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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards corrected addl info re post-accident sampling sys previously submitted on 840706.Info responds to SER Subitem 3 concerning accuracy,range & sensitivity of each radionuclide & chemical analysis.

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CP&L
Carolina Power & Light Company

JUL 06 1984

SERIAL: NLS-84-262 (Rev. 1)

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NO. 1 - DOCKET NO. 50-400
POST-ACCIDENT SAMPLING SYSTEM

Dear Mr. Denton:

Carolina Power & Light Company (CP&L) hereby submits additional information concerning the Shearon Harris Nuclear Power Plant Post-Accident Sampling System. This information is provided in response to Safety Evaluation Report (SER) License Condition No. 3 from the Chemical Engineering Branch. This information responds specifically to the part of Subitem (3) concerning accuracy, range and sensitivity of each radionuclide and chemical analysis.

This information was submitted by letter dated July 3, 1984. Page 2 of the attachment, however, was missing. This submittal corrects that mistake.

If you have any questions or require additional information, please feel free to contact me.

Yours very truly,

S. R. Zimmerman
Manager
Nuclear Licensing Section

ESS/ccc (240NLU)
Attachment

cc: Mr. B. C. Buckley (NRC)
Mr. G. F. Maxwell (NRC-SHNPP)
Mr. James Wing (NRC-CHEB)
Mr. J. P. O'Reilly (NRC-RII)
Mr. Travis Payne (KUDZU)
Mr. Daniel F. Read (CHANGE/ELP)
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Mr. John D. Runkle
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Mr. G. O. Bright (ASLB)
Dr. J. H. Carpenter (ASLB)
Mr. J. L. Kelley (ASLB)

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Shearon Harris Nuclear Power Plant
Safety Evaluation Report
License Condition No. 3

Item:

The applicant stated that periodic operational testing of the post-accident sampling system will be performed, but has not indicated the frequency and type of testing and operator training requirements for post-accident sampling. The Staff has determined that the proposed post-accident sampling system partially meets the acceptance criteria of Item II.B.3 in NUREG-0737. Before exceeding 5 percent power operation, the applicant shall have installed and have operational the post-accident sampling system. Before 5 percent power operation, the applicant also shall (1) submit for NRC approval a core damage assessment procedure that incorporates, as a minimum, hydrogen levels, reactor coolant system pressure, core exit thermocouple temperatures, and containment radiation levels, in addition to radionuclide data; (2) demonstrate applicability of procedures and instrumentation in the post-accident water chemistry and radiation environment, and retraining of operators on semiannual basis; (3) provide the plant procedures for chemical analyses and provide the accuracy, range, and sensitivity of each of the radionuclide and chemical analyses.

RESPONSE

The Post-Accident Sampling System (PASS) shown on FSAR Figure 9.3.2-1 provides the capability to obtain diluted and undiluted samples of the containment atmosphere and the reactor coolant system and to analyze reactor coolant for dissolved oxygen, pH, hydrogen, and total gas. The diluted and undiluted samples will be subjected to laboratory analysis for radionuclides, chlorides, and boron concentration. The indications from the post-accident control panel and results from laboratory analyses are used in conjunction with the core damage assessment procedure to estimate core damage. For further system description, see FSAR Section 9.3.2.2.3, Amendment No. 5.

The accuracy, range, and sensitivity of each radionuclide and chemical analysis is listed below:

I. Reactor Coolant

A. PASS Online Analyses

1. Dissolved Oxygen - The dissolved oxygen sample measurement is obtained by passing reactor coolant through the dissolved oxygen probe assembly. The oxygen measurement has an accuracy of ± 1 percent of signal or ± 1 ppb, whichever is greater. The dissolved oxygen is indicated and recorded continuously in the range of 0-20 ppm. The sensitivity of the oxygen analyzer is 0.05 percent of full scale.

The materials used in the oxygen probe assembly are specified to withstand an integrated radiation dose of 10^8 rads without structural failure. Tefzel is a preferred membrane material. Radiolysis of water does not constitute a problem because of unique features of the oxygen probe design, a small electrolyte volume, and the protecting influence of a "guard ring" electrode.

2. pH - pH measurement is obtained by passing reactor coolant through a pH probe assembly. The pH is indicated and recorded continuously in the range of 1 to 13 pH units. The pH instrument has an accuracy of ± .5 percent. The pH Chart Recorder has an accuracy of ± 1 percent for the recorder output. The pH probe is constructed of glass with a silver/silver chloride reference. The pH probe is constructed of materials compatible with high radiation. The sensitivity of the pH analyzer is better than 0.1 percent of full scale.

