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November 2, 1984

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 2900
Atlanta, Georgia 30303

Subject: McGuire Nuclear Station
Docket Nos. 50-369 and 50-370

Reference: IE Inspection Report 50-369/84-07, 50-370/84-07
Post Accident Sampling System

Dear Mr. O'Reilly:

This letter is in response to an October 5, 1984 letter from the NRC to Duke Power Company concerning the Post Accident Sampling System (PASS) at McGuire Nuclear Station.

Action 1 committed Duke Power Company to have the Unit 1 PASS modified and capable of obtaining a representative sample of reactor coolant by November 1, 1984 and that the analyses for Gross Activity, Boron, Chloride, Hydrogen, Oxygen (recommended) and pH meet the accuracy specified in the letter. Data from samples obtained from the PASS are included in Attachment 1. The results of the analyses clearly indicate that, for the parameters listed, the panel provides data within the required accuracy. A few analyses are shown which had data out of tolerance. The percentage of inaccurate data is insignificant and was attributed to errors in panel operation analysis technique. This data is included for completeness. Overall the PASS has been demonstrated to be capable of obtaining and analyzing data and is considered operable. The following is a description of the capabilities of the Unit 1 PASS for each type of analysis described in the October 5, 1984 letter.

A. Gross Activity: Modifications were completed such that these analyses are accurate within a factor of two over the range of coolant activity of 1uCi/gm - 10Ci/gm. Data from samples obtained from the panel are included in Attachment 1.

B. Boron: Modifications were completed such that these analyses are accurate within ±10% of the measured value. For concentrations below 500 ppm, the tolerance band is ±50 ppm. Data from samples obtained from the panel are included in Attachment 1.

C. Chlorides: Ion chromatographic analysis has been chosen to be the technique for chloride analysis in a post accident reactor coolant sample. The method is well established for its reliability and the method has been verified as acceptable for a typical post accident matrix. (Reference: Evaluation of GE and SEC Chemical Procedures for Post Accident Analysis of Reactor Coolant Samples-Prepared by Exxon Nuclear Idaho Co., Inc. for the NRC).

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To further demonstrate the acceptability of the method in meeting the NUREG-0737 requirements, a standard solution containing 1160 ppb chloride and 500 ppm boron was prepared. The solution was then diluted 1:50 and analyzed in triplicate by the ion chromatographic method. The chloride concentration of 1160 ppb was determined by the automated colorimetric method normally used at McGuire.

Based on the dilution factor of 50 for the 1160 ppb solution, the ion chromatographic method should yield results of 23.2 ppb chloride. The actual results were:

Analysis 1:	21.2 ppb
Analysis 2:	21.4 ppb
Analysis 3:	22.1 ppb
	21.6 ppb average (6.9% error)

Applying the dilution factor of 50, the undiluted chloride concentration of the solution was:

Analysis 1:	1060 ppb
Analysis 2:	1070 ppb
Analysis 3:	1105 ppb

Based on the standard solution containing 1160 ppb chloride and an accuracy of ±10% of the measured value for the 0.5 to 20 ppm range of concentration, chloride results between 1044 and 1276 ppb would be acceptable. The ion chromatographic chloride results were within this range.

For concentrations less than 0.5 ppm, an accuracy of ±0.05 ppm is required and the ion chromatographic method of analysis should be employed for the determination in post accident conditions. The method has a detection limit of 0.5 ppb.

The system has been modified and testing has indicated that a sample for chloride may be obtained which is representation of chloride concentrations in the reactor coolant system Diluted system samples were analyzed by the automated colorimetric method and the results have indicated chloride concentrations to be less than detectable (<25 ppb) by the method. This confirms the absence of any chloride contamination in the sampling panel.

D. Hydrogen: Modifications were completed such that these analyses are accurate within ±15cc/kg for concentrations less than or equal to 50 cc/kg and ± 20% for concentrations between 50 cc/kg and 2000 cc/kg. Data from samples obtained from the panel are included in Attachment 1.

E. Oxygen: In the design of the Duke Post Accident Liquid Sample Panels, no provision was made for oxygen analysis since this was not a requirement. However it was believed that oxygen data could be generated as by product information while analyzing for hydrogen by gas chromatography. The results were consistently high with the cause attributed to 1) incomplete evacuation of the stripped gas sample loops, 2) oxygenated water remaining in the loop after flushing and 3) the nitrogen dilution gas contains a significant amount of oxygen.

