details, Paragraph 2), and the results of the inspection (as listed in the "Summary of Findings").

Certain items presented by the inspector were discussed in further detail at this management meeting, specifically:

Contractor results on weekly composites of liquid effluents (77-03-01)

The inspector discussed with the licensee the discrepancies between the licensee's measurements of Co-60 in Waste Test Tank liquids and measurements made by the licensee's contractor on composite samples of the same liquids. After noting that the licensee's measurements on a split of one of these samples was in agreement with NRC measurements, possible causes for the discrepancies were discussed along with possible methods to determine the cause. The licensee stated that the use of spiked and/or split samples would be used to determine the cause of the discrepancies. The inspector stated that this item was unresolved pending further evaluation by the licensee. (Details, Paragraph 5)

## DETAILS

1. Persons Contacted

*Mr. R. Graves, Plant Superintendent
*Mr. R. Traggio, Assistant Superintendent
*Mr. J. Kangley, Chemistry Supervisor
Mr. M. Quinn, Assistant Chemist

2. General

This inspection consisted of a review of the licensee's effluent collection and analysis procedures, effluent records, quality assurance audit records, certain monitoring and counting equipment, and performance on verification test samples split between the licensee and the NRC:I. The verification test samples were analyzed by (1) the licensee using his normal method and equipment and (2) NRC:I using the NRC Mobile Laboratory at the site and the NRC reference laboratory, Idaho Health Services Laboratory (IHSL). Results of sample analyses were compared. Joint analyses of the verification test samples with subsequent comparison tests the licensee's capability to measure radioactive material in actual effluent samples. In addition, certain other capability test standards, prepared by IHSL were also submitted to the licensee for analysis and his performance in these samples was reviewed also.

A split verification test liquid effluent sample was sent to the IHSL for analyses requiring wet chemistry. These results will be compared with the licensee's results at a later date when received and documented in a subsequent Inspection Report.

3. Licensee Program for Quality Control of Analytical Measurements

a. The inspector noted that the supervisory staff responsible for performance of activities in the area of radiochemistry had not changed since the last inspection in this area.

b. In a previous inspection, (NRC:I Inspection Report 50-213/76-02) the upgrading of the licensee's internal chemistry QA program by the addition of a schedule of spiked, split and duplicate samples was left as an Unresolved Item. During this inspection the inspector reviewed the following licensee procedures in this area.

-- Procedure CHDP 1.1, Revision 1, Laboratory Quality Assurance.

-- Procedure CHDP 1.8, Split Sample Analysis Program.

-- Procedure CHDP 1.9, Spiked Sample Analysis Program.

After noting the sample schedules the inspector had no additional questions in this area. This item is considered resolved.

c. The inspector reviewed the recalibration of the plant's River Effluent monitor (R-18). This was performed on June 2, 1976. The inspector noted by direct observation that the detector in this monitor was a 2"x2" NaI(Tl) gamma scintillation detector. The observed background was 1,000 CPM. The monitor was calibrated using Co-60 standards and three different concentrations. The inspector calculated from the background and calibration curve that the instrument had sufficient sensitivity to assure compliance with sections 2.4.1.1 and 2.4.1.4 of the licensee's Technical Specifications.

4. Confirmatory Measurements

a. The results for the intercomparisons made are presented in Table 1. These include results for: split liquid and noble gas effluent samples; samples prepared by IHSL and presented to the licensee for measurement and which substitute for particulate and charcoal filters; and liquid standards prepared by IHSL and sent to the licensee for measurement previous to this inspection. The criteria for comparing analytical measurements are enclosed as Attachment 1.

The measurements requiring wet chemistry (i.e. gross beta, Sr-89 and Sr-90, and tritium) will be compared when available at a later date.

b. The data presented in Table 1 indicates that 17 results are in agreement, 3 in possible agreement and none in disagreement with NRC values.

In previous inspections, there had been disagreement in the compared values. In 1974, IE Inspection Report 50-213/ 76-11, Detail 3, and in 1976, IE Inspection Report 50-213/76-02, Detail 3, the adequacy of the gamma system calibration was left unresolved. In 1976, IE Inspection Report 50-213/76-02, Detail

2 and 3, the verification test results for liquids were left unresolved pending analyses by the licensee's contractor laboratory and IHSL. In IE Inspection Report 50-213/76-10, Detail I, the licensee's gamma results were again in disagreement with NRC values. At that time the licensee stated that a new calibration program for their gamma spectrometer system would be obtained from the system vendor. A spiked liquid gamma standard from IHSL was then sent to the licensee for measurement.

