

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-309/90-22

Docket No. 50-309

License No. DPR-36

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

Facility Name: Maine Yankee Atomic Power Station

Inspection At: Wiscasset, Maine

Inspection Conducted: October 22-26, 1990

Inspectors: Nancy T. McNamara 11-26-90
N. T. McNamara, Physical Science Technician, date
Effluents Radiation Protection Section (ERPS),
Facilities Radiological Safety and Safeguards
Branch (FRSSB), Divisions of Radiation Safety
and Safeguards (DRSS)

J. J. Kottan 11-26-90
J. J. Kottan, Laboratory Specialist, ERPS, date
FRSSB, DRSS

Approved by: Robert J. Bores 11-27-90
R. J. Bores, Chief, ERPS, FRSSB, DRSS date

Inspection Summary: Inspection on October 22-26, 1990 (Inspection Report
No. 50-309/90-22)

Areas Inspected: Routine, unannounced inspection of the radiological and
non-radiological chemistry programs. Areas reviewed included: confirmatory
measurements-radiological, standards analyses-chemistry, and laboratory QA/QC.

Results: Of the areas reviewed, no violations were identified.

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DETAILS

1.0 Individuals Contacted

Principal Licensee Employees

- *R. Blackmore, Plant Manager
- *W. Drake, Licensing
- *R. Hayward, QA Supervisor
- *W. Lach, Analytical Chemist
- *G. Pillsbury, Assistant Manager Technical Support
- *P. Radsky, Chemistry Section Head
- *J. Stevens, Senior Chemist
- L. Thornburg, Systems Chemist

State of Maine Employees

- *P. Dostie, Nuclear Safety Inspector

NRC Employees

- *R. Freudenberger, Resident Inspector

*Denotes those present at the exit meeting on October 26, 1990

The inspectors also interviewed other licensee personnel, including members of the chemistry and radiation protection staffs.

2.0 Purpose

The purpose of this routine inspection was to review the following areas.

1. The licensee's ability to measure radioactivity in plant systems and effluent samples, and the ability to measure chemistry parameters in various plant systems.
2. The licensee's ability to demonstrate the acceptability of analytical results through implementation of a laboratory QA/QC program.

3.0 Radiological and Chemical Measurements

3.1 Confirmatory Measurements-Radiological

During this part of the inspection, liquid, airborne particulate (filter) and iodine (charcoal cartridge), and gas samples were analyzed by the licensee and the NRC for the purpose of inter-comparison. The samples were actual split samples with the exception

of the particulate filter, charcoal cartridge, liquid radwaste, and Primary Vent System (PVS) and containment gas samples. In these cases the samples could not be split, and the same samples were analyzed by the licensee and the NRC. Where possible, the samples are actual effluent samples or inplant samples which duplicated the counting geometries used by the licensee for effluent sample analyses. These samples were analyzed by the Chemistry Department using routine methods and equipment and by the NRC's Mobile Radiological Measurements Laboratory. Joint analyses of actual effluent samples are used to verify the licensee's capability to measure radioactivity in effluent and other samples with respect to Technical Specifications 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 sample are Sr-89, Sr-90, Fe-55, H-3, and gross alpha. The results of these analyses 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 during a previous inspection on May 16-20, 1988 (inspection Report No. 50-309/88-08) were also compared during this inspection.

The licensee's Radiation Protection Department also possesses two germanium detectors (one of which was out of service during this inspection) as a part of the site gamma spectrometry system. Therefore, the particulate filter, charcoal cartridge, and containment gas samples were also analyzed by the licensee using the Radiation Protection Department's detector and were compared with the NRC results. The particulate filter, charcoal cartridge and containment gas are the types of samples which are routinely analyzed by this department.

The results of the above sample measurements comparisons, which are presented in Table I, indicated that all of the measurements were in agreement under the criteria used for comparing results (See Attachment 1) with one exception. The one exception was the Fe-55 analysis of the liquid sample split during the previous inspection. As stated previously, a liquid sample was also split during this inspection for Fe-55 analysis. These results will be compared as soon as received in order to resolve this disagreement. An additional disagreement will result in an Fe-55 standard being sent by the NRC to the licensee for analysis.

No violations were identified in this area.

3.2 Standards Analyses - Chemical

During this part of the inspection, standard chemical solutions were submitted to the licensee for analysis. The standards were prepared by Brookhaven National Laboratory (BNL) for the NRC, and were analyzed by the licensee using routine methods and equipment. The analysis of standards is used to verify the licensee's capability to monitor chemical parameters in various plant systems with respect to Technical Specifications and other regulatory requirements. In addition, the analysis of standards is used to evaluate the licensee's procedures with respect to accuracy and precision.

