

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 50-333/85-27

Docket No. 50-333

License No. DPR-59 Priority - Category C

Licensee: New York Power Authority

P.O. Box 41

Lycoming, New York

Facility Name: James A. FitzPatrick Nuclear Power Plant

Inspection At: Scriba, New York

Inspection Conducted: October 21 - 25, 1985

Inspectors: J. J. Kottan  
J. J. Kottan, Radiation Laboratory  
Specialist

11/27/85  
date

M. E. Kramaric  
for M. E. Kramaric, Radiation Specialist

11/27/85  
date

Approved by: W. J. Pasciak  
W. J. Pasciak, Chief, BWR Radiological  
Protection Section

11/29/85  
date

Inspection Summary: Inspection on October 21 - 25, 1985 (Report No. 50-333/85-27)

Areas Inspected: Routine, unannounced inspection of the licensee's radiochemical measurements program and bioassay whole body counting program using the NRC:I Mobile Radiological Measurements Laboratory and laboratory assistance provided by DOE Radiological and Environmental Sciences Laboratory. Areas reviewed for the radiochemical measurements program included: program for the quality control of analytical measurements, performance on radiological analyses of split actual effluent samples, and records and procedures; and for the bioassay whole body counting program included: performance of the whole body counting phantom analysis comparison, procedures, and QC and calibration data. The inspection involved 72 inspector hours onsite by two NRC regionally-based inspectors.

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

## DETAILS

### 1. Persons Contacted

#### Principal Licensee Employees

- \*R. Converse, Resident Manager
- \*R. Patch, QA Superintendent
- \*W. Fernandez, Superintendent of Power
- \*E. Mulcahey, Radiological and Environmental Service  
Superintendent
- \*A. McKeen, Assistant Radiological and Environmental  
Services Superintendent
- \*B. Gorman, Chemistry General Supervisor
- \*W. Hamblin, Chemistry Supervisor
- \*G. Vargo, Radiological Engineer
- K. Wells, Senior Technician
- M. McMahon, Dosimetry Supervisor

The inspector also interviewed other licensee employees, including members of the chemistry and health physics staffs.

\*Denotes those present at exit interview.

### 2. Laboratory QA Program

The inspector reviewed the licensee's program for the quality assurance of radioanalytical measurements performed by the Radiological and Environmental Services (RES) Department. The licensee's program was reviewed against the criteria of Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment". The QA program is detailed in "Quality Assurance/Quality Control Program", Rev. 4 11/84, which is a non-procedural document. The program specifies the nature and frequency of analytical equipment checks and QC samples. It also provides acceptance criteria for QC samples and specifies follow-up action if the criteria are not met.

The inspector reviewed the QC data for the Radiochemistry Check Program for the period 1/1/85 through 10/25/85. The review included samples prepared by the licensee and by independent laboratories. The results reviewed by the inspector were in agreement based on the licensee's acceptance criteria. The acceptance criteria are the same as stated in Attachment 1 of this report. However, the inspector noted that the split samples used for comparison contained very low levels of radioactivity which resulted in poor counting statistics. The inspector stated that the results of the QC sample splits were not very meaningful since the acceptance criteria is very wide when the counting uncertainty is large. The licensee stated that in the future they would analyze sample splits with more activity or count the low level samples for longer periods of time to reduce the counting uncertainty.

The inspector also reviewed the analytical equipment performance data which included background, source, and calibration checks. The daily checks were logged and plotted appropriately for all instrument records reviewed, except for the background data for GeLi #3 and GeLi #4. For these instruments background data were not plotted on control charts, as recommended by Regulatory Guide 4.15. The inspector discussed the importance of plotting background data in control charts since the lower limit of detection (LLD) changes as the background changes. GeLi #3 and GeLi #4 are used routinely for analyzing effluent samples and Technical Specification LLD requirements must be met. The licensee stated that in the future they would plot the background checks for GeLi #3 and GeLi #4.

