U. S. ATOMIC ENERGY COMMISSION

DIRECTORATE OF REGULATORY OPERATIONS

REGION I

RO Inspection Report No.: 50-219/73-19

Docket No.: 50-219

Licensee: Jersey Central Power and Light Company

License No.: DPR-16

Madison Avenue at Punch Bowl Road

Priority: ---

Morristown, New Jersey 07960

Category: C

~~(Oyster Creek Station)~~

Location: Forked River, New Jersey 08731

Type of Licensee:

Type of Inspection: Special, Announced (Independent Measurements)

Dates of Inspection: November 29, 30, 1973

Dates of Previous Inspection: November 5, 1973

Principal Inspector: R. J. Everett 12/17/73
Date

R. J. Everett, Radiation Specialist

Accompanying Inspectors: J. F. Stoltz 12/19/73
Date

R. J. Bores, Radiation Specialist

Date

Other Accompanying Personnel:

Reviewed By: J. P. Stohr 12/19/73
Date

J. P. Stohr, Senior Environmental Scientist

SUMMARY OF FINDINGS

Enforcement Action

None

Licensee Action on Previously Identified Enforcement Action (Independent Measurements)

None

Other Significant Findings

None

Unresolved Item

A. The measurement of radioactive iodine in effluents is considered to be an unresolved item. (Paragraph 4)

Status of Previously Reported Unresolved Items (Independent Measurements)

None

Management Interview

A meeting was held on November 30, 1973 in the office of Mr. J. T. Carroll, Oyster Creek Station (OC) Superintendent, following the inspection at the site. The following individuals were in attendance:

Mr. R. J. Everett, Radiation Specialist, AEC RO:I
Mr. R. J. Bores, Radiation Specialist, AEC RO:I
Mr. I. R. Finfrock, Vice President, Jersey Central Power and Light Company
Mr. D. A. Ross, Manager, Nuclear Generating Stations, Jersey Central Power and Light Company
Mr. J. T. Carroll, Superintendent, OC
Mr. E. J. Growney, Technical Engineer, OC
Mr. J. L. Sullivan, Operations Engineer, OC

During the meeting, the following items were discussed:

A. Tritium Sampling in Gaseous Effluents

The licensee stated that the amount of gaseous tritium present in stack effluent would be measured and an evaluation made of the contribution of this tritium specie to the total tritium present. (Paragraph 6)

B. Iodine Measurements in Reactor Effluents

The inspector stated that techniques used to sample and measure iodine concentrations in effluents were questionable and action should be taken

to verify these techniques and improve the level of confidence in the overall iodine measurement. The licensee stated that the iodine collection and measurement techniques would be evaluated and action taken to improve the overall accuracy. The licensee stated further that a new Ge(Li) detector and spectrometer was ready for calibration in December which would improve the accuracy of the iodine measurement as well as other gamma emittors. (Paragraph 4)

C. Results of Split and Spiked Samples

The inspector stated that the results of split and spiked samples revealed several instances where OC's analysis was not in agreement with the AEC's Idaho Health Services Laboratory (IHSL). The licensee stated that these items would be reviewed and evaluated, however, the change over to the Ge(Li) detector in the near future would enable them to perform a more accurate gamma spectral analysis and results on split and spiked samples should improve significantly. The inspector stated that the strontium analyses contracted for, which did not involve a gamma spectral measurement, were also in disagreement with IHSL. The licensee stated that this item would be investigated with their contracting laboratory and that they would participate in the contractor's Quality Assurance (QA) Program directly as part of their operational QA Program. (Paragraph 4)

D. Reporting Errors of Measurements

The inspector requested that the licensee report random and systematic errors associated with their effluent measurements since this information is used in evaluating split and spiked samples. The licensee stated that they would provide counting errors on split and spiked samples when their new Ge(Li) detector and spectrometer becomes operational. (Paragraph 3)

E. Self-Absorption Correction of Gross Beta Measurements

The inspector stated that it was standard radiochemical practice to measure the amounts of residue on gross beta samples and to correct all results for losses due to beta absorption in these residues. The licensee stated that this would be done in the future. (Paragraph 3)

DETAILS

1. Persons Contacted

Oyster Creek Generating Station

Mr. J. T. Carroll, Station Superintendent
Mr. J. L. Sullivan, Operations Engineer
Mr. E. J. Growney, Technical Engineer
Mr. J. R. Pelrine, Chemical Foreman
Mr. E. Rossler, Instrumentation and Electronics Foreman
Mr. D. Weigle, Engineering Assistant