After reviewing the licensee's results on the IHSL standard, which were all in agreement, and the licensee's results on split liquid samples, which showed 4 results in agreement, 2 in possible agreement and none in disagreement, the inspector stated that all the above noted Unresolved Items in this area were considered resolved.

c. The inspector reviewed the results for the spiked Sr-89, 90 sample prepared by IHSL. The inspector noted that these analyses are performed by a contractor laboratory for the licensee. The inspector noted that the licensee QA program included the submission of QC samples to the contractor. The inspector stated that the Unresolved Item, IE Inspection Report 50-213/74-11, Detail 2 and 3, with respect to Sr-89, 90 discrepancies was considered resolved.

5. Accuracy of Contractor Gamma Measurements (77-03-01)

The licensee sends weekly composites of his liquid radioactive waste samples to a contractor lab for analysis. This is done (1) to comply with Table 2.4-1 of his environmental Technical Specifications which requires an analysis for Ba-La-140 and I-131 on a weekly composite; (2) as part of his labortory QC program; and (3) to obtain a more sensitive gamma analysis than can be achieved on his in-plant system.

While reviewing the laboratory results for December, 1976, the inspector noted that for the week of December 10, 1976, four tanks of liquid waste were released containing an average concentration of $8.67 \times 10^{-5}$ uCi/ml of Co-60 based on the licensee's measurements while the contractor measured $6.34 \times 10^{-7}$ uCi/cc on the proportional composite from these tanks. For the week of December 17, 1976, three tanks were released with an average concentation of $1.48 \times 10^{-5}$ uCi/cc of Co-60 as measured by the licensee, while the contractor measured $3.46 \times 10^{-7}$ uCi/cc. For other periods during October, November, and December, the licensee released at least one tank during each compositing period which had insufficient activity to be detected by the licensee's system and therefore an average value could not be calculated.

The licensee and the inspector discussed possible causes for this disagreement. The licensee stated that the contractors gamma data was not used to compile the semi-annual report except in those cases in which the contractor's greater sensitivity allowed the measurement of isotopes not detected by the licensee's system. The inspector noted that this would be a small fraction of the Technical Specification limit on total releases and of the licensee's reported releases.

The licensee stated that the use of spiked and/or split samples would be used to determine the cause of the discrepancies. The inspector stated that this item was unresolved pending further evaluation by the licenee.

6. Charcoal Cartridge Changeover

The licensee is required by his Environmental Technical Specifications to monitor radioiodine releases from the plant stack. In a previous report, IE Inspection Report 50-213/74-11, Detail 4, it was noted that a charcoal impregnated paper was used for sampling. Since this medium has a poor collection efficiency for organic iodine species, the licensee had planned to switch to a charcoal cartridge for sampling. The inspector noted by direct observation that a Scott charcoal cartridge #4235 is now being used. The inspector had no additional questions in this area. This item is considered resolved.

7. Composite Storage

The licensee is required by his environmental Technical Specifications to composite certain liquid effluent samples. In a previous inspection reports, IE Inspection Report 50-213/74-11, Detail 3, and IE Inspection Report 50-213/76-02, Detail 4, it was noted that there was no written compositing procedure and samples were composited without the addition of acid to reduce sample plateout on the walls of the storage container. The inspector reviewed the licensee's procedure number CHDP 1.4 "Liquid Sample Compositing" and noted that the addition of acid prior to compositing was now required. The inspector had no additional questions in this area. This item is considered resolved.

8. Tritium Discrepancies

The licensee is required by his Environmental Technical Specifications to measure the tritium concentration in a monthly composite of his liquid effluent releases. The licensee is required by 10 CFR 20.201 to measure each test tank release. In a previous inspection (IE: Inspection Report 50213/74-11, Detail 3) the accuracy of the licensee's tritium measurements was left unresolved. During this inspection the inspecor reviewed the licensee's results on a sample split in January, 1976, and analyzed by IHSL and the licensee and reported in IE Inspection Report 50-213/76-10. The inspector noted that the results were in agreement. The inspector had no additional questions in this area. This item is considered resolved.