The inspector stated that QC sample split results and the use of control charts for background data would be reviewed in a future inspection. (333/85-27-01)

### 3. Confirmatory Measurements

During the inspection, liquid, particulate filter, charcoal cartridge, and gas samples were split between the licensee and NRC for the purpose of intercomparison. Where possible, the split samples are actual effluent samples, or inplant samples which duplicate counting geometries used by the licensee for effluent sample analyses. The samples were analyzed by the licensee using normal methods and equipment and by the NRC:I Mobile Radiological Measurements Laboratory. Joint analyses of actual effluent 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 sample are Sr-89, Sr-90, gross alpha, tritium and Fe-55. The 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 an effluent sample split between the licensee and NRC:I during a previous inspection on March 25-27, 1981 (Inspection Report No. 50-333/81-08), were also compared during this inspection.

The results of the sample measurements comparison indicated that all of the measurements were in agreement under the criteria used for comparing results. (See Attachment I). The results of the comparisons are listed in Table I. The initial reactor water sample split resulted in disagreements for the I-133 and I-135 values. The disagreements were due to the fact that the licensee analyzed the sample on detector number one which is coupled to the licensee's old computer based multi-channel analyzer

(MCA) system. When another reactor water sample was split and analyzed using the licensee's new computer based MCA, the results were in agreement. The licensee's old computer based MCA system is not capable of resolving the interferences present in the complex gamma ray spectrum of fresh reactor water. The licensee stated that reactor water would be analyzed using the new computer based MCA system. Also, although analysis of the offgas and stack gas measurements were in agreement, the Kr-88 measurement of the offgas sample appeared to be inconsistently low and the stack gas values appeared to be biased high. A review of these areas indicated that the licensee's old computer based MCA system isotope library contained a branching ratio of 35% for Kr-88 versus the NRC value of 26%. When the NRC value was used in the calculation of the Kr-88 concentration, the value was in line with the other offgas isotopic concentration values. The inspector noted that the references used to establish the old computer based MCA system isotope library were approximately 10-15 years old. The licensee stated that the library of the system would be updated using the same references as the new computer based MCA systems, which were current references. The stack gas values appeared to be higher than the NRC values by approximately 25 percent. This bias may be due to the fact that the licensee calibrated the stack gas Marinelli beaker using the offgas vial and calculated an effective volume for the Marinelli beaker using the offgas vial efficiency factors. The inspector noted that the effective volume was calculated as 3300 ml but the value used in the calculations was 3000 ml. The inspector discussed the need for accurate measurements versus conservative measurements with the licensee. The licensee stated that a gas calibration standard would be purchased and the gas Marinelli beaker geometry would be recalibrated. The inspector stated that all of the above sample counting and analysis areas would be reviewed during a subsequent inspection. (333/85-27-02)

#### 4. Records and Procedures

The inspector reviewed the licensee's procedures for the analysis and control of effluent releases with respect to Technical Specification requirements. The inspector noted that the licensee's procedures included detailed steps for compositing liquid effluent samples. Composite samples are analyzed for Sr-89, Sr-90, Fe-55, gross alpha, and tritium in liquid effluents as required by the Technical Specification. However, the procedure does not require addition of a preservative agent to the composite. The inspector discussed the potential for fractionation in the sample and sample loss on container walls. This could result in incomplete and inaccurate analysis of the effluent composite sample. The licensee stated that the vendor laboratory used for analyzing composite samples would be contacted, regarding sample preservation, and an appropriated preservative would be added to composite samples. The inspector stated that this area would be reviewed during a subsequent inspection. (333/85-27-03)

The inspector also asked several questions about the vendor supplied algorithms used for analysis of effluent samples on the new computer based MCA system. In order to answer the questions, the licensee had to list the program and perform a line by line search to obtain the answer. The inspector discussed software documentation and verification with the licensee. The licensee stated that the vendor supplied software used for effluent control and dose calculations was documented and verified, however, the software for sample analysis was not. A further review of laboratory software found that additional programs were written and implemented by chemistry personnel on the same computer to perform various laboratory calculations, but they were not verified or documented. The licensee's QA software for example intercompares duplicate sample results and rounds the results to one significant figure after the decimal point. The licensee's acceptance criteria include two significant figures after the decimal point. Therefore, it appears the software could round results into or out of acceptance. The licensee stated that this area would be reviewed and appropriate action taken. The inspector stated that this area would be reviewed during a subsequent inspection. (333/85-27-04).

