REGULATORY I[redacted]ORMATION DISTRIBUTION SYS[redacted] (RIDS)

ACCESSION NBR:8311300247 DOC.DATE: 83/11/23 NOTARIZED: NO DOCKET #
FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400
50-401 Shearon Harris Nuclear Power Plant, Unit 2, Carolina 05000401
AUTH.NAME AUTHOR AFFILIATION
MCDUFFIE,M.A. Carolina Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards responses to draft SER open items re in-core exit thermocouple & subcooling instrumentation sys (NUREG-0737, Item II.F.2) & release of particulates & iodines from condenser vacuum pump exhaust.

DISTRIBUTION CODE: B001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 11
TITLE: Licensing Submittal: PSAR/FSAR Amdts & Related Correspondence

NOTES:

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
	NRR/DL/ADL		1	0	NRR LB3 BC		1	0
	NRR LB3 LA		1	0	BUCKLEY,B	01	1	1
INTERNAL:	ELD/HDS1		1	0	IE FILE		1	1
	IE/DEPER/EPB	36	3	3	IE/DEPER/IRB	35	1	1
	IE/DEQA/QAB	21	1	1	NRR/DE/AEAB		1	0
	NRR/DE/CEB	11	1	1	NRR/DE/EHEB		1	1
	NRR/DE/EQB	13	2	2	NRR/DE/GB	28	2	2
	NRR/DE/MEB	18	1	1	NRR/DE/MTEB	17	1	1
	NRR/DE/SAB	24	1	1	NRR/DE/SGEB	25	1	1
	NRR/DHFS/HFEB	40	1	1	NRR/DHFS/LQB	32	1	1
	NRR/DHFS/PSRB		1	1	NRR/DL/SSPB		1	0
	NRR/DSI/AEB	26	1	1	NRR/DSI/ASB		1	1
	NRR/DSI/CPB	10	1	1	NRR/DSI/CSB	09	1	1
	NRR/DSI/ICSB	16	1	1	NRR/DSI/METB	12	1	1
	NRR/DSI/PSB	19	1	1	NRR/DSI/RAB	22	1	1
	NRR/DSI/RSB	23	1	1	REG FILE	04	1	1
	RGN2		3	3	RM/DDAMI/MIB		1	0
EXTERNAL:	ACRS	41	6	6	BNL(AMDTS ONLY)		1	1
	DMB/DSS (AMDTS)		1	1	FEMA-REP DIV	39	1	1
	LPDR	03	1	1	NRC PDR	02	1	1
	NSIC	05	1	1	NTIS		1	1

TOTAL NUMBER OF COPIES REQUIRED: LTTR 53 ENCL 46

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8311300247 DOC.DATE: 83/11/23 NOTARIZED: NO DOCKET #
FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400
50-401 Shearon Harris Nuclear Power Plant, Unit 2, Carolina 05000401
AUTH.NAME AUTHOR AFFILIATION
MCDUFFIE,M.A. Carolina Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards responses to draft SER open items re in-core exit thermocouple & subcooling instrumentation sys (NUREG-0737, Item II.F.2) & release of particulates & iodines from condenser vacuum pump exhaust.

DISTRIBUTION CODE: A001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 11
TITLE: Licensing Submittal: PSAR/FSAR Amdts & Related Correspondence

NOTES:

