

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9005020113      DOC. DATE: 90/04/20      NOTARIZED: NO      DOCKET #  
 FACIL: 50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina      05000400  
 AUTH. NAME      AUTHOR AFFILIATION  
 SCHWABENBAUER      Carolina Power & Light Co.  
 RICHEY, R.B.      Carolina Power & Light Co.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 90-007-00: on 900321, Tech Spec violation due to  
 miscalculation of waste gas decay tanks noble gases.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5 ltr.  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: Application for permit renewal filed.      05000400

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INTERNAL:	ACNW	2 2	ACRS	2 2
	AEOD/DOA	1 1	AEOD/DSP/TPAB	1 1
	AEOD/ROAB/DSP	2 2	DEDRO	1 1
	NRR/DET/ECMB 9H	1 1	NRR/DET/EMEB9H3	1 1
	NRR/DET/ESGB 8D	1 1	NRR/DLPQ/LHFB11	1 1
	NRR/DLPQ/LPEB10	1 1	NRR/DOEA/OEAB11	1 1
	NRR/DREP/PRPB11	2 2	NRR/DST/SELB 8D	1 1
	NRR/DST/SICB 7E	1 1	NRR/DST/SPLB8D1	1 1
	NRR/DST/SRXB 8E	1 1	<del>REG FILE 02</del>	1 1
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EXTERNAL:	EG&G STUART, V.A	4 4	L ST LOBBY WARD	1 1
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**Carolina Power & Light Company**

P. O. Box 165 • New Hill, N. C. 27582

APR 20 1990

R. B. RICHEY  
Manager  
Harris Nuclear Project

Letter Number: HO-900080 (O)

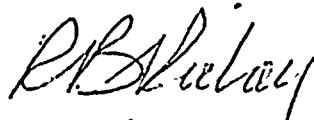
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SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1  
DOCKET NO. 50-400  
LICENSE NO. NPF-63  
LICENSEE EVENT REPORT 90-007-00

Gentlemen:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Licensee Event Report is submitted. This report fulfills the requirement for a written report within thirty (30) days of a reportable occurrence and is in accordance with the format set forth in NUREG-1022, September 1983.

Very truly yours,



R. B. Richey, Manager  
Harris Nuclear Project

RBR:dgr

Enclosure

cc: Mr. R. A. Becker (NRR)  
Mr. S. D. Ebnetter (NRC - RII)  
Mr. J. E. Tedrow (NRC - SHNPP)

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1 DOCKET NUMBER (2) 0 5 | 0 0 | 0 4 | 0 0 | PAGE (3) 1 OF 0 | 4

TITLE (4) TECHNICAL SPECIFICATION VIOLATION DUE TO A MISCALCULATION OF THE WASTE GAS DECAY TANKS NOBLE GASES CAUSED BY AN INACCURATE INTERPRETATION

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)			
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)		
03	21	90	90	007	00	04	20	90	N/A	0 5   0 0   0 0		
										0 5   0 0   0 0		

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

OPERATING MODE (9) 1	20.402(b)	20.406(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 100	20.406(a)(1)(i)	50.38(c)(1)	50.73(a)(2)(v)	73.71(c)
	20.406(a)(1)(ii)	50.38(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.406(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.406(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.406(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME RICHARD SCHWABENBAUER - REGULATORY COMPLIANCE TECHNICIAN	TELEPHONE NUMBER
	AREA CODE 9   19   3   6   2   -   2   6   6   9

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

**Abstract:**

The plant was operating in Mode 1, POWER OPERATION, at 100 percent reactor power on March 21, 1990. Technical Specification (TS) 3.11.2.6 requires that the quantity of noble gas in a waste gas decay tank (WGDT) shall not exceed 1.05 E+05 Curies (Ci) as "Xe-133 equivalent". During a review of the WGDT event reported in LER-90-006-00, Chemistry and Radwaste personnel discovered that the present calculational approach used in Radiochemistry procedure CRC-255, Waste Gas Decay Tank Sampling, is incapable of deriving the inventory approximation on a "Xe-133 equivalent" basis.

The cause of the event, a miscalculation, is attributed to an inaccurate interpretation of the "Xe-133 equivalent" term in TS. The interpretation allowed a deviation from an equivalence based calculation, and therefore provided the basis for the present miscalculation.

Corrective action for the event is CRC-255 has been revised to incorporate the appropriate Xe-133 dose equivalency weighting factors in the procedure to ensure the proper calculation.

There were no safety consequences as a result of this event as a recalculation of the WGDT Ci inventories demonstrated that although the inventory determinations have been nonconservative in a small percentage of the cases, the calculational errors have not resulted in, or approached, the exceedance of any TS limit.

