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September 30, 1982

Mr. H. R. Denton
Office of Nuclear Reactor Regulation
U.S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

Attention: Mr. R. A. Clark
Operating Reactors Branch #3

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
NUREG-0737 ITEM II.B.3
POST ACCIDENT SAMPLING SYSTEM
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Enclosed is the information requested in your June 30, 1982 letter to document our implementation of NUREG-0737, Item II.B.3, Post-Accident Sampling Systems for Point Beach Nuclear Plant, Units 1 and 2.

Please note that a description of the post-accident sampling systems was submitted as an addendum to our December 31, 1979 submittal on our Implementation of NUREG-0578. During the period of January 4-15, and 20, 1982, members of the NRC Office of Inspection and Enforcement conducted an on-site review of the post-accident reactor coolant and containment atmosphere sampling systems and procedures as part of the overall appraisal of the Point Beach Nuclear Plant emergency preparedness program. The results of this review are documented in the February 11, 1982 NRC letter from Mr. J. Keppler to Mr. Sol Burstein. The post-accident sampling systems and the associated procedures were both evaluated as being acceptable in meeting the requirements of NUREG-0737, Item II.B.3.

We note that new and additional requirements have been provided in the clarifications transmitted with your June 30, 1982 letter, specifically those regarding backup power sources for the laboratory, the environmental qualification of certain valves related to sampling, and the Standard Test Matrix for sample analysis. While we agree to address these items and, except for the Standard Test Matrix, had planned their implementation before receipt of your letter, we consider these items beyond the scope of the

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original NUREG-0737 implementation schedule and will implement them on their own specific schedules as indicated in the attachment.

System drawings have been previously submitted with our December 31, 1979 submittal.

Should you require any further information, please contact us.

Very truly yours,

Sol Burstein
Executive Vice President

Copy to NRC Resident Inspector

ATTACHMENT

NUREG-0737, ITEM II.B.3
POST-ACCIDENT SAMPLING SYSTEM
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Criterion: (1) The licensee shall have the capability to promptly obtain reactor coolant samples and containment atmosphere samples. The combined time allotted for sampling and analysis should be 3 hours or less from the time a decision is made to take a sample.

Post-accident reactor coolant samples can be obtained from the reactor coolant system hot leg and from the residual heat removal loop (FSAR Figure 9.4.1). The sampling stations are located at accessible locations on the outside wall of the Unit 1 and Unit 2 sample rooms. Sampling is accomplished with a sample bomb, constructed of stainless steel and shielded with approximately 2-3/4" of lead, which is connected to the sampling station with Swagelok fittings. The valving of the sample lines and sample bomb allows recirculation with the sample bomb installed, ensures that sample flow is forced through the bomb when the sample is collected, and provides double valve protection against leakage when the bomb is removed. The sample bomb is transported to and from the sample station on a standard industrial four-wheel cart modified with special provisions for lifting and holding the sample bomb.

The total time required for sample collection, transport, and analysis is 3 hours or less from the time a decision is made to take a sample. The following are average times recorded during training sessions conducted on the post-accident sampling system and procedures for PBNP personnel:

	Unit 1 (min.)	Unit 2 (min.)
Sampling (including recirculation and flush)	30	30
Transport	24	40
Required dilutions, gas extraction, pH, boric acid, and chloride analysis	35	35
Radionuclide analysis	17	17
Total Time	106	122

The containment atmosphere is sampled at a station located on the outside wall of the containment atmosphere sampling cubicle. The samples for the required analyses are drawn from an in-line septum by two shielded syringes. The syringes are placed in a hollowed lead brick to reduce the personnel exposure during transport to the chemistry laboratory and counting room.

The containment atmosphere can also be sampled and analyzed in 3 hours or less from the time the decision is made to take a sample. The following are average times recorded during training sessions conducted on the post-accident sampling system and procedures for PBNP personnel:

	Unit 1 (min.)	Unit 2 (min.)
Valve lineup and sampling	40	40
Total Transit	10	10
Preparation and dilution of the sample	15	15
Analysis	17	17
Total Time	82	82

Figures showing the relative locations of sampling stations, chemistry laboratory, counting room, and access routes were provided with our December 31, 1979 submittal.

Two backup analysis options are also available for the reactor coolant and containment atmosphere samples. An alternate chemistry laboratory and counting facility is located in our Technical Support Center. Also, Point Beach Nuclear Plant has a reciprocal agreement with Kewaunee Nuclear Power Plant to provide use of facilities for analysis of post-accident samples. Kewaunee Nuclear Power Plant is located approximately five miles north which would require approximately fifteen minutes of transport time.