3. Total Gas - The total gas analyzer measures the gas effluent from the top of the gas stripper. The gases being measured will be primarily hydrogen and nitrogen. The instrument has an accuracy of ± 1 percent of range. The flowmeter/totalizer continuously measures the total gas flow in the 100-5000 cc/min range.

   The flowmeter is constructed of stainless steel with viton seals and is compatible with high radiation. The flow totalizer has an accuracy of ± 1 percent. The total accuracy, therefore, for the gas totalizer is ± 2 percent. The sensitivity of the total gas analyzer is 0.3 percent of full scale.

4. Hydrogen - The PASS hydrogen analyzer for reactor coolant samples indicates and records the percent hydrogen in the gas effluent from the PASS gas stripper. The analyzer works on the thermal conductivity method. The accuracy of the instrument is related to the accuracy of the calibrating gases used. Specific details on the accuracy of the hydrogen analyzer will be submitted to the NRC by January 1985. This instrument is constructed of materials compatible with high radiation levels. The sensitivity of the hydrogen analyzer is 0.15 percent of full scale.

B. Laboratory Analyses

The information provided below describes features of the sampling and analysis equipment which influence the accuracy of the laboratory analysis performed to determine radionuclide chloride and boron concentration. Specific values for the accuracy of these analyses will be submitted to the NRC by January 1985.

1. Undiluted Liquid Sample - The undiluted liquid sample is obtained by passing depressurized and cooled reactor coolant through a sample cask assembly which isolates a 10 ml sample. The accuracy of the analysis of the undiluted liquid sample is

based strictly on the accuracy of the analysis procedures employed in the laboratory. The accuracy of the volume of sample (10 ml) is not a factor since the laboratory will use a measured aliquot for each particular analysis.

2. Diluted Liquid Grab Sample - The diluted liquid sample is obtained by capturing a .1 ml sample of reactor coolant in a specially designed valve bore. The .1 ml sample is then flushed with 100 ml of dilution water from a syringe into a sample bottle. This equates to a 1000:1 dilution. The accuracy of the dilution is determined by three factors; the accuracy of the valve bore, the accuracy of the 100 ml syringe, and the accuracy of the laboratory analysis.

   The valve bore has an accuracy of better than ± 1 percent. The syringe has an accuracy of ± 1 percent. Coupling these two accuracies gives an overall dilution accuracy of ± 2 percent. Once in the laboratory, the 100.1 ml of sample will be aliquoted as required by the analysis. The laboratory analysis accuracy will be added to the dilution accuracy for an overall accuracy range.

3. Diluted Gas Grab Sample - The diluted gas grab sample is obtained by blending dilution gas with the stripped gas effluent from the phase separator. The dilution is adjustable from 1:1 to 1000:1. The diluted sample is then captured in a sample cylinder and transferred to the lab for analysis. The accuracy of the measurements is based on the accuracy of the dilution and the accuracy of the laboratory analysis. The accuracy of the gas-blending unit is ± 1 percent. For laboratory analysis, the sample will then be aliquoted from the sample cylinder by syringe or other means and analyzed in the laboratory.

II. Containment Atmosphere

NUREG-0737 II.B.3 also requires the capability to obtain containment atmosphere samples for determination of the hydrogen levels in containment and quantification of containment atmosphere radionuclides. The post-accident hydrogen monitoring system is described in FSAR Section 6.2.5.1.3. The redundant in-line hydrogen analyzer samples containment air and measures the hydrogen concentration with a range of 0-10 percent hydrogen (by volume) and an accuracy of ± 2 percent of full scale. The sensitivity of the containment atmosphere hydrogen analyzer is 0.1 percent hydrogen by volume.

A containment atmosphere sample for quantification of radionuclides is obtained via the hydrogen analyzer cabinet by the remote sample dilution panel as shown on FSAR Figure 6.2.5-7 (Amendment 14). The sample line is heat traced to limit plateout prior to sample collection.

The remote sample dilution panel provides a grab sample of containment atmospheric gases and a diluted or undiluted cooled gas sample for further radiological analysis. An iodine sample is obtained via a silver zeolite filter cartridge. The containment atmosphere sample is collected

in a 10 cc or 150 cc grab sample cylinder with dilution as required. The gas sample is diluted with dilution gas in the 10 cc cylinder with an accuracy of 5 percent. The 150 cc sample will have a greater accuracy therefore the 10 cc sample accuracy is the limiting value. The sample panels pressure transducer range is 0-10,000 mm Hg with a reading accuracy of ± 1.5 percent.

The dilution accuracy will be verified after the dilution equipment is calibrated and the system functional performance test is completed.

(240NLU/ccc)