## TABLE 1

## CONNECTICUT YANKEE TEST RESULTS VERIFICATION

| SAMPLE | ISOTOPE | NRC VALUE | LICENSEE VALUE | COMPARISON |
|---|---|---|---|---|
| | | Results in uCi/cc | | |
| HSL-5 | Co-60 | (3.4 ± 0.1) E-3 | (4.44 ± 0.03) E-3 | A |
| 5/18/76 | Cs-134 | (1.4 ± 0.1) E-3 | (1.81 ± 0.02) E-3 | A |
| | Cs-137 | (3.7 ± 0.1) E-3 | (4.45 ± 0.02) E-3 | A |
| | Ce-144 | (1.6 ± 0.1) E-2 | (1.71 ± 0.05) E-2 | A |
| HSL-Sr 4 | Sr-89 | (3.34 ± 0.07) E-5 | (3.2 ± 0.3) E-5 | A |
| 12/1/75 | Sr-90 | (4.79 ± 0.14) E-6 | (7.0 ± 0.8) E-6 | PAA |
| | | Results in uCi | | |
| SPIKED CHARCOAL CARTRIDGES | | | | |
| H-4 | Ba-133 | (7.61 ± 0.01) E-2 | 6.54 E-2 | A |
| S-11 | Ba-133 | (4.86 ± 0.07) E-2 | 5.96 E-2 | A |
| SPIKED FILTER | | | | |
| HSL-6 | Cs-137 | (6.0 ± 0.3) E-2 | 6.29 E-2 | A |
| | Na-22 | (1.11 ± 0.04) E-2 | 1.15 E-2 | A |
| | Ag-100m | (2.6 ± 0.1) E-2 | 3.42 E-2 | A |
| | Sb-125 | (4.5 ± 0.1) E-2 | 4.4 E-2 | A |

## TABLE 1

## CONNECTICUT YANKEE TEST RESULTS VERIFICATION

| SAMPLE | ISOTOPE | NRC VALUE | LICENSEE VALUE | COMPARISON |
|---|---|---|---|---|
| | | Results in uCi/cc | | |
| GAS DECAY TANK 2/15/77 | Xe-133 | (0.506 ± 0.011) E-3 | 0.478 E-3 | A |
| | Kr-85 | 0.176 ± 0.002 | 0.143 | A |
| WASTE TEST TANK "B" 2/15/77 | Co-60 | (0.42 ± 0.07) E-5 | 0.81 E-5 | A |
| PRIMARY WATER FILTERED 2/7/77 | I-131 | (0.396 ± 0.007) E-2 | 0.511 E-2 | PAA |
| | Cs-134 | (0.130 ± 0.004) E-2 | 0.164 E-2 | A |
| | Cs-137 | (0.169 ± 0.004) E-2 | 0.237 E-2 | PAA |
| | Co-58 | (0.118 ± 0.014) E-3 | 0.163 E-3 | A |
| | Mn-54 | (0.449 ± 0.019) E-3 | 0.509 E-3 | A |

## Attachment 1

### Criteria for Comparing Analytical Measurements

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgement limits are variable in relation to the comparison of the NRC Reference Laboratory's value to its associated uncertainty. As that ratio, referred to in this program as "Resolution", increases the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement must be considered acceptable as the resolution decreases.

| | | LICENSEE VALUE / NRC REFERENCE VALUE | |
|---|---|---|---|
| Resolution | Agreement | Possible Agreement A | Possible Agreement B |
| <3 | 0.4 - 2.5 | 0.3 - 3.0 | No Comparison |
| 4 - 7 | 0.5 - 2.0 | 0.4 - 2.5 | 0.3 - 3.0 |
| 8 - 15 | 0.6 - 1.66 | 0.5 - 2.0 | 0.4 - 2.5 |
| 16 - 50 | 0.75 - 1.33 | 0.6 - 1.66 | 0.5 - 2.0 |
| 51 - 200 | 0.80 - 1.25 | 0.75 - 1.33 | 0.6 - 1.66 |
| >200 | 0.85 - 1.18 | 0.80 - 1.25 | 0.75 - 1.33 |

"A" criteria are applied to the following analyses:

Gamma Spectrometry where principal gamma energy used for identification is greater than 250 Kev.

Tritium analyses of liquid samples.

"B" criteria are applied to the following analyses:

Gamma Spectrometry where principal gamma energy used for identification is less than 250 Kev.

89Sr and 90Sr Determinations.

Gross Beta where samples are counted on the same date using the same reference nuclide.

# END

# DATE FILMED

7 / 25 / 77