In the event of a loss of offsite power, power could be made available to the chemistry laboratory and counting room to allow analysis within three hours by the manual transfer to a number of power supply options. In addition, we have planned the provision of a backup power source to the TSC building, including the TSC laboratory and counting facilities. This will be complete by the end of 1983. In the interim, manual transfer to other power supplies or transportation of samples to Kewaunee Nuclear Power Plant can be used to complete analyses in the desired time frame.

Criterion: (2) The licensee shall establish an onsite radiological and chemical analysis capability to provide, within three-hour time frame established above, quantification of the following:

(a) certain radionuclides in the reactor coolant and containment atmosphere that may be indicators of the degree of core damage (e.g., noble gases; iodines and cesiums, and non-volatile isotopes);

(b) hydrogen levels in the containment atmosphere;

(c) dissolved gases (e.g., H_2) chloride (time allotted for analysis subject to discussion below), and boron concentration of liquids.

(d) Alternatively, have inline monitoring capabilities to perform all or part of the above analyses.

(a) The correlation of the inventory of certain radionuclides in the reactor coolant and containment atmosphere to the degree of core damage is accomplished by the implementation of the following Emergency Plan Implementing Procedures (EPIPs):

EPIP 1.3	Estimation of Source Term
EPIP 1.7	Evaluation of Core Damage
EPIP 7.3.2	Post-Accident Sampling and Analysis of Potentially High Level Reactor Coolant
EPIP 7.3.3	Post-Accident Sampling of Containment Atmosphere

(b) Hydrogen levels in the containment atmosphere are determined by obtaining a containment atmosphere sample and performing the analysis in accordance with EPIP 7.3.3.

(c) Dissolved gasses, chloride, and boron concentrations are determined by obtaining a reactor coolant sample and performing the analyses in accordance with EPIP 7.3.2.

(d) Not applicable.

Criterion: (3) Reactor coolant and containment atmosphere sampling during post-accident conditions shall not require an isolated auxiliary system [e.g., the letdown system, reactor water cleanup system (RWCUS)] to be placed in operation in order to use the sampling system.

The post-accident reactor coolant sample is obtained directly from the reactor coolant system hot leg or the residual heat removal system. The post-accident containment atmosphere sample is obtained directly from the containment atmosphere radiation monitoring system. The reactor coolant hot leg sample lines and the containment atmosphere sample lines are isolated by a containment isolation signal. In addition, the instrument air containment isolation valve is closed by a containment isolation signal. Upon resetting of the containment isolation signal, the instrument air isolation valve is reopened to allow operation of selected systems including the reactor coolant hot leg and containment atmosphere sampling systems.

The Point Beach Nuclear Plant environmental qualification program, developed in accordance with IE Bulletin 79-01B, includes electrical equipment required to mitigate design basis Loss of Coolant or High Energy Line Break Accidents (based on the PBNP FSAR and EOP's) subject to a harsh accident environment. Due to the clarification of NUREG-0737, Item II.B.3, Criterion 3, the instrument air isolation valves have been identified as requiring environmental qualification and have been added to the overall environmental qualification program. The qualification of these valves will be completed for both units by June 1, 1984.

Criterion: (4) Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized reactor coolant samples. The measurement of either total dissolved gases or H_2 gas in reactor coolant samples is considered adequate. Measuring the O_2 concentration is recommended, but is not mandatory.

Pressurized reactor coolant samples are obtained and analyzed for hydrogen and chloride concentration in accordance with EPIP 7.3.2. The hydrogen concentration is maintained at 25-35 cc/kg by regulating the pressure of the hydrogen blanket on the volume control tank. This ensures that sufficient hydrogen is available as an oxygen scavenger to maintain the oxygen concentration less than 0.1 ppm.

Criterion: (5) The time for a chloride analysis to be performed is dependent upon two factors: (a) if the plant's coolant water is seawater or brackish water and (b) if there is only a single barrier between primary containment systems and the cooling water. Under both of the above conditions the licensee shall provide for a chloride analysis within 24 hours of the sample being taken. For all other cases, the licensee shall provide for the analysis to be completed within 4 days. The chloride analysis does not have to be done onsite.

An initial chloride analysis is performed with a chloride specific electrode. A more sensitive follow up chloride analysis is obtained by use of a liquid ion chromatograph. The liquid ion chromatograph is maintained by the laboratory services group at the corporate headquarters in Milwaukee. In the event of an accident, the instrument would be transported to the plant site to perform the required chloride analyses. The chloride analysis would be performed within 96 hours post-accident.