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
	NRR/DL/ADL		1	0	NRR LB3 BC		1	0
	NRR LB3 LA		1	0	BUCKLEY,B	01	1	1
INTERNAL:	ELD/HDS1		1	0	IE FILE		1	1
	IE/DEPER/EPB	36	3	3	IE/DEPER/IRB	35	1	1
	IE/DEQA/QAB	21	1	1	NRR/DE/AEAB		1	0
	NRR/DE/CEB	11	1	1	NRR/DE/EHEB		1	1
	NRR/DE/EQB	13	2	2	NRR/DE/GB	28	2	2
	NRR/DE/MEB	18	1	1	NRR/DE/MTEB	17	1	1
	NRR/DE/SAB	24	1	1	NRR/DE/SGEB	25	1	1
	NRR/DHFS/HFEB	40	1	1	NRR/DHFS/LQB	32	1	1
	NRR/DHFS/PSRB		1	1	NRR/DL/SSPB		1	0
	NRR/DSI/AEB	26	1	1	NRR/DSI/ASB		1	1
	NRR/DSI/CPB	10	1	1	NRR/DSI/CSB	09	1	1
	NRR/DSI/ICSB	16	1	1	NRR/DSI/METB	12	1	1
	NRR/DSI/PSB	19	1	1	NRR/DSI/RAB	22	1	1
	NRR/DSI/RSB	23	1	1	REG FILE	04	1	1
	RGN2		3	3	RM/DDAMI/MIB		1	0
EXTERNAL:	ACRS	41	6	6	BNL(AMDTS ONLY)		1	1
	DMB/DSS (AMDTS)		1	1	FEMA-REP DIV	39	1	1
	LPDR	03	1	1	NRC PDR	02	1	1
	NSIC	05	1	1	NTIS		1	1

TOTAL NUMBER OF COPIES REQUIRED: LTTR 53 ENCL 46

CP&L

Carolina Power & Light Company

NOV 23 1983

SERIAL: LAP-83-541

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

SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NOS. 1 AND 2
DOCKET NOS. 50-400 AND 50-401
DRAFT SAFETY EVALUATION REPORT RESPONSES

Dear Mr. Denton:

Carolina Power & Light Company (CP&L) hereby transmits one original and forty copies of responses to Shearon Harris Nuclear Power Plant Draft Safety Evaluation Report Open Items. The response numbers are listed on the cover page of the attachment along with the corresponding review branch and reviewer for each response.

We will be providing responses to other Open Items in the Draft Safety Evaluation Report shortly.

Yours very truly,

M. A. McDuffie
Senior Vice President
Nuclear Generation

FXT/lcv (8541FXT)
Attachment

cc: Mr. B. C. Buckley (NRC)
Mr. N. Wagner (NRC)
Mr. G. F. Maxwell (NRC-SHNPP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. Travis Payne (KUDZU)
Mr. Daniel F. Read (CHANGE/ELP)
Mr. R. P. Gruber (NCUC)
Chapel Hill Public Library
Wake County Public Library
Mr. Wells Eddleman
Dr. Phyllis Lotchin
Mr. John D. Runkle
Dr. Richard D. Wilson
Mr. G. O. Bright (ASLB)
Dr. J. H. Carpenter (ASLB)
Mr. J. L. Kelley (ASLB)

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

B001
1/1

LIST OF OPEN ITEMS, REVIEW BRANCH, AND REVIEWER

CORE PERFORMANCE BRANCH/T. HUANG
OPEN ITEM 31

METEOROLOGICAL & EFFLUENT TREATMENT BRANCH/J. HAYES
OPEN ITEM

(8541FXT1cv)

Shearon Harris Nuclear Power Plant
Draft SER Open Item 31
Supplemental Information

The applicant has been requested to provide an evaluation of the conformance of the incore exit thermocouple and the subcooling instrumentation system with NUREG-0737, Appendix B, "Design and Qualification Criteria for Accident Monitoring Instrumentation."

Response

The applicant's previous submittal on the documentation required for NUREG-0737 Item II.F.2 provides a description of the inadequate core cooling instrumentation to be used at Shearon Harris. In particular, the design utilizes a computer based processing system (ERFIS) for primary display of incore exit thermocouple and margin of subcooling data. Although ERFIS is non-Class 1E, it receives qualified pressure and temperature signals through an accessible isolator, and is powered from a high reliability power source which is battery backed. ERFIS computes margin of subcooling data which is displayed together with incore exit thermocouple temperature on the SPDS CRT located on the MCB.

