

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 85-21

Docket No. 50-309

License No. DPR-36

Priority --

Category C

Licensee: Maine Yankee Atomic Power Company

83 Edison Drive

Augusta, Maine 04336

Facility Name: Maine Yankee Nuclear Power Station

Inspection At: Wiscasset, Maine

Inspection Conducted: August 19-23, 1985

Inspectors:

Richard K. Struckmeyer  
Richard K. Struckmeyer  
Radiation Specialist

9-26-85

date

for Richard K. Struckmeyer  
Thomas E. Tuccinardi  
Radiation Specialist

9-26-85

date

Approved by:

M. Shanbaky  
Mohamed M. Shanbaky  
Chief, PWR RPS

9/26/85

date

Inspection Summary: Inspection on August 19-23, 1985 (Report No. 50-309/85-21)

Areas Inspected: Routine, unannounced inspection of the licensee's radiochemical measurements program using the NRC: I Mobile Radiological Measurements Laboratory and laboratory assistance provided by DOE Radiological and Environment Sciences Laboratory. Areas reviewed included: program for the quality control of analytical measurements and performance on radiological analyses of split actual effluent samples. The inspection involved 66 inspector hours onsite by two NRC region-based inspectors.

Results: Within the areas inspected, no violations were identified.

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## DETAILS

### 1. Individuals Contacted

- \*J. Garrity, Plant Manager
- \*E. Boulette, Assistant Plant Manager, Technical Support
- \*D. Sturniola, Principal Radiological Engineer
- \*P. Radsky, Chemistry Section Head
- L. Thornburgh, Secondary Chemist
- R. Haynes, Chemistry Lab Assistant

\*Denotes those present at exit meeting on August 23, 1985

### 2. Organization and Management Controls

The inspector reviewed the organization and administration of the Chemistry Section. The Chemistry Section Head reports to the Technical Support Department Head, who reports to the Plant Manager. Within the Section there are the positions of Radiochemist and Secondary Chemist. The Radiochemist position was vacant at the time of this inspection; efforts to find a replacement had begun but no offers had yet been made. During the current planned outage, the Chemistry Section head is covering the day shift activities, and the Secondary Chemist is covering the evening shift. The section also has chemistry technicians available for performing the necessary sampling and analyses on both shifts.

### 3. Laboratory Quality Control Program

The inspector reviewed the licensee's program for quality control of analytical measurements. This program is covered in the licensee's procedures 7-02-1 and 7-02-2. The former covers general aspects of laboratory QA/QC, including preparation of reagents and standards, spiked, duplicate, and split samples, EPA crosschecks, and interlaboratory crosschecks among nuclear power plants in the northeast. Procedure 7-02-2 discusses QC checks of laboratory instruments, including Ge(Li) detectors. Procedure 7-05-2 covers calibration of the Ge(Li) detectors and their associated multichannel analyzer. This procedure requires energy and efficiency calibrations every two years at a minimum. Quality Control checks are performed daily and logged on form MY-CH-45-77. For gamma spectroscopy, three checks are made: gain shift, resolution, and efficiency. A source containing known quantities of Cd-109, Cs-137, and Co-60 is analyzed and the resulting spectra are compared to the reference spectra obtained at the time of calibration of each detector. If the observed values for these parameters differ by more than 10% from the expected values, the instrument may not be used without the approval of the chemistry section head, radiochemist, or secondary chemist. The licensee stated that the efficiency parameter of one instrument (detector 3) is frequently found to exceed 10% for the Cd-109 (88 keV) gamma ray. This excess is always in a positive direction; i.e., the observed value of the

measured parameter (gammas per second) exceeds the expected value. The licensee further stated that approval is routinely given to continue using this instrument. The inspector stated that this excessive positive bias may indicate a problem with the detector that should be investigated and corrected. This will be reviewed in a future inspection (50-309/85-21-01).