In addition to the above, Point Beach Nuclear Plant has a reciprocal agreement with Kewaunee Nuclear Power Plant for use of the Kewaunee facilities to perform the required analyses of post-accident samples. Kewaunee Nuclear Power Plant has analytical capabilities which are equivalent to those of Point Beach Nuclear Plant.

Criterion: (6) The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to obtain and analyze a sample without radiation exposures to any individual exceeding the criteria of GDC 19 (Appendix A, 10 CFR Part 50) (i.e., 5 rem whole body, 75 rem extremities). (Note that the design and operational review criterion was changed from the operational limits of 10 CFR Part 20 (NUREG-0578) to the GDC 19 criterion (October 30, 1979 letter from H. R. Denton to all licensees).

The systems were fabricated and procedures developed for reactor coolant and containment atmosphere sampling and analysis in accordance with the criteria of Appendix A, 10 CFR 50, GDC 19 as the design basis. A radiation exposure study was performed on the Point Beach Nuclear Plant post-accident sampling systems and provided with our December 31, 1979 submittal on the Implementation of NUREG-0578. The study assumed a conservative source term inventory consistent with NUREG-0578 and demonstrated that post-accident sampling and analysis can be performed without exceeding the exposure limits of 5 rem to the whole body and 75 rem to extremities.

Subsequent to our December 31, 1979 submittal, we performed a refined re-analysis of exposures expected to be received during primary coolant post-accident sampling. As a result of this re-analysis, an additional inch of lead shielding was added to the sample bomb. Expected post-accident dose rates were recalculated assuming primary coolant post-accident concentrations both with and without safety injection. In both cases the calculated doses were less than the GDC 19 criteria.

In order to further facilitate sampling, a supplemental primary coolant sampling system will be installed in both units of PBNP. These systems will afford the capability to obtain a diluted primary coolant sample and will be designed to ensure compliance with the GDC 19 exposure limits.

As a part of our upgrading of the entire plant radiation monitoring system, the containment atmosphere post-accident sampling system is presently being redesigned. Dose calculations will be performed on the new system prior to installation and operation. Operation in obtaining a containment atmosphere sample with the new system will be similar to that of the present system.

Criterion: (7) The analysis of primary coolant samples for boron is required for PWRs. (Note that Rev. 2 of Regulatory Guide 1.97 specifies the need for primary coolant boron analysis capability at BWR plants).

The reactor coolant sample is analyzed to boron concentration in accordance with EPIP 7.3.2. by performing a titration with 0.1N NaOH.

Criterion: (8) If inline monitoring is used for any sampling and analytical capability specified herein, the licensee shall provide backup sampling through grab samples, and shall demonstrate the capability of analyzing the samples. Established planning for analysis at offsite facilities is acceptable. Equipment provided for backup sampling shall be capable of providing at least one sample per day for 7 days following onset of the accident, and at least one sample per week until the accident condition no longer exists.

Not applicable to Point Beach Nuclear Plant.

Criterion: (9) The licensee's radiological and chemical sample analysis capability shall include provisions to:

(a) Identify and quantify the isotopes of the nuclide categories discussed above to levels corresponding to the source terms given in Regulatory Guide 1.3 or 1.4 and 1.7. Where necessary and practicable, the ability to dilute samples to provide capability for measurement and reduction of personnel exposure should be provided. Sensitivity of onsite liquid sample analysis capability should be such as to permit measurement of nuclide concentration in the range from approximately 1 uCi/g to 10 Ci/g.

(b) Restrict background levels of radiation in the radiological and chemical analysis facility from sources such that the sample analysis will provide results with an acceptably small error (approximately a factor of 2). This can be accomplished through the use of sufficient shielding around samples and outside sources, and by the use of a ventilation system design which will control the presence of airborne radioactivity.

(a) The reactor coolant samples are diluted prior to counting in the multichannel analyzer until the contact reading is less than 1 mr/hour to avoid saturation of the instrument. The isotopes of the radionuclides are identified and quantified in accordance with EPIP 7.3.2.7

(b) As described in our December 31, 1979 submittal, the chemistry laboratory and counting room remain available for unlimited access for any postulated Unit 2 accident and prior to recirculation for any postulated Unit 1 accident. After recirculation, following a core melt accident in Unit 1, continuous occupancy and use of the chemistry laboratoy is impractical because of the radiation levels due to the proximity of safety injection (SI) suction lines. For this reason, backup laboratory and counting facilities have been provided in the new Technical Support Center building. The TSC facilities meet all NUREG-0737 requirements for shielding and ventilation control. Additional alternatives for sample analyses include the ability to flush SI lines to recover use of the main plant laboratory and our mutual agreement for use of the Kewaunee Nuclear Power Plant facilities.