A qualified backup redundant display device is also located in the Control Room which will display qualified incore exit thermocouple temperatures. Qualified RCS pressure information can also be obtained from the indicators on the MCB. In accordance with the provisions of Regulatory Guide 1.97 Revision 3, this allows the operator to confirm displayed subcooling data, when used in conjunction with ASME Steam Tables.

An evaluation of the conformance of the above system with NUREG-0737 Appendix B is made as follows:

(1) The instrumentation will be environmentally qualified in accordance with Regulatory Guide 1.89 (NUREG-0588). For the backup systems, qualification applies to the complete instrument channel from sensor to display. For the primary ERFIS based system, qualification applies up to and including the isolation devices. The isolators are accessible for maintenance during accident conditions. Seismic qualification of the above environmentally qualified systems will be in accordance with Regulatory Guide 1.100. The instrumentation will continue to read within the required accuracy following a safe shutdown earthquake.

The instrument range for which it is qualified meets the range required as noted in the applicant's submittal of Regulatory Guide 1.97 Revision 3.

(2) No single failure within the above described instrumentation system will prevent the operator from being presented with information necessary to determine the safety status of the plant and to bring the plant to a safe and maintainable condition following an accident.

This can be accomplished since RCS pressure instrumentation has redundant trains and incore exit thermocouple instrumentation has the redundancy (4 thermocouples per train per core quadrant) recommended by NUREG-0737 Item II.F.2. Additional diverse pressure and RCS Loop temperature information is available to supplement the other instrumentation should redundant displays disagree.

Redundant channels are electrically independent, energized from station Class 1E power sources, and are physically separated in accordance with Regulatory Guide 1.75 up to and including any isolation device. At least one channel can be displayed on a direct indicating or recording device.

(3) The incore exit thermocouple and RCS wide range pressure instrumentation is energized from station Class 1E power sources.

(4) Instrumentation channel availability will be provided as specified in SHNPP Technical Specifications.

(5) The guidance of Regulatory Guides 1.28, 1.30, 1.38, 1.58, 1.64, 1.74, 1.88, 1.123, 1.144 and 1.146 have been utilized as described in FSAR Section 1.8.

(6) Display and recording capabilities have been provided consistent with those required in Regulatory Guide 1.97 Revision 3.

(7) Refer to (6).

(8) Post Accident Monitoring instrumentation is easily identifiable by the use of color coded bezels etc.

(9) Isolation devices are utilized to ensure that Class 1E instrumentation channels are not degraded by non-Class 1E channels.

(10) Means are available for checking channel operational availability during reactor operation.

(11) Servicing, testing, and calibrating programs will be specified to ensure that the necessary level of qualification is maintained during plant operation.

(12) Removal of channels from service will be controlled by administrative procedures.

(13) Administrative control will determine access to calibration, adjustment, and test points.

(14) The monitoring instrumentation has included in its design, consideration for minimizing situations that would be potentially confusing to the operator.

(15) The instrumentation has been designed to facilitate the recognition, location, replacement, repair, or adjustment of malfunctioning components or modules.

(16) Monitoring instrumentation includes incore exit thermocouples which measure temperature immediately above the core, and RCS wide range pressure sensors which monitor RCS system pressure. The margin of subcooling is primarily calculated by the ERFIS. The backup method of calculating margin of subcooling is provided by utilizing the above 1E sensor information (1E Display in the MCR) in conjunction with ASME Steam Tables.

(17) The above instrumentation will be utilized during normal operation thus assuring operator familiarity.

(18) Periodic testing of the instrument channels will be in accordance with the applicable provisions of Regulatory Guide 1.118 as noted in SHNPP FSAR Section 1.8.

Shearon Harris Nuclear Power Plant
Draft SER Open Item
Additional Information

Provide additional information on the release of particulates and iodines from the condenser vacuum pump exhaust.

RESPONSE

CP&L has completed the calculations necessary to establish a relationship between the noble gas monitor reading and the amount of released particulates and iodines. The approach intended to be used is as presented below.