#### 5. Whole Body Counting Program

During this inspection the licensee's capability to adequately perform radiological bioassay using a whole body counting system was reviewed. An NRC whole body counting phantom containing radioactive sources traceable to the National Bureau of Standard (NBS) was submitted to the licensee for analysis. The phantom duplicated the nuclides and the organ burdens that the licensee might encounter during normal operation. The phantom was analyzed using the licensee's normal methods and equipment.

##### Comparison of Results

The licensee's whole body counter consists of a chair containing three sodium iodide detectors: a 5" x 4" for the torso, a 4" x 4" for the lung, and a 1½" x 2" for the thyroid. The detectors are coupled to a multichannel analyzer which is interfaced to a computer. The system software is supplied by a vendor. The NRC phantom was counted for 300 seconds. The results of the comparisons are listed in Table II. The lung results are based on an average of five measurements and the GI tract results are based on an average of two measurements. Based on these results, no violations were identified in this area.

#### 6. Procedures and Data

The licensee's procedure, PDP10, "Whole Body Counter Operation and Calibration" was reviewed. The procedure requires daily gain and background checks, weekly source checks with acceptance criteria, and annual calibrations. The inspector reviewed the calibration data for 1985 and noted that NBS Traceable standards were used. The inspector also reviewed selected 1985 QC data. The inspector observed that the licensee does not



plot the results of the QC checks on control charts in order to note any trends in QC data. The licensee stated that the whole body counter QC data would be plotted on control charts. The inspector stated that this area would be reviewed during a subsequent inspection. (333/85-27-05)

7. Exit Interview

The inspector met with the licensee representatives denoted in Paragraph 1 at the conclusion of the inspection on October 25, 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 5 and report the results to the NRC.

TABLE 1  
FitzPatrick 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>                           |                |                               |                                 |                   |
| Offgas<br>1320 hrs.<br>10/22/85  | Kr-87          | $(3.1 \pm 0.2) \text{ E-3}$   | $(3.42 \pm 0.08) \text{ E-3}$   | Agreement         |
|  | Kr-88          | $(1.69 \pm 0.04) \text{ E-3}$ | $(1.22 \pm 0.07) \text{ E-3}$   | Agreement         |
|  |                |                               | * $(1.64 \pm 0.09) \text{ E-3}$ | Agreement         |
|  | Xe-135m        | $(1.74 \pm 0.08) \text{ E-2}$ | $(1.73 \pm 0.02) \text{ E-2}$   | Agreement         |
|  | Xe-135         | $(2.79 \pm 0.07) \text{ E-3}$ | $(2.73 \pm 0.04) \text{ E-3}$   | Agreement         |
|  | Xe-138         | $(7 \pm 2) \text{ E-2}$       | $(6.87 \pm 0.09) \text{ E-2}$   | Agreement         |
| Stack gas<br>1045 hrs.<br>10/23/85                                     | Xe-133         | $(2.4 \pm 0.8) \text{ E-7}$   | $(2.9 \pm 0.5) \text{ E-7}$     | Agreement         |
|  | Kr-85m         | $(3.4 \pm 0.5) \text{ E-7}$   | $(4.5 \pm 1.1) \text{ E-7}$     | Agreement         |
| *Value obtained using NRC branching ratio. See Paragraph 3.            |                |                               |                                 |                   |
| Reactor Water<br>1230 hrs.<br>10/22/85<br>(counted on<br>"old" system) | I-131          | $(8 \pm 3) \text{ E-5}$       | $(9.7 \pm 0.9) \text{ E-5}$     | Agreement         |
|  | I-132          | $(3.88 \pm 0.09) \text{ E-3}$ | $(3.79 \pm 0.05) \text{ E-3}$   | Agreement         |
|  | I-133          | $(1.26 \pm 0.03) \text{ E-3}$ | $(9.15 \pm 0.16) \text{ E-4}$   | Disagreement      |
|  | I-134          | $(1.26 \pm 0.04) \text{ E-2}$ | $(1.11 \pm 0.01) \text{ E-2}$   | Agreement         |
|  | I-135          | $(3.4 \pm 0.2) \text{ E-3}$   | $(2.48 \pm 0.05) \text{ E-3}$   | Disagreement      |
| Reactor Water<br>0930 hrs.<br>10/23/85<br>(counted on<br>"new" system) | I-131          | $(9 \pm 2) \text{ E-5}$       | $(1.19 \pm 0.15) \text{ E-4}$   | Agreement         |
|  | I-132          | $(3.84 \pm 0.07) \text{ E-3}$ | $(4.03 \pm 0.05) \text{ E-3}$   | Agreement         |
|  | I-133          | $(1.24 \pm 0.03) \text{ E-3}$ | $(1.26 \pm 0.02) \text{ E-3}$   | Agreement         |
|  | I-134          | $(1.20 \pm 0.04) \text{ E-2}$ | $(1.21 \pm 0.01) \text{ E-2}$   | Agreement         |
|  | I-135          | $(3.41 \pm 0.15) \text{ E-3}$ | $(3.13 \pm 0.06) \text{ E-3}$   | Agreement         |