The standards were submitted to the licensee for analysis in triplicate at three concentrations spread over the licensee's normal calibration and analysis range.

The results of the standards measurements comparisons, presented in Table II, indicated that all results were in agreement or qualified agreement under the criteria used for comparing results. (See Attachment 2). The licensee's atomic absorption spectrometer graphite furnace was not operable during this inspection, and, therefore, no iron or copper analyses are presented in Table II. No violations were identified in this area.

4.0 Laboratory QA/QC

The inspector reviewed the licensee's chemistry and radiochemistry laboratory QA/QC program. This program was described in a number of procedures including the following.

Procedure No. 7-02-01, Chemistry Quality Assurance/Quality Control Programs

Procedure No. 7-201, Operational Quality Control Checks of Laboratory Instruments

Procedure No. 7-211, Chemistry Qualification Program

Procedure 7-02-01 described the overall laboratory QA/QC program including duties and responsibilities, procedures, control of reagents and standards, and control of analyses. Procedures 7-201 and 7-211 provided for the actual laboratory QC activities for ensuring the accuracy and statistical control of analytical results.

Included in these procedures were provisions for both an intralaboratory and an interlaboratory QC program. The intralaboratory program consisted of the use of instrument and procedure control charts and spiked sample analyses. The interlaboratory program consisted of the analysis of

unknown samples supplied by vendor laboratories for various chemical and radioactivity parameters.

The inspector reviewed selected data for 1989 and 1990 to date and noted that the licensee appeared to be implementing the program as required. In particular, the inspector noted that the control charts and reagent/standard preparation logs were well maintained and periodically reviewed by chemistry management. The inspector noted that the laboratory QA/QC activities appeared to be a strength of the licensee's chemistry program, with one exception. This one exception was the fact that the licensee was not using control charts to demonstrate acceptable performance of the gamma spectrometry system, but rather was using plus or minus ten percent ($\pm 10\%$) as control limits. The inspector discussed this matter with the licensee and noted that control charts were in use for all other laboratory instruments and procedures. The licensee stated that a software update was planned for the gamma spectrometry system, and that after the new software was installed consideration would be given to establishing control charts for this system. The inspector stated that this area would be reviewed during a subsequent inspection in this area. The inspector had no further questions in this area.

The inspector also reviewed Audit Report No. MY-90-02 which described an audit of the site chemistry program performed on March 19-23, 1990. The inspector noted that the audit team included a technical specialist with expertise in the chemistry area. The audit appeared to be of excellent technical depth, sufficient to note any developing programmatic breakdowns in the chemistry area. Of particular note in this audit report was the indepth review of the laboratory QA/QC program performed by the audit team.

No violations were identified in this area.

5.0 Exit Interview

The inspector met with the licensee representatives denoted in Section 1 of this report at the conclusion of the inspection on October 26, 1990. The inspector summarized the purpose, scope and findings of the inspection.

Table I

Maine Yankee Verification Test Results

<u>SAMPLE</u>	<u>ISOTOPE</u>	<u>NRC VALUE</u>	<u>LICENSEE VALUE</u>	<u>COMPARISON</u>
<u>Results in Microcuries Per Milliliter</u>				
Liquid Radio- active Waste 10-23-90 1015 hrs (Det. #2)	Co-58	(1.73±0.06)E-6	(1.67±0.08)E-6	Agreement
	Co-60	(2.00±0.06)E-6	(2.00±0.08)E-6	Agreement
	Sb-124	(1.59±0.10)E-6	(1.62±0.08)E-6	Agreement
	Sb-125	(2.61±0.13)E-6	(2.55±0.15)E-6	Agreement
	I-131	(4.87±0.07)E-6	(4.7±0.2)E-6	Agreement
	Cs-134	(6.4±0.5)E-7	(7.3±0.5)E-7	Agreement
	Cs-137	(4.24±0.07)E-6	(4.26±0.15)E-6	Agreement
Containment Gas 10-23-90 0905 hrs (Det #2)	Xe-133	(4.30±0.03)E-5	(4.8±0.3)E-5	Agreement
Containment Gas 10-23-90 0905 hrs (Analyzed by Radiation Control)	Xe-133	(4.30±0.03)E-5	(4.8±0.3)E-5	Agreement
PVS Gas 10-23-90 1100 hrs (Det. #2)	Xe-133	(1.22±0.04)E-6	(1.33±0.08)E-6	Agreement
WGDT "A" 10-25-90 1305 hrs (Det. #1)	Xe-131m	(2.24±0.11)E-3	(2.31±0.14)E-3	Agreement
	Xe-133	(1.445±0.006)E-2	(1.50±0.08)E-2	Agreement
Containment Charcoal Cartridge 10-24-90 0745 hrs (Analyzed by Radiation Control)	I-131	(1.22±0.02)E-9	(1.11±0.04)E-9	Agreement
Containment Charcoal Cartridge 10-22-90 0930 hrs (Det. #1)	I-131	(2.18±0.03)E-9	(2.14±0.07)E-9	Agreement
	I-133	(4.4±0.2)E-10	(4.4±0.2)E-10	Agreement