#### 4. Confirmatory Measurements

During the inspection, actual liquid and gas, as well as simulated particulate filter, charcoal cartridge and gas samples were analyzed by the licensee and NRC for the purpose of intercomparison. The samples are actual effluent and inplant samples normally analyzed by the licensee, and simulated filter, cartridge, and gas samples supplied by the NRC, containing known quantities of suitable radionuclides. The samples were analyzed by the licensee using normal methods and equipment, and by the NRC using the NRC:I Mobile Radiological Measurements Laboratory. Joint analyses of such samples are used to verify the licensee's capability to measure radioactivity in effluent samples with respect to Technical Specification requirements and other regulatory requirements.

In addition, a liquid effluent sample was sent to the NRC reference laboratory, Department of Energy, Radiological and Environmental Sciences Laboratory (RESL), for analyses requiring wet chemistry. The analyses to be performed on the samples are: Sr-89, Sr-90, gross alpha, gross beta, and tritium. These results will be compared with the licensee's results when received at a later date, and will be documented in a subsequent inspection report.

The results of a liquid effluent sample split between the licensee and the NRC reference laboratory (RESL) during a previous inspection on May 17-20, 1983 (Inspection Report 50-309/83-11), were also compared during this inspection.

The results of the gamma isotopic measurements comparisons indicated that all of the measurements except the Volume Control Tank gas in a 33ml glass bulb were in agreement under the criteria used for comparing results (see Attachment 1). The results of the comparisons are listed in Table I.

The comparisons of Volume Control Tank (VCT) gas samples indicated agreement for the 1000 ml gas marinelli, and partial agreement for the 33 ml glass bulb. In the latter case, the results for Xe-133, which has an 81 keV gamma ray, did not agree. The reason for this disagreement could not be determined at the time of this inspection. This will be reviewed in a future inspection (50-309/85-21-02).

When the licensee analyzed a simulated gas bulb (a standard used by the NRC for its detector calibration), its results were in agreement with the known values over the range of energies for which its detector had been calibrated.

5. Procedures and Records

The inspector reviewed selected procedures and records in the areas of radiochemistry and detector calibrations. Calibration records for all detectors and geometries were available; those selected for review appeared to be accurate and complete. No problems were noted with procedures. The inspector reviewed the licensee's Semiannual Effluent Release Reports covering the periods January-June and July-December, 1984. No anomalous data were noted and all information required by Technical Specifications were included in the reports.

6. Exit Interview

The inspector met with the licensee representative denoted in Paragraph 1 at the conclusion of the inspection on August 23, 1985. The inspector summarized the purpose and scope of the inspection and the inspection findings.

The licensee agreed to perform the analyses listed in Paragraph 4 and report the results to the NRC.

## 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 judgment 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.

$$\text{Resolution} = \frac{\text{NRC REFERENCE VALUE}}{\text{REFERENCE VALUE UNCERTAINTY}}$$

$$\text{Ratio} = \frac{\text{LICENSEE VALUE}}{\text{NRC REFERENCE VALUE}}$$

<u>Resolution</u>	<u>Agreement (Ratio)</u>
<3	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

TABLE 1

MAINE YANKEE VERIFICATION TEST RESULTSRESULTS IN TOTAL MICROCURIES

<u>SAMPLE</u>	<u>ISOTOPE</u>	<u>NRC VALUE</u>	<u>LICENSEE VALUE</u>	<u>COMPARISON</u>
NRC Spiked Filter	Ce-144	(3.46 ± 0.02) E-02	(3.48 ± 0.10) E-02	Agreement
	Co-60	(2.68 ± 0.02) E-02	(2.67 ± 0.05) E-02	Agreement
	Cs-137	(1.50 ± 0.02) E-02	(1.51 ± 0.02) E-02	Agreement
	Mn-54	(1.47 ± 0.02) E-02	(1.48 ± 0.04) E-02	Agreement
NRC Spiked Cartridge	Cd-109	(3.42 ± 0.05) E-02	(3.89 ± 0.20) E-02	Agreement
	Co-57	(9.80 ± 0.12) E-04	(9.04 ± 0.12) E-03	Agreement
	Co-60	(9.84 ± 0.05) E-03	(1.02 ± 0.02) E-02	Agreement
	Cs-137	(9.74 ± 0.05) E-03	(9.92 ± 0.11) E-03	Agreement
RCS Filter 2016 hrs. 8-20-85	Cr-51	(9.7 ± 1.6) E-03	(1.13 ± 0.03) E-02	Agreement
	Co-58	(3.48 ± 0.08) E-02	(3.63 ± 0.03) E-02	Agreement
	Fe-59	(1.04 ± 0.08) E-02	(1.07 ± 0.02) E-02	Agreement
	Co-60	(7.6 ± 0.5) E-03	(7.55 ± 0.12) E-03	Agreement
	La-140	(4.5 ± 0.5) E-03	(4.08 ± 0.10) E-03	Agreement
	Ce-141	(3.5 ± 1.5) E-04	(4.4 ± 0.4) E-04	Agreement