The isotopic concentrations in the condenser vacuum pump effluent stream have been calculated under tech-spec and normal operating conditions. Assumptions used in this calculation were consistent with the assumptions used in calculating the effluent releases presented in Section 11.3 of the FSAR. As described in Attachment 1 of this memo all isotopic concentrations were normalized to XE-133, as a function of time after shutdown. Particulate and iodine releases are estimated by multiplying the condenser air ejector radiation monitor reading, by the appropriate isotopic composition fractions presented in Table 1 of Attachment 1. The primary isotopic contributors to this reading are XE-133 and KR-85. The particulate and iodine composition fractions vary as a function of time as presented in Figure 1 of Attachment 1. After completion of hogging operations the amount of particulates and iodines released shall be estimated by the composition fraction method. This shall provide a conservative estimate of releases. It is expected that under actual operating conditions concentration levels less than those shown in the calculations of Attachment 1 shall apply. The calculation methodology is further explained in Attachment 2.

It should be noted that no "clean up" credit is taken for the use of the condensate polishing system. This system would normally be operational prior to initiating hogging operations.

ATTACHMENT 1

TABLE 1

Relationship Between Nuclides Normalized to Xe-133

Nuclide	No Decay	18-day Decay	30-day Decay
Kr-85m	2.78(-2)	(-)	(-)
Kr-85	1.54(-3)	1.56(-2)	7.19(-2)
Kr-88	4.17(-2)	(-)	(-)
Xe-133m	1.39(-2)	7.76(-4)	1.13(-4)
Xe-133	1.00	1.00	1.00
Xe-135	5.56(-2)	(-)	(-)
I-131	3.89(-4)	8.33(-4)	1.38(-3)
I-133	5.83(-4)	9.21(-9)	5.79(-12)
Sr-89	9.17(-9)	7.29(-8)	2.90(-7)
Sr-90	1.81(-10)	1.81(-9)	8.48(-9)
Cs-134	1.01(-6)	1.00(-5)	4.62(-5)
Cs-137	7.36(-7)	7.40(-6)	3.45(-5)

(8535NLUccc)

TABLE 2

Xe-133 Condenser Air Ejector Concentrations (μCi/cc)

No Decay

Normal Op. Coolant Levels	- Normal Flow (30 cfm)	-2.0(-4)
Tech Spec Coolant Levels	- Normal Flow	-6.2(-2)
Normal Op. Coolant Levels	- Hogging (1260 cfm)	-4.8(-6)
Tech Spec Coolant Levels	- Hogging	-1.5(-3)

18-day Decay

Normal Op. Coolant Levels	- Hogging	4.8(-7)
Tech Spec Coolant Levels	- Hogging	1.5(-4)

(8535NLUccc)