Criterion: (10) Accuracy, range, and sensitivity shall be adequate to provide pertinent data to the operator in order to describe radiological and chemical status of the reactor coolant systems.

Isotopic analysis of the reactor primary coolant is accomplished by counting a diluted solution of the primary coolant using a Canberra Model 8100 Multichannel Analyzer in conjunction with a GeLi detector. The specific activity of the diluted sample permits accurate analysis of the sample on the multichannel analyzer system. A single channel calibration efficiency check is performed on the GeLi detectors weekly and a full spectrum calibration is conducted quarterly.

A standard sodium hydroxide titration is used to determine boron concentrations. The titration is performed in conjunction with a calibrated pH probe. Standardized boron solutions are made to determine the accuracy of the boron testing methodology. Accuracy determinations performed in the past have exhibited accuracies within the established limits.

Chloride ion concentration estimations are made with an ultra-sensitive solid state chloride electrode. The millivolt reading obtained from the chloride ion probe is adjusted for iodine interferences and converted to a chloride ion concentration. The lower limit of detection of this instrument is 20 parts per billion. Standard test runs have been conducted and a correction curve have been generated to compensate for iodine interferences. This correction curve is included in the PBNP emergency procedures. Accuracy checks conducted on the chloride probe have exhibited deviations within the acceptable limit.

A liquid ion chromatograph will be used as the primary instrument for the determination of chloride concentrations. The instrument can measure chloride concentrations to parts per trillion. The instrument has an accuracy rating of 0.5%.

A gas chromatograph is used to determine hydrogen concentrations. The minimum sensitivity of the gas chromoatograph is 0.05% by volume. This corresponds to a minimum level of detection of approximately 150 parts per billion for hydrogen using the PBNP procedures.

The calibration and standardization procedures used at PBNP will ensure, to a high degree of reliability, that equipment required to analyze post-accident samples will be available when required and the samples will be measured accurately. Accuracy checks conducted on the required equipment indicates accuracy capabilities within the established limits. It is recognized that accuracy determinations routinely conducted at PBNP may not simulate a post-accident environment. Therefore, to demonstrate the accuracy capailities of our instrumentation in a post-accident environment, PBNP will commit to conducting the standarized test matrix outlined in the NRC clarification statement with the exception of the induced radiation field. Post-accident coolant measurements are conducted on diluted samples with specific activities which would have negligible effects on instrumentation. The use of the induced radiation field is also contrary to ALARA practices. The performance of the test matrix will be completed before April 1, 1983.

Criterion: (11) In the design of the post-accident sampling and analysis capability, consideration should be given to the following items:

(a) Provisions for purging sample lines, for reducing plateout in sample lines, for minimizing sample loss or distortion, for preventing blockage of sample lines by loose material in the RCS or containment, for appropriate disposal of the samples, and for flow restrictions to limit reactor coolant loss from a rupture of the sample line. The post-accident reactor coolant and containment atmosphere samples should be representative of the reactor coolant in the core area and the containment atmosphere following a transient or accident. The sample lines should be as short as possible to minimize the volume of fluid to be taken from containment. The residues of sample collection should be returned to containment or to a closed system.

(b) The ventilation exhaust from the sampling station should be filtered with charcoal absorbers and high-efficiency particulate air (HEPA) filters.

(a) In accordance with EPIP 7.3.2, the post-accident reactor coolant sample lines are purged and recirculated prior to obtaining a sample and are flushed with demineralized water subsequent to obtaining a sample. The isolation valve arrangement and the valve operating sequence minimize the possibility of sample loss. The post-accident reactor coolant sampling system can be isolated by operation of the in-containment air-operated solenoid isolation valves or by operation of the out-of-containment air-operated solenoid isolation valves.

In accordance with EPIP 7.3.3., the post-accident containment atmosphere sample lines are recirculated prior to obtaining a sample and are purged with service air subsequent to obtaining a sample. The containment atmosphere sample system can be isolated by the closing of the air operated solenoid isolation valves from the control room. Two samples, ½ cc and

1 cc, are drawn by syringes from the in-line neoprene septum. The discharge of the sample pump is directed back into the containment. The lengths of sample lines for both the reactor coolant and containment atmosphere post-accident sampling systems are as short as possible within the constraints of the physical structure to minimize the volume of the in-line fluid.

(b) All exhaust air from the auxiliary building is filtered through roughing and high efficiency filters for removal of all particulates. Areas which have possible contamination from iodine vapor also have the capability to be exhausted through activated carbon beds in addition to high efficiency filters. The exhausted air is then discharged through the auxiliary building vent stack, which is monitored for radiation.