The only alternative to the gas chromatographic method for oxygen determination is to incorporate an oxygen probe in the PASS. This would require major system modifications. Also, in order to obtain valid results, the line with the probe would have to be flushed with a very large quantity of undiluted sample which is contrary to ALARA principles.

Another item of consideration is if containment building recirculation is initiated, the system will be oxygen saturated and there would be no need for oxygen analysis.

Criterion 4 states that, "The measurement of either total dissolved gases of H_2 in reactor coolant sample is considered adequate. Measuring the O_2 concentration is recommended, but is not mandatory."

Criterion 4 Clarification states, "Verification that dissolved oxygen is 0.1 ppm by measurement of a dissolved hydrogen residual of $\geq$10 cc/kg is acceptable for up to 30 days after the accident." This can be performed. After 30 days, the system will be cooled down and there will be no need for oxygen analysis.

There are currently no plans for further pursuing oxygen analyses in PASS samples.

F. pH: Modifications were completed such that these analyses are accurate within ±0.3 pH units for a pH between 5 to 9. For other ranges ±0.5 pH units will be used. Attachment 1 contains data from the sample panels for pH.

Action 2 requested information concerning operability tests and NUREG-0737. The operability tests of the installed system have been successfully conducted and analytical data provided in the Action 1 responses substantiate acceptable operation of the system. The data provided in the Action 1 responses also insure that the requirements of NUREG-0737, Item II.B.3 parameters, as modified by the October 5, 1984 NRC letter, can be measured with the accuracy and sensitivity stated, with the exception of oxygen.

The Unit 1 PASS modifications have been incorporated with the significant changes described in Attachment 2. The modified Unit 1 system has been successfully

and consistently operated to demonstrate the systems ability to obtain samples representative of the reactor coolant system (except for oxygen). Present plans are to incorporate the Unit 1 modifications to the Unit 2 PASS and have it operable by May 1, 1985.

Please advise us if there are further questions regarding this matter.

H. B. Tucker 1/850

Hal B. Tucker

WHMcD/mjf

Attachment

cc: Mr. W. T. Orders
Senior Resident Inspector
McGuire Nuclear Station

ATTACHMENT I

CHEMISTRY DATA

	10-4-84			10-5-84		
	PASS	HOT LEG	DEVIATION	PASS	HOT LEG	DEVIATION
Boron (ppm)	343	370	27	335	370	35
pH	6.6	6.4	0.2	6.6	6.6	0.0
*Chlorides (ppb)	30	<25	5	32	<25	7
Hydrogen (cc/Kg)	29	34	5	26	40	14

*Chlorides on PASS are before dilution factor.

	10-8-84			10-9-84		
	PASS	HOT LEG	DEVIATION	PASS	HOT LEG	DEVIATION
Boron (ppm)	353	357	4	424	357	67
pH	6.5	6.7	0.2	6.6	6.7	0.1
*Chlorides (ppb)	insuff. sample	<25	-	<25	<25	0
Hydrogen (cc/Kg)	17	35	18	23	35	12

*Chlorides on PASS are before dilution factor.

ATTACHMENT I

CHEMISTRY DATA

10-10-84

	PASS	HOT LEG	DEVIATION
Boron (ppm)	343	348	5
pH	6.5	6.6	0.1
*Chlorides (ppb)	65	<25	40
Hydrogen (cc/Kg)	27	34	7

*Chlorides on PASS are before dilution factor.

10-11-84

PASS	HOT LEG	DEVIATION
323	347	24
6.6	6.8	0.2
55	<25	30
24	34	10

10-13-84

	PASS	HOT LEG	DEVIATION
Boron (ppm)	336	343	7
pH	6.6	6.8	0.2
*Chlorides (ppb)	<25	<25	0
Hydrogen (cc/Kg)	31	37	6

*Chlorides on PASS are before dilution factor.

10-15-84

PASS	HOT LEG	DEVIATION
329	330	1
6.7	6.6	0.1
35	<25	10
26	38	12

ATTACHMENT I

CHEMISTRY DATA

10-16-84

	PASS	HOT LEG	DEVIATION
Boron (ppm)	330	327	3
pH	6.7	6.7	0.0
*Chlorides (ppb)	<25	<25	0
Hydrogen (cc/Kg)	34	38	4

*Chlorides on PASS are before dilution factor.