2. General

The inspection consisted of a review of the licensee's analytical performance on the spiked samples submitted by the AEC's Idaho Health Services Laboratory (IHSL) and split effluent samples taken in conjunction with the AEC's Independent Measurements Program. In addition, a review was made of the licensee's program to sample and measure radioactivity in these effluents. The licensee's surveillance requirements are detailed in Sections 3.6 and 4.6 of their Technical Specifications (TS). The licensee's program consists of: continuous monitoring of liquid and gaseous effluent during release; gross radioactivity measurements and specific analyses on batch and composite samples. The licensee contracts certain analyses to Ledoux Labs, Incorporated of Teaneck, New Jersey. A review was made of the licensee's onsite Meteorology Program also.

3. The Oyster Creek Laboratory

The OC Chemistry Program is directed by the chemical foreman. The sampling and analysis program is carried out by technicians, under the directions of the chemical foreman. The laboratory is located in the reactor building in close proximity to sources of radioactivity which impart an observable background to counting instruments in the laboratory.

The laboratory contains a Beckman liquid scintillation spectrometer (Model LS-100) which is used for all tritium measurements. Tritium samples are distilled and two milliliters (ml) of sample placed in a Beckman "Liquiflor" cocktail mixture. The mixture is allowed to dark adapt for one hour prior to measurement. The licensee reported a background of about 27 CPM. The inspector computed a minimum detectable level (MDA) of about 8×10^{-6} microcuries (mci) per ml at 95% confidence.

The licensee reported that they did not have an inhouse capability for strontium analysis, but contracted these analyses to Ledoux Laboratories, Incorporated of Teaneck, New Jersey.

Gamma spectroscopy is performed on a Nuclear Data, Model 2200, multichannel (512) analyzer that is equipped with a Model, RM503 oscilloscope and a Moseley X-Y plotter. The gamma detector is a 3x3 inch NaI crystal. The gamma spectra are resolved manually using photopeak heights. No attempt is made to strip complex spectra.

Reference sources of Cs-137, Co-60 and pitchblende are used to calibrate the spectrometer. The licensee reported a background in the I-131 photopeak height channel of about 25 CPM. The inspector determined that the MDA would be about $3 \times 10^{-}$ uci per ml using a sample volume of 1800 ml.

Gross alpha and gross beta measurements are made by evaporating 10 mls of liquid on a 2 inch stainless steel planchet. Gross alpha measurements on primary coolant water use 0.1 ml of liquid. Samples are counted on a Nuclear Measurements Corporation, Model PCC-11T, proportional counter, with mylar window. The licensee reported that the average background on the $\alpha+\beta$ plateau was 40 CPM, and a SrY-90 source was used as the reference source. The inspector calculated the MDA for the gross beta measurement to be 2.6×10^{-6} uci per ml at 95% confidence. The inspector noted in discussing the gross beta analyses with the licensee that their technique did not include a measurement of the residual solids on each planchet so that any beta activity found could be corrected for absorption losses. The inspector stated that it was good radiochemistry practice to consider these residues and make appropriate corrections to gross beta measurements. The licensee stated that the residues from most of their waste liquid samples were small due to demineralization and other treatment, however, a new procedure would be instituted whereby an absorption correction could be made.

The licensee also uses a 1½ x 1 3/4 inch NaI detector in conjunction with a Nuclear Data, Model 537 spectrometer for gross gamma counting of effluent samples. This detector, as well as the 3x3 inch detector above, are housed in standard General Electric shields which contain 3 to 4 inches of lead in a rectangular array.

The inspector also reviewed the new Ge(Li) detector and spectrometer located outside the reactor building in a trailer. The detector is a Princeton Gamma Tech with a rated efficiency of 8.5% relative to NaI. The spectrometer is a Northern Scientific, Model 660, with mini-computor, Model PDP-11, from the Digital Equipment Corporation. The computor has a library of data treatment software and manual input via a teletype. Data output is via magnetic tape or hard copy through the teletype. The licensee reported that the system would be calibrated by a consultant in December and barring unforeseen problems, would be operational early in 1974.