NOTE: See Paragraph 3 for discussion of reactor water results

TABLE 1

FitzPatrick 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 Waste                                 | Na-24          | (6.9 ± 0.6) E-6   | (4.9 ± 0.5) E-6       | Agreement         |
| Filter Outlet                                | I-133          | (1.3 ± 0.5) E-6   | (1.3 ± 0.2) E-6       | Agreement         |
| 0810 hrs.                                    |                |                   |                       |                   |
| 10/23/85                                     |                |                   |                       |                   |
| "B" Laundry                                  | H-3            | (2.70 ± 0.06) E-5 | (2.2 ± 0.2) E-5       | Agreement         |
| Tank   | Sr-89          | (4 ± 1) E-8       | <8.79 E-8             | No Comparison     |
| 0815 hrs.                                    | Sr-90          | (3 ± 4) E-9       | <6.12 E-8             | No Comparison     |
| 3/26/81                                      |                |                   |                       |                   |
| Turbine Building                             | I-131          | (3.0 ± 0.5) E-12  | (3.3 ± 0.3) E-12      | Agreement         |
| Vent Particulate Filter                      | I-133          | (4.8 ± 0.5) E-11  | (6.0 ± 0.2) E-11      | Agreement         |
| 0220 hrs.                                    | Ba-140         | (5 ± 3) E-12      | (2.5 ± 0.5) E-12      | Agreement         |
| 10/22/85                                     |                |                   |                       |                   |
| Turbine Building                             | I-133          | (8.2 ± 1.1) E-12  | (8.6 ± 0.3) E-12      | Agreement         |
| Vent Charcoal Cartridge                      | I-133          | (5.4 ± 0.7) E-11  | (5.0 ± 0.1) E-11      | Agreement         |
| 0220 hrs.                                    |                |                   |                       |                   |
| 10/22/85                                     |                |                   |                       |                   |



TABLE II  
RESULTS OF PHANTOM DATA \*

LUN RESULTS

| <u>ISOTOPE</u> | <u>NRC VALUE</u> | <u>LICENSEE VALUE</u> | <u>LICENSEE VALUE</u><br><u>NRC VALUE</u> |
|----------------|------------------|-----------------------|---|
| Co-60          | 80 ± 10          | 76 ± 3                | 0.95 ± 0.12                               |
| Cs-137         | 96 ± 9           | 112 ± 4               | 1.17 ± 0.12                               |

GI TRACT RESULTS

| <u>ISOTOPE</u> | <u>NRC VALUE</u> | <u>LICENSEE VALUE</u> | <u>LICENSEE VALUE</u><br><u>NRC VALUE</u> |
|----------------|------------------|-----------------------|---|
| Co-60          | 72 ± 9           | 160 ± 14              | 2.2 ± 0.3                                 |
| Cs-137         | 86 ± 8           | 190 ± 14              | 2.2 ± 0.3                                 |

\* Results in nanocuries

# Attachment 1

## Criteria for Comparing Analytical Measurements (Table 1 only)

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.

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

| <u>Resolution</u> | <u>Agreement</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      |