10-18-84

	PASS	HOT LEG	DEVIATION
Boron (ppm)	308	318	10
pH	6.5	6.5	0.0
*Chlorides (ppb)	<25	<25	0
Hydrogen (cc/Kg)	21	40	19

10-19-84

	PASS	HOT LEG	DEVIATION
Boron (ppm)	319	316	3
pH	6.9	6.6	0.3
*Chlorides (ppb)	<25	<25	0
Hydrogen (cc/Kg)	29	35	6

*Chlorides on PASS are before dilution factor.

ATTACHMENT I

RADIOCHEMISTRY DATA

	10-4-84		10-5-84		10-8-84	
	PASS (µCi/gm)	HOT LEG (µCi/gm)	PASS (µCi/gm)	HOT LEG (µCi/gm)	PASS (µCi/gm)	HOT LEG (µCi/gm)
Kr-85M	$3.0E^{-2}$	$3.7E^{-2}$	$2.9E^{-2}$	$3.4E^{-2}$	$2.2E^{-2}$	$5.0E^{-2}$
Kr-87	$3.4E^{-2}$	$4.8E^{-2}$	$3.2E^{-2}$	$3.6E^{-2}$	$2.3E^{-2}$	$4.0E^{-2}$
Kr-88	$6.2E^{-2}$	$8.1E^{-2}$	$6.5E^{-2}$	$6.7E^{-2}$	$4.5E^{-2}$	$8.5E^{-2}$
Xe-133	$2.7E^{-1}$	$3.1E^{-1}$	$2.6E^{-1}$	$2.6E^{-1}$	$2.0E^{-1}$	$3.2E^{-1}$
Xe-133M	$7.9E^{-3}$	$1.0E^{-2}$	$5.7E^{-3}$	$9.2E^{-3}$	$6.5E^{-3}$	$8.6E^{-3}$
Xe-135	$1.5E^{-1}$	$2.0E^{-1}$	$1.6E^{-1}$	$1.6E^{-1}$	$1.0E^{-1}$	$2.1E^{-1}$
Xe-135M	$1.6E^{-3}$	$3.4E^{-3}$	$3.5E^{-3}$	$4.1E^{-3}$	$2.4E^{-3}$	$4.4E^{-3}$
I-131	$5.9E^{-3}$	$6.9E^{-3}$	$6.6E^{-3}$	$7.1E^{-3}$	$7.5E^{-3}$	$6.6E^{-3}$
I-132	$2.0E^{-2}$	$2.0E^{-2}$	$1.7E^{-2}$	$2.2E^{-2}$	$2.0E^{-2}$	$2.2E^{-2}$
I-133	$1.4E^{-2}$	$1.4E^{-2}$	$1.5E^{-2}$	$1.6E^{-2}$	$1.4E^{-2}$	$1.5E^{-2}$
I-134	- *	$3.0E^{-2}$	$2.0E^{-2}$	$3.4E^{-2}$	$2.8E^{-2}$	$3.6E^{-2}$
I-135	$1.8E^{-2}$	$2.0E^{-2}$	$2.4E^{-2}$	$2.2E^{-2}$	$2.1E^{-2}$	$2.2E^{-2}$
Rb-88	- *	$3.5E^{-2}$	$8.5E^{-3}$	$2.6E^{-2}$	$1.5E^{-2}$	$1.1E^{-1}$
Cs-138	$7.3E^{-2}$	$1.1E^{-1}$	$3.6E^{-2}$	$1.2E^{-1}$	$5.3E^{-2}$	$1.2E^{-1}$