4. Split and Spiked Sample Analytical Results

The Independent Measurements Program has been conducted at OC since November, 1972. Over this time, two spiked and eleven split samples have been analyzed. These samples entailed the measurement of thirty-seven nuclides. The licensee's spiked sample analyses resulted in seventy-five percent agreement and twenty-five percent possible disagreement with IHSL. The licensee's split sample analyses resulted

in forty-nine percent agreement, eighteen percent possible disagreement and thirty-three percent disagreement with IHSL.* The inspector stated that the strontium results on split samples have been consistently high (41-250%) as compared to IHSL and inquired as to the reasons for these discrepancies. The licensee stated that these analyses were performed by Ledoux Laboratories, Inc. under a contract, and these discrepancies would be investigated with them. The inspector inquired as to Ledoux's QA Program for their analytical laboratory and whether or not OC had participated directly in Ledoux's analytical program by the submission of control, blank or duplicate samples. The licensee stated that they had not participated in Ledoux's QA Program in the past but would make their contracting laboratories part of their operational QA Program which would be instituted in the near future.

The inspector stated that OC's iodine-131 results on charcoal cartridges, stack filters and liquid samples have been highly variable and not in agreement with IHSL. The inspector stated further that the use of nitric acid on liquid composite sample without the use of iodine carrier or other means to hold the iodine in solution was questionable and should be further evaluated. The inspector stated also that the combination of the methods used to quantitate gamma spectra, the presence of a high background in the counting area, and the halogen release rates running 10-15% of TS limits, necessitated action to increase the level of confidence in the iodine measurement. The licensee stated that they were aware of the limitations of their present counting capability and therefore they had puchased a new Ge(Li) detector and spectrometer to improve their capability. The inspector stated that until such time as all gamma spectroscopy measurements could be made by the new system, action should be taken now to improve the present situation. The licensee agreed to investigate their iodine sampling techniques, recalibrate the present spectrometer, and possibly move it to a low background area. The inspector stated that the adequacy of OC's iodine measurement techniques would be considered an unresolved item until the licensee investigated the problem and detailed areas to be improved.

The inspector determined that the analytical discrepancies mentioned above were of a magnitude such that, when the maximum uncertainty was applied to the licensee's measurements, they would not have caused the licensee to exceed TS limits.

During the inspection, split samples of liquid rad waste, off gas and stack filters and cartridges were collected for analysis by the licensee, the State of New Jersey, and the AEC (IHSL).

*See Attachment 1 to this report for a description of the criteria used to evaluate differences between analytical results.

5. Liquid Effluent Measurements

Section 4.6.B.2 of the OC Technical Specifications (TS) details the surveillance requirements on radioactive liquids released from the facility. During a selective review of release records over the past year, the inspector observed no occasion when the licensee was not in compliance with these surveillance requirements.

Specification 3.6.B.2 requires, in part, that radioactive liquid effluent being released to the discharge canal will be continuously monitored. The inspector inquired as to how these requirements were accomplished. The licensee stated that a 2x2 inch NaI detector is mounted on the discharge pipe and their detector monitors the gross gamma activity in the pipe during release. The licensee stated further that this activity is remotely read out in the control room and the system is checked daily for proper operation, checked monthly using standard Cs-137, Co-60 and pitchblende check sources and calibrated quarterly using a standard Cs-137 solution in the pipe.

The inspector inquired as to what other measurements are made upon liquid effluent. The licensee stated that liquid waste is released on the basis of unidentified isotopes ($1x10^{-7}$ uci/cc) and prior to each batch release, the alpha, beta and gamma activity is measured and the results recorded. This activity is used to calculate the required dilution before release. The licensee stated further that a weekly proportional composite sample is collected which is representative of the batches released during the week. This composite is analyzed for gross alpha, beta and gamma activity as well as BaLa-140, I-131 and dissolved gases. A monthly composite is collected and analyzed for gross alpha, beta and gamma activity, tritium and the principal gamma emitters. A quarterly composite is analyzed for Sr-90. The inspector inquired as to any other measurements on liquid samples. The licensee responded that the waste tanks are sampled every 72 hours in order to insure that the total activity does not exceed 10.0 curies, and the primary coolant is sampled every 72 hours to insure that the iodine concentration does not exceed 8.0 uci/gram. The inspector noted that the iodine concentration over the past few months was about 0.1 uCi per gram.

6. Gaseous Effluent Measurements

Specification 3.6.A.3 requires that the radioactive gases released from the stack be continuously monitored during release. The inspector inquired as to how this requirement was accomplished. The licensee stated that the main stack is monitored at the 264

foot level where the stack flow is sampled isokinetically at a constant rate of 2 cfm. The sample line returns to ground level inside the stack. In the boiler room the air is heated and caused to flow successively through a Gelman 47MM glass fiber filter, a Cesco Model B, charcoal cartridge, through chambers containing 2x2 inch NaI detectors and finally back into the main stack via the vacuum pump. The stack gas monitor reads out in the control room and is visually checked for proper operation daily. The licensee stated further than an offgas sample, taken every 96 hours, is used to identify and quantify the gamma emittors present and thereby calibrate the stack monitor. The offgas analysis is also used to establish a gross ratio of long lived (> 8 days) and shortlived activity as well as $\bar{E}$ (average gamma energy per disintegration) which is used to calculate their maximum release rates of gross activity according to TS 3.6.A.1.