Table I (continued)

Maine Yankee Verification Test Results

<u>SAMPLE</u>	<u>ISOTOPE</u>	<u>NRC VALUE</u>	<u>LICENSEE VALUE</u>	<u>COMPARISON</u>
<u>Results in Microcuries Per Milliliter</u>				
Reactor Coolant Crud Filter 10-24-90 0041 hrs (Det. #1)	Co-58 Co-60 I-131	(2.18±0.07)E-5 (6.6±0.7)E-6 (2.80±0.07)E-5	(2.46±0.13)E-5 (4.6±0.8)E-6 (3.04±0.14)E-5	Agreement Agreement Agreement
Reactor Coolant Crud Filter 10-24-90 0041 hrs (Analyzed by Radiation Control)	Co-58 I-131	(2.18±0.07)E-5 (2.80±0.07)E-5	(2.5±0.2)E-5 (2.92±0.15)E-5	Agreement Agreement
Containment Particulate Filter 10-22-90 2300 hrs (Det. #2)	I-131	(4.46±0.13)E-11	(5.0±0.3)E-11	Agreement
Reactor Coolant 10-22-90 0027 hrs (Det. #1)	I-131 I-133 Cs-137	(1.182±0.011)E-2 (2.82±0.09)E-3 (2.48±0.02)E-3	(1.17±0.05)E-2 (2.7±0.3)E-3 (2.3±0.2)E-3	Agreement Agreement Agreement
Test Tank* 5-17-88 1345 hrs	H-3 Sr-89 Sr-90 Fe-55 gross alpha	(1.84±0.03)E-2 (-1.6±1.9)E-8 (3±3)E-9 (1.18±0.02)E-5 (3.1±1.0)E-9	(1.8586±0.0014)E-2 (1.8±4.5)E-9 (1.9±2.9)E-9 (0.0703±0.0051)E-5 <5.58E-9	Agreement No Comparison No Comparison Disagreement No Comparison

*Note: This sample was split during a previous inspection on May 16-20, 1988.

TABLE II
Maine Yankee
Chemistry Test Results

<u>Chemical Parameter</u>	<u>Method of Analysis*</u>	<u>NRC Known Value</u>	<u>Licensee Measured Value</u>	<u>Ratio (LIC/NRC)</u>	<u>Comparison</u>
<u>Results in parts per billion (ppb)</u>					
Fluoride	IC	4.8±0.2	5.20±0.09	1.08±0.05	Agreement
		9.6±0.4	10.7±0.3	1.11±0.06	Agreement
		14.8±0.6	16.1±0.3	1.09±0.05	Agreement
Chloride	IC	6.0±0.4	5.95±0.10	0.99±0.07	Agreement
		12.4±0.8	12.29±0.08	0.99±0.06	Agreement
		19.0±1.0	18.7±0.2	0.98±0.05	Agreement
Sulfate	IC	3.8±0.6	4.00±0.10	1.0±0.2	Agreement
		7.6±0.8	7.81±0.09	1.03±0.11	Agreement
		12.0±0.8	11.58±0.09	0.97±0.06	Agreement
Sodium	AA	51±2	53±3	1.04±0.07	Agreement
		99±2	102.7±1.2	1.04±0.02	Agreement
		152±4	156±3	1.03±0.03	Agreement
Hydrazine	SP	10.2±0.3	9.2±0.6	0.90±0.06	Agreement
		42.3±0.9	41±2	0.97±0.05	Agreement
		84.4±0.6	79.3±1.2	0.94±0.02	Agreement
Silica	SP	49±4	48±0	0.98±0.08	Agreement
		55.0±1.0	51±2	0.93±0.04	Agreement
		80.5±0.5	79±3	0.98±0.04	Agreement
<u>Results in parts per million (ppm)</u>					
Ammonia	SP	0.102±0.005	0.096±0.006	0.94±0.07	Agreement
		0.310±0.010	0.2833±0.0015	0.91±0.03	Agreement
		0.50±0.02	0.483±0.004	0.97±0.04	Agreement
Lithium	AA	0.198±0.003	0.2097±0.0015	1.06±0.02	Agreement
		0.293±0.008	0.310±0.003	1.06±0.03	Agreement
		0.395±0.006	0.4187±0.0012	1.06±0.02	Agreement