*Less than Minimum Detectable Activity

ATTACHMENT I

RADIOCHEMISTRY DATA

	10-9-84		10-10-84		10-11-84	
	PASS (µCi/gm)	HOT LEG (µCi/gm)	PASS (µCi/gm)	HOT LEG (µCi/gm)	PASS (µCi/gm)	HOT LEG (µCi/gm)
Kr-85M	$3.6E^{-2}$	$5.0E^{-2}$	$4.2E^{-2}$	$3.8E^{-2}$	$3.3E^{-2}$	$3.8E^{-2}$
Kr-87	$3.7E^{-2}$	$4.0E^{-2}$	$4.4E^{-2}$	$4.2E^{-2}$	$3.3E\pi^{2}$	$4.2E^{-2}$
Kr-88	$7.1E^{-2}$	$8.5E^{-2}$	$8.4E^{-2}$	$7.5E^{-2}$	$6.5E^{-2}$	$7.5E^{-2}$
Xe-133	$2.9E^{-1}$	$3.2E^{-1}$	$3.2E^{-1}$	$3.1E^{-1}$	$3.0E^{-1}$	$3.1E^{-1}$
Xe-133M	$8.8E^{-3}$	$8.6E^{-3}$	$1.1E^{-2}$	$4.5E^{-3}$	$1.1E^{-2}$	$4.5E^{-3}$
Xe-135	$1.7E^{-1}$	$2.1E^{-1}$	$1.9E^{-1}$	$2.0E^{-1}$	$1.6E^{-1}$	$2.0E^{-1}$
Xe-135M	$3.1E^{-3}$	$4.4E^{-3}$	$2.0E^{-3}$	$2.7E^{-3}$	$3.2E^{-3}$	$2.7E^{-3}$
I-131	$5.3E^{-3}$	$6.6E^{-3}$	$6.2E^{-3}$	$7.1E^{-3}$	$5.6E^{-3}$	$7.1E^{-3}$
I-132	$1.7E^{-2}$	$2.2E^{-2}$	$1.8E^{-2}$	$2.1E^{-2}$	$1.7E^{-2}$	$2.1E^{-2}$
I-133	$1.3E^{-2}$	$1.5E^{-2}$	$1.5E^{-2}$	$1.5E^{-2}$	$1.4E^{-2}$	$1.5E^{-2}$
I-134	- *	$3.6E^{-2}$	$2.5E^{-2}$	$3.1E^{-2}$	$2.1E^{-2}$	$3.1E^{-2}$
I-135	$2.0E^{-2}$	$2.2E^{-2}$	$2.4E^{-2}$	$2.1E^{-2}$	$1.9E^{-2}$	$2.1E^{-2}$
Rb-88	- *	$1.1E^{-1}$	- *	$4.7E^{-2}$	$1.9E^{-2}$	$4.7E^{-2}$
Cs-138	$4.4E^{-2}$	$1.2E^{-1}$	$6.3E^{-2}$	$1.1E^{-1}$	$5.3E^{-2}$	$1.1E^{-1}$

*Less than Minimum Detectable Activity

ATTACHMENT I

RADIOCHEMISTRY DATA

	10-13-84		10-15-84		10-16-84	
	PASS(μCi/gm)	HOT LEG(μCi/gm)	PASS(μCi/gm)	HOT LEG (μCi/gm)	PASS(μCi/gm)	HOT LEG (μCi/gm)
Kr-85M	$3.7E^{-2}$	$4.4E^{-2}$	$3.1E^{-2}$	$4.0E^{-2}$	$3.6E^{-2}$	$4.0E^{-2}$
Kr-87	$3.9E^{-2}$	$5.1E^{-2}$	$3.3E^{-2}$	$4.2E^{-2}$	$3.6E^{-2}$	$4.2E^{-2}$
Kr-88	$7.6E^{-2}$	$9.1E^{-2}$	$6.3E^{-2}$	$8.0E^{-2}$	$7.4E^{-2}$	$8.0E^{-2}$
Xe-133	$3.1E^{-1}$	$3.9E^{-1}$	$2.9E^{-1}$	$3.7E^{-1}$	$3.4E^{-1}$	$3.7E^{-1}$
Xe-133M	$1.1E^{-2}$	$9.9E^{-3}$	$8.3E^{-3}$	$9.2E^{-3}$	$1.0E^{-2}$	$9.2E^{-3}$
Xe-135	$1.8E^{-1}$	$2.4E^{-1}$	$1.5E^{-1}$	$2.0E^{-1}$	$1.7E^{-1}$	$2.0E^{-1}$
Xe-135M	$2.9E^{-3}$	$3.6E^{-3}$	$3.3E^{-3}$	$3.6E^{-3}$	$3.7E^{-3}$	$3.6E^{-3}$
I-131	$5.6E^{-3}$	$6.6E^{-3}$	$5.3E^{-3}$	$6.0E^{-3}$	$6.6E^{-3}$	$6.0E^{-3}$
I-132	$2.0E^{-2}$	$2.0E^{-2}$	$1.7E^{-2}$	$1.8E^{-2}$	$1.7E^{-2}$	$1.8E^{-2}$
I-133	$1.4E^{-2}$	$1.3E^{-2}$	$1.4E^{-2}$	$1.2E^{-2}$	$1.3E^{-2}$	$1.2E^{-2}$
I-134	$3.4E^{-2}$	$2.7E^{-2}$	$1.7E^{-2}$	$2.1E^{-2}$	- *	$2.1E^{-2}$
I-135	$2.3E^{-2}$	$2.2E^{-2}$	- *	$2.2E^{-2}$	$2.2E^{-2}$	$2.2E^{-2}$
Rb-88	- *	$3.9E^{-2}$	- *	$4.1E^{-2}$	- *	$4.1E^{-2}$
Cs-138	$5.5E^{-2}$	$9.3E^{-2}$	- *	$9.8E^{-2}$	$4.4E^{-2}$	$9.8E^{-2}$