The inspector questioned the use of the Cesco Model B cartridge for organic iodine since this cartridge is not impregnated with chemicals known to be efficient for organic iodine collection. The licensee stated that the Model B cartridge had been evaluated in a special study by RO* and had been found to be comparable to impregnated charcoal. The inspector verified this finding by a review of the study in question.

The inspector inquired as to other measurements on gaseous effluents. The licensee stated that the charcoal cartridges and stack filters are analyzed weekly for gross alpha, beta and gamma activity, Ba-140, La-140 and I-131. A complete isotopic analysis is performed on filter composites at least quarterly. The licensee stated further that a tritium sample is collected at the end of the offgas line and on the gland seal leakage line by drawing air from these lines into a silica jel absorbant. This material collects tritiated water vapor which can be distilled from the jel and analyzed for tritium in a manner previously described. The inspector inquired as to the amount of gaseous tritium present in these gaseous effluents. The license responded that gaseous tritium had not been measured but that the amount of gaseous tritium would be determined and evaluated as to the relative contribution of the total tritium present.

7. Meteorology

The Meteorological Program employed at the OC site was reviewed in detail during this inspection. The inspector visited the currently used, 400 foot meteorology tower located approximately 1300 feet west of the plant. The inspector noted that wind speed and direction were being measured at the 400, 75 and 33 foot levels and that temperature differences were measured between the 12 foot level and the 400, 200 and 75 foot levels. Strip chart recorders in the stack at the base of the tower provided permanent records of the above data. The inspection revealed that the wind speed recorders for the 75 and 33 foot levels were not inking at the time of inspection.

*"Results of Independent Measurements of Radioactivity in Process Systems and Effluents at Boiling Water Reactors". C.A. Pelletier, Director of Regulatory Operations, USAEC, May 1973

The licensee stated that the data was only recorded at the shack and that OC had problems during the past several weeks with several of these recorders not inking. He stated further that the instrumentation at the tower was checked three times a week; Monday, Wednesday and Friday; either by an engineering assistant or by a member of the instrumentation group. The inspector reviewed a log book and noted that a record was made of the current readings at the time of the check and whether any instrument malfunctions had occurred. The inspector noted that the log book indicated that each of the last several checks showed one of the recorders was not inking and that the problem had recurred over the past several weeks. A record of servicing was attached to indicate the problem had been corrected, at least temporarily.

The inspector asked what frequency and techniques were used to calibrate the meteorology imstrumentation. The licensee stated that the instrumentation group performed a weekly electronic check of the instrumentation. Complete calibration was done on an annual basis, following written procedures. Records indicated the latest calibration was performed on July 24, 1973.

The inspector's visit to the reactor control room revealed that meteological data being transmitted from the tower, consisted of wind speed and direction at the 400 foot level. No permanent record was made at the control room other than the reactor operator's log which indicated the current wind speed and direction each hour on the half-hour.

The inspector asked how the raw meteorological data was reduced and used. The licensee stated that the strip charts are sent to Digital Graphics in Rockville, Maryland where the data is reduced to 15 minute averages and recorded on computer punch cards. The data is then turned over to Picker and Lowe, Washington, D.C. who use it in the compilation of the 6-month operating reports for OC. The inspector noted that wind speed and direction data at the 400 foot level appeared in these reports. The licensee stated that they did not receive any other reduced meteorological data.

The licensee stated that a new meteorology tower would be constructed in 1974 and that the meteorological program would be conducted in conformance with Safety Guide 23. They indicated that much of the new equipment was already purchased and a mini-computor would be utilized to provide 15-minute data summaries of the raw data to the reactor control room.

CRITERIA FOR COMPARING EFFLUENT RESULTS

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\sigma_1^2 + \sigma_2^2}}$$

$\bar{x}_1$ = HSL value

$\bar{x}_2$ = Licensee value

σ_1 = HSL standard deviation

σ_2 = Licensee standard deviation

z value	Comparison
< -10	Disagreement
-10 to -5	Possible Disagreement
-5 to +3	Agreement
+3 to +5	Possible Disagreement
> +5	Disagreement