This event is being reported in accordance with 10CFR50.73(a) (2) (i) (B) as a Technical Specification violation.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	DOCKET NUMBER (2)  0   5   0   0   0   4   0   0	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9   0	-   0   0   7	-   0   0	0   2	OF 0   4

TEXT (If more space is required, use additional NRC Form 368A's) (17)

Description:

The plant was operating in Mode 1, POWER OPERATION, at 100 percent reactor power on March 21, 1990. Chemistry and Radwaste Engineering personnel were evaluating the Waste Gas Decay Tank (WGDT) crosstie event reported in LER-90-006-00. During the course of this evaluation they discovered that the present calculational approach used to determine the WGDT Curie (Ci) inventory was contradictory with Technical Specification (TS) 3.11.2.6 requirements. The limiting condition of operation restricts the quantity of noble gas in each WGDT to less than or equal to 1.05 E+05 Ci, but explicitly references the Ci limit in terms of a "Xe-133 equivalent". However, rather than scaling the measured isotopic activities relative to a characteristic Xe-133 weighting factor (e.g. energy or dose equivalent) the implementing Radiochemistry procedure CRC-255, Waste Gas Decay Tank Sampling, simply summed the isotopic activities as the basis for the Ci inventory derivation. Since the personnel investigating this calculation recognized that the calculational equation, used in CRC-255, could potentially result in a nonconservative approximation of the WGDT inventory, the validity of the existing calculational approach was challenged and determined to be incorrect.

Cause:

The event was caused by an inaccurate interpretation of the "Xe-133 equivalent" term in TS 3.11.2.6. In November 1984 plant personnel interpreted "Xe-133 equivalent" to mean if all the activity in a WGDT were Xe-133. This interpretation allowed a deviation from an equivalence based calculation and therefore provided the basis for the present incorrect calculation. The following factors are considered to be contributing elements to the cause of this event:

1. To a large extent, the initial interpretation was a direct result of a misreading of the term "Xe-133 equivalent." At that time there was substantial confusion over whether reference was made to dose equivalent, energy equivalent, or some other equivalency. Because most references to an equivalency explicitly state the basis (e.g. I-131 dose equivalent) it was interpreted by default that the Xe-133 equivalency was not dose related.
2. The plant's interpretations of "Xe-133 equivalent" was based on a perception that the predominant isotope in a WGDT was Xe-133. As such, the WGDT isotopic mixture could be assumed to represent pure Xe-133 since the relative contributions from other isotopes would be insignificant.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1) SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	DOCKET NUMBER (2) 0   5   0   0   0   4   0   0   9   0   -   0   0   7   -   0   0   0   3   OF   0   4	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		

TEXT (If more space is required, use additional NRC Form 386A's) (17)

Analysis:

There were no safety consequences as a result of this event as a recalculation of the WGDT Ci inventories demonstrated that although the inventory determinations have been nonconservative the calculational error has not resulted in or approached the exceedance of any TS limit.

The Technical Specifications limit the total noble gas inventory in a WGDT to 105,000 Ci, considered as "Xe-133 equivalent". The determination of the daily surveillance is performed using the calculational methodology in CRC-255. As outlined in this procedure, the calculation of the total noble gas inventory is based on a summation of individual isotopes identified in a gamma spectrum analysis. As such this calculational approach does not derive the Ci inventory on a "Xe-133 equivalent" basis.

In order to determine whether or not the current calculational approach was nonconservative, and correspondingly, to evaluate the validity of the current calculational method, the WGDT noble gas activities were recalculated using a Xe-133 dose equivalent basis. The Xe-133 dose equivalent approach is considered analogous to the TS reference to "Xe-133 equivalent" since the derivation of the WGDT Ci limit is based exclusively on the whole body dose at the site boundary. Following computation of the nuclide-specific weighting factors (Nuclide X whole body dose factor/Xe-133 whole body dose factor) each factor was multiplied by the corresponding nuclide activity in each release during the period January 1, 1990 through March 29, 1990. The ratio of the weighted Xe-133 dose equivalent to nonweighted (present summation method) activity was then derived. Of the 200 WGDT measurements in 1990, roughly two-thirds were shown to have ratios less than or equal to 1, suggesting that the current calculational method in CRC-255 is equally or more conservative than the Xe-133 dose equivalent calculation. The remaining one-third ratios provide evidence that the present calculations have underestimated the waste gas inventory by a factor of 2-10.

Assuming that the 1990 ratios reflect a representative range of expected values, the most conservative ratio, 10, can be used to calculate an upper limit approximation of how close the actual activity approached the TS limit. Since the highest observed tank inventory during the period January 1988 through March 1990 was approximately 10 Ci, and if this estimate is assumed nonconservative by a factor of 10, then the recalculation would show that the plant was still a factor of 1,000 below the TS limit of 105,000 Ci.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	DOCKET NUMBER (2) 0   5   0   0   0   4   0   0   9   1   0   -   0   0   7   -   0   0   0   4   OF   0   4	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		

TEXT (If more space is required, use additional NRC Form 366A's) (17)

The earlier plant recommendation to exclude a Xe-133 equivalence based calculation, on the basis that Xe-133 was the primary constituent, was unbounded within the context of the TS 3/4.11.2.6 bases. Although the TS bases do not provide specific guidance on the "Xe-133 equivalent" calculation, the basis for the WGDT Ci limit is clearly derived using a dose equivalency approach.

This event is being reported in accordance with 10CFR50.73(a) (2) (i) (B) as a Technical Specification violation.

There have been no similar events reported.

Corrective Action:

1. The implementing procedure, CRC-255, has been revised to incorporate the Xe-133 dose equivalent weighting factors into the calculational equation.

EIIS Code Information:

Waste Gase Decay Tank

WE