TABLE 1

## MAINE YANKEE VERIFICATION TEST RESULTS

## RESULTS IN MICROCURIES PER MILLILITER

SAMPLE	ISOTOPE	NRC VALUE	LICENSE VALUE	COMPARISON
Reactor Water 1400 hrs. 8-20-85	Xe-133	$(6.3 \pm 0.6) \text{ E-04}$	$(6.7 \pm 1.0) \text{ E-04}$	Agreement
	Mn-54	$(1.43 \pm 0.06) \text{ E-03}$	$(1.33 \pm 0.07) \text{ E-03}$	Agreement
	Co-58	$(5.22 \pm 0.02) \text{ E-02}$	$(4.95 \pm 0.05) \text{ E-02}$	Agreement
	Co-60	$(4.27 \pm 0.09) \text{ E-03}$	$(4.30 \pm 0.13) \text{ E-03}$	Agreement
Test Tank A 1020 hrs. 5-18-83	Gross Alpha	$(7 \pm 2) \text{ E-10}$	$<3.1 \text{ E-09}$	No comparison
	H-3	$(8.94 \pm 0.02) \text{ E-02}$	$(8.71 \pm 0.02) \text{ E-02}$	Agreement
	Sr-89	$(3.1 \pm 1.2) \text{ E-08}$	$<4 \text{ E-08}$	No comparison
	Sr-90	$(0 \pm 4) \text{ E-09}$	$<7 \text{ E-09}$	No comparison
Volume Control Tank (gas) 1026 hrs. 8-21-85 (gas marinelli)	Xe-131m	$(1.93 \pm 0.28) \text{ E-02}$	Not detected	No comparison
	Xe-133m	$(2.09 \pm 0.12) \text{ E-02}$	$(2.37 \pm 0.09) \text{ E-02}$	Agreement
	Xe-133	$(1.09 \pm 0.003) \text{ E+00}$	$(1.11 \pm 0.015) \text{ E+00}$	Agreement
	Xe-135	$(1.81 \pm 0.18) \text{ E-03}$	$(1.56 \pm 0.10) \text{ E-03}$	Agreement
Volume Control Tank (gas) 1836 hrs. 8-21-85 (33ml glass bulb)	Xe-131m	$(1.8 \pm 0.3) \text{ E-04}$	Not detected	No comparison
	Xe-133m	$(2.51 \pm 0.08) \text{ E-04}$	$(3.34 \pm 0.14) \text{ E-04}$	Agreement
	Xe-133	$(1.376 \pm 0.002) \text{ E-02}$	$(1.86 \pm 0.01) \text{ E-02}$	Disagreement
	Xe-135	$(1.22 \pm 0.15) \text{ E-05}$	$(1.27 \pm 0.12) \text{ E-05}$	Agreement



TABLE 1

MAINE YANKEE VERIFICATION TEST RESULTSRESULTS IN GAMMAS PER SECOND

<u>SAMPLE</u>	<u>ENERGY KEV</u>	<u>NRC VALUE</u>	<u>LICENSEE VALUE</u>	<u>COMPARISON</u>
NRC	186	582 $\pm$ 9	595 $\pm$ 8	Agreement
Calibration	242	1246 $\pm$ 20	1110 $\pm$ 10	Agreement
Standard	295	3088 $\pm$ 53	2720 $\pm$ 16	Agreement
(for gas bulb geometry)	352	5946 $\pm$ 131	5240 $\pm$ 21	Agreement