ATTACHMENT 2

CALCULATION METHODOLOGY

1. Identify the amount of time passed since shutdown.

2. From Figure 1 of Attachment 1 pick the appropriate composition function values for particulates and iodines.

3. Note the average radiation monitors readings.

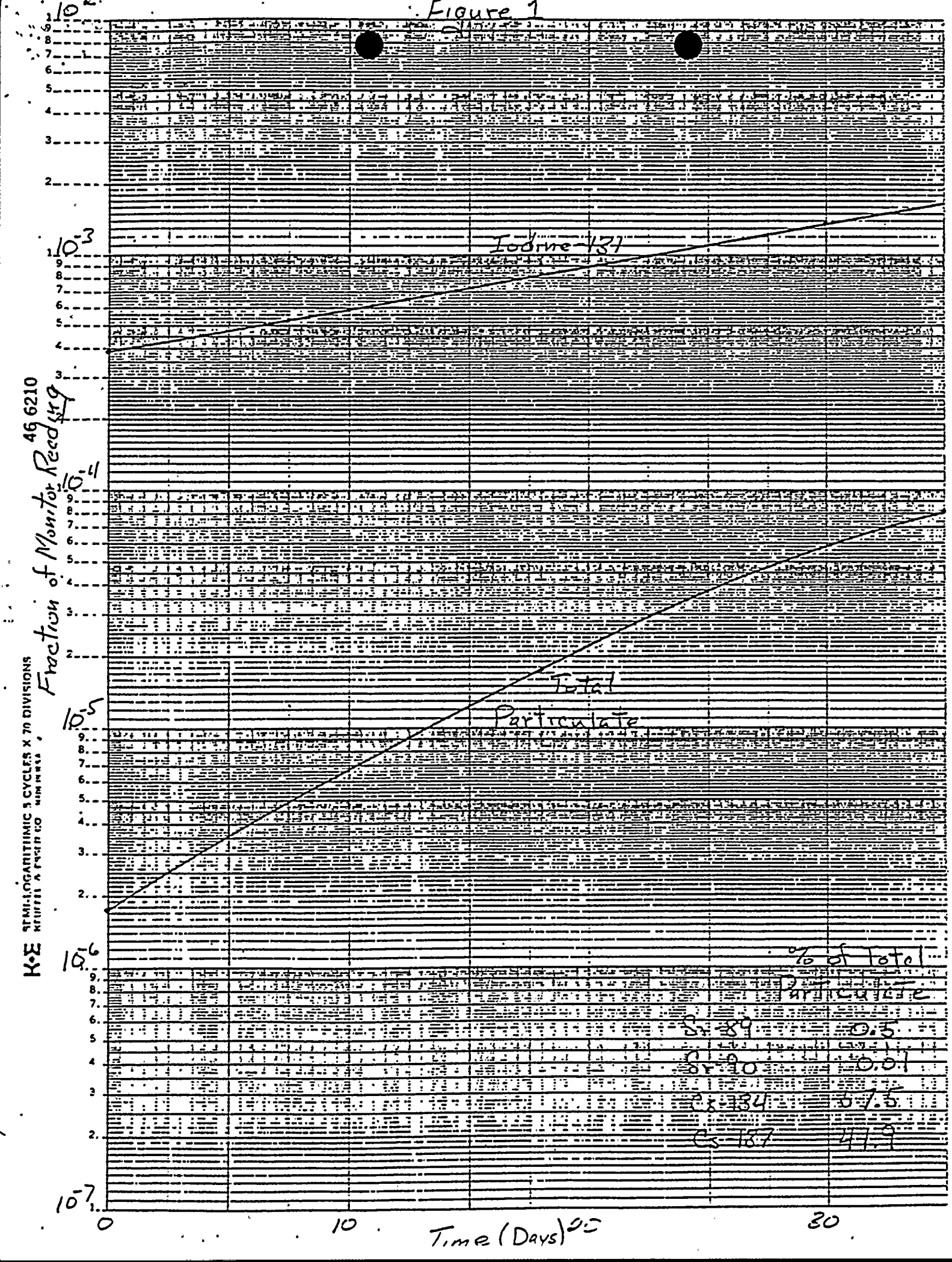
4. From Figure 2 Attachment 1 based on Step 1 above identify the expected composition of noble gases XE-133 and Kr-85.