TABLE II
 Maine Yankee
 Chemistry Test Results

<u>Chemical Parameter</u>	<u>Method of Analysis*</u>	<u>NRC Known Value</u>	<u>Licensee Measured Value</u>	<u>Ratio (LIC/NRC)</u>	<u>Comparison</u>
Results in parts per million (ppm)					
Nickel	AA	0.203±0.005	0.192±0.013	0.94±0.07	Agreement
		0.403±0.006	0.394±0.002	0.978±0.015	Agreement
		0.610±0.010	0.597±0	0.98±0.02	Agreement
Chromium	AA	0.200±0.010	0.199±0.005	1.00±0.06	Agreement
		0.404±0.009	0.389±0.002	0.96±0.02	Agreement
		0.600±0.007	0.594±0.005	0.990±0.014	Agreement
Boron	Tit.	1030±20	1002±2	0.97±0.02	Qualified Agreement
		2990±40	3001±6	1.004±0.014	Agreement
		5100±100	4944±6	0.97±0.02	Agreement

*Note: AA = Flame Atomic Absorption Spectrometry
 SP = UV - Vis Spectrophotometry
 IC = Ion Chromatography
 Tit.= Titration

ATTACHMENT 1

CRITERIA FOR COMPARING ANALYTICAL MEASUREMENTS OF TABLE I

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 the 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.

<u>Resolution¹</u>	<u>Ratio for Agreement²</u>
<3	No Comparison
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

¹Resolution = (NRC Reference Value/Reference Value Uncertainty)

²Ratio = (License Value/NRC Reference Value)

ATTACHMENT 2

Criteria for Comparing Analytical Measurements of Table II

This attachment provides criteria for comparing results of capability tests. In these criteria the judgement limits are based on data from Table 2.1 of NUREG/CR-5244, "Evaluation of Non-Radiological Water Chemistry at Power Reactors". Licensee values within the plus or minus two standard deviation range ($\pm 2Sd$) of the BNL known values are considered to be in agreement. Licensee values outside the plus or minus two standard deviation range but within the plus or minus three standard deviation range ($\pm 3Sd$) of the BNL known values are considered to be in qualified agreement. Repeated results which are in qualified agreement will receive additional attention. Licensee values greater than the plus or minus three standard deviations range of the BNL known value are in disagreement. The standard deviations were computed using the above average percent standard deviation values of each analyte in Table 2.1 of the NUREG.

The ranges for the data in Table II are as follows.

<u>Analyte</u>	<u>Agreement Range</u>	<u>Qualified Agreement Range</u>
Fluoride	4.2-5.4	4.0-5.6
	8.4-10.8	8.0-11.2
	13.0-16.6	12.2-17.4
Chloride	5.6-6.4	5.4-6.6
	11.4-13.4	11.0-13.8
	17.6-20.4	17.0-21.0
Sulfate	3.4-4.2	3.2-4.4
	6.8-8.4	6.6-8.6
	10.0-13.2	10.4-13.6
Sodium	44-58	40-62
	85-113	78-120
	131-173	120-184
Hydrazine	9.4-11.0	9.0-11.4
	39.0-45.6	37.4-47.2
	77.9-90.9	74.6-94.2
Silica	44-54	42-56
	50-60	47-63
	73-88	69-92

ATTACHMENT 2 (continued)

<u>Analyte</u>	<u>Agreement Range</u>	<u>Qualified Agreement Range</u>
Ammonia	0.092-0.112 0.280-0.340 0.452-0.548	0.087-0.117 0.265-0.355 0.428-0.572
Lithium	0.170-0.226 0.252-0.334 0.340-0.450	0.157-0.239 0.230-0.356 0.312-0.478
Nickel	0.190-0.216 0.378-0.428 0.572-0.648	0.184-0.222 0.366-0.440 0.553-0.667
Chromium	0.181-0.219 0.365-0.443 0.542-0.658	0.171-0.229 0.345-0.463 0.512-0.688
Boron	1008-1052 2926-3054 4991-5209	997-1063 2894-3086 4937-5263