*Less than Minimum Detectable Activity

ATTACHMENT I

RADIOCHEMISTRY DATA

	10-18-84		10-19-84	
	PASS(μCi/gm)	HOT LEG (μCi/gm)	PASS(μCi/gm)	HOT LEG(μCi/gm)
Kr-85M	$2.6E^{-2}$	$4.1E^{-2}$	$2.9E^{-2}$	$4.0E^{-2}$
Kr-87	$2.4E^{-2}$	$4.4E^{-2}$	$3.2E^{-2}$	$3.9E^{-2}$
Kr-88	$5.1E^{-2}$	$8.2E^{-2}$	$6.7E^{-2}$	$7.6E^{-2}$
Xe-133	$2.4E^{-1}$	$3.8E^{-1}$	$2.7E^{-1}$	$3.4E^{-1}$
Xe-133M	$7.5E^{-3}$	$8.1E^{-3}$	$1.1E^{-2}$	$9.2E^{-3}$
Xe-135	$1.2E^{-1}$	$2.1E^{-1}$	$1.6E^{-1}$	$1.9E^{-1}$
Xe-135M	$2.4E^{-3}$	$3.5E^{-3}$	$1.5E^{-3}$	$3.8E^{-3}$
I-131	$5.1E^{-3}$	$5.8E^{-3}$	$5.4E^{-3}$	$5.6E^{-3}$
I-132	$1.9E^{-2}$	$1.8E^{-2}$	$1.7E^{-2}$	$1.8E^{-2}$
I-133	$1.4E^{-2}$	$1.2E^{-2}$	$1.3E^{-2}$	$1.3E^{-2}$
I-134	- *	$2.1E^{-2}$	$4.5E^{-2}$	$2.3E^{-2}$
I-135	$2.4E^{-2}$	$2.3E^{-2}$	$2.2E^{-2}$	$2.1E^{-2}$
Rb-88	- *	$4.1E^{-2}$	- *	$4.2E^{-2}$
Cs-138	$4.3E^{-2}$	$1.1E^{-1}$	$6.7E^{-2}$	$9.3E^{-2}$

*Less than Minimum Detectable Activity

ATTACHMENT 2

SIGNIFICANT MODIFICATION INCORPORATED IN UNIT I PASS

1. Reduced the size of the gas sample cylinder from 1000cc to 150cc.
2. Reduced the size of the liquid sample cylinder from 150cc to 95cc.
3. Added two 30cc sample cylinders in the gas sample loop.
4. Changed the diluted liquid sample port to a 40cc sample cylinder.
5. Rerouted the sump pump discharge to prevent chloride contamination of the liquid sample loop.
6. Increased sample loop volume to 5.2ml.
7. Relocated valve to provide sample movement and mixing with nitrogen.
8. Removed the nitrogen totalizer and incorporated manual activation of nitrogen flow.
9. Rerouted the sample flow to the pH meter so chloride contamination of the sample from the pH electrodes will not occur.
10. Revised alignment possibilities to allow for obtaining a sample if no pumps were in service.