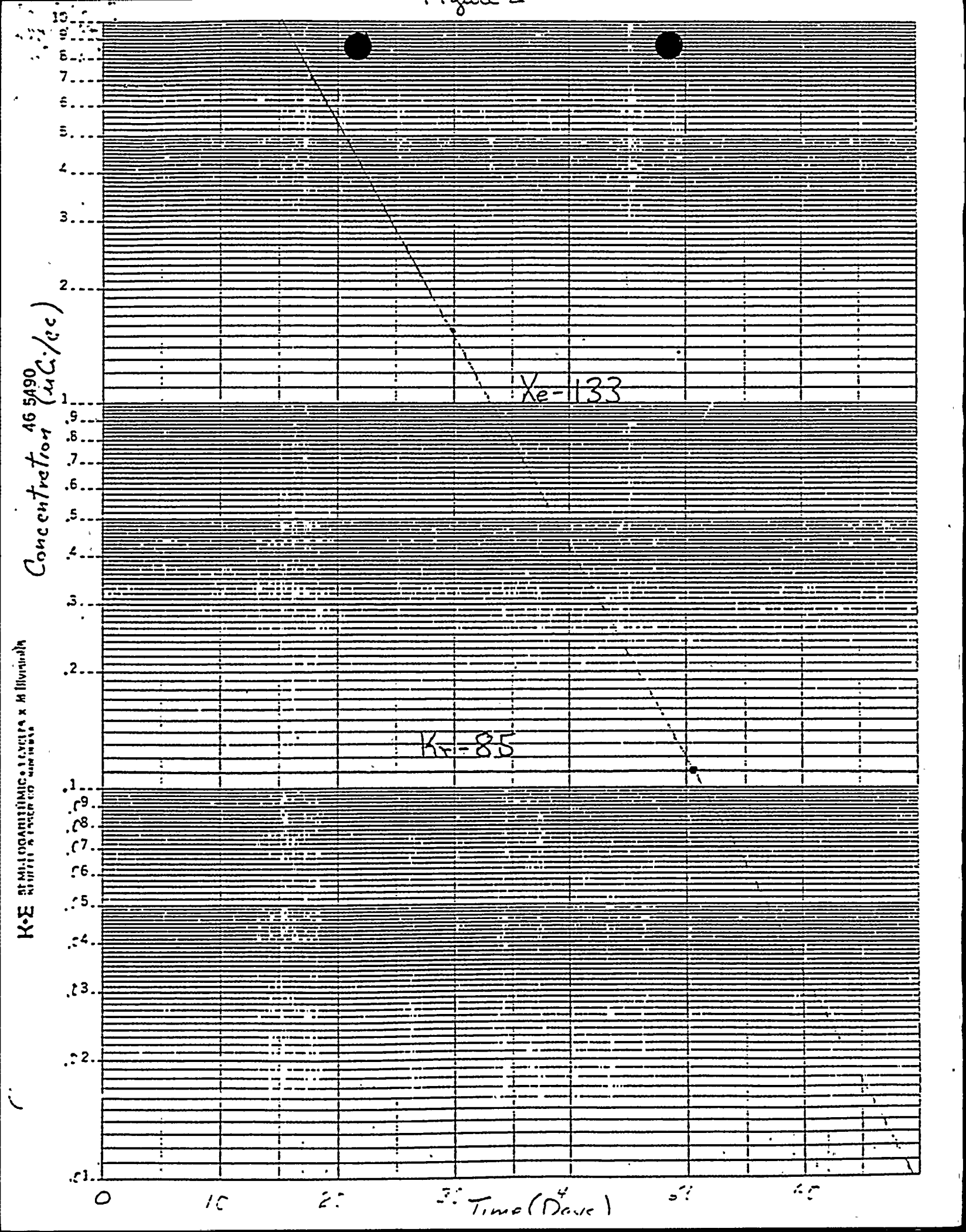
5. Using the radiation monitor calibration reports calculate actual concentrations of XE-133 and Kr-85. (This is important only in the case of a prolonged shutdown greater than 40 days. This step was added to prevent overestimation of releases.)

6. Having calculated the XE-133 concentration multiply it by the composition fractions obtained via Step 2 above. (In the case of a short shutdown less than 40 days it can be assumed that the sole contributor to monitor readings is XE-133, the effect of Kr-85 can be ignored.)

7. Record the estimated valves to permit reported as required by R.G. 1.21.

Figure 1


Iodine-131
Total Particulate
Fraction of Monitor Reading
Time (Days)
0
10
20
10^-3
10^-4
10^-5
10^-6
10^-7
% of Total Particulate
Sr-89 0.5
Sr-90 0.01
Cs-134 37.5
Cs-137 47.9
K+E 46 6210
SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS


Concentration (μCi/cc)
Xe-133
Kr-85
Time (Days)
0
10
20
30
40
50
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
.09
.08
.07
.06
.05
.04
.03
.02
.01
2
3
4
5
6
7
8
9
10