NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	1 OF 0 9

TITLE (6)
Inadvertent Release Due To Leakage Following System Maintenance

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)
0 2	0 8	8 8	8 8	— 0 1 2 —	0 0	0 3	3 1	8 8	Catawba, Unit 2	0 5 0 0 0 4 1 4
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OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 9 7	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	Voluntary
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER	
	AREA CODE	
Julio G. Torre, Associate Engineer - Licensing	7 0 4	3 7 3 - 8 0 2 9

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On February 8, 1988, from approximately 0530 hours to approximately 0730 hours, the contents of the in-service Waste Gas Decay Tank (WGDT) were inadvertently released to the environment due to a leak following a maintenance activity. The concentration of the radioactive gases released was insufficient to cause an alarm of the Auxiliary Building Ventilation or Unit Vent Radiation Monitors. Station personnel were not aware of the leak until the WGDT was empty. An estimated 7.46 Curies of noble gases were released during the event. Unit 1 was at 97% power and Unit 2 was in Mode 6, Refueling, at the time of this incident.

The leakage was subsequently discovered to have occurred at a removable vent plug on a Waste Gas (WG) compressor moisture separator. Both Radwaste Chemistry (RDW) and Mechanical Maintenance (MM) personnel had attempted to remove the vent plug prior to the maintenance, but it could not be removed and did not appear to have moved. Apparently, the vent plug had been moved just enough to unseat it and caused it to leak. This incident is also attributed to a personnel error. A RDW Specialist incorrectly calculated an increase in the in-service WGDT pressure during the shift.

This incident has been reviewed with the RDW Specialist involved. A change to the RDW procedure has been initiated to require leak checks to be performed. A program change request is being submitted for the Operator Aid Computer to provide an alarm upon decreasing WGDT pressure. This event was determined to be not reportable. This LER is being submitted as a voluntary report for information purposes. The health and safety of the public were unaffected by this event.

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* U.S.GPO:1984-0-464-481/18759

BACKGROUND:

The purpose of the Waste Gas (WG) System is to remove fission product gases from radioactive fluids. WG Decay Tanks (EIIS:TK) are provided to contain these gases for a relatively long period of time. The system is designed to allow for maximum decay time of radioactive gases prior to their monitored and controlled release to the environment.

The WG System is a closed loop system comprised of two compressors (EIIS:CMP), two catalytic hydrogen recombiners (EIIS:RCB), six WG decay tanks (WGDTs) for normal power service and two WGDTs for service at shutdown and startup. The system is shared between the two Catawba Units. All of the WG system equipment is located in the Auxiliary Building. The eight WGDTs are vertical and cylindrical with a volume of 600 cubic feet each and a design pressure of 150 psig.

During normal power operation, nitrogen gas, with contained fission gases, is continuously circulated around the WG system loop by one of two compressors. Fresh hydrogen gas is continuously introduced into both Unit Volume Control Tanks (VCTs), where it is mixed with fission gases which have been stripped from the Reactor (EIIS:RCT) Coolant (EIIS:AB) into the VCT gas space by the VCT letdown line nozzle (EIIS:NZL) spray. The hydrogen and fission gas mixture is continuously vented from the VCT into the circulating nitrogen and fission gas stream in the WG loop.

The resulting mixture of nitrogen, hydrogen, and fission gases is transferred by one of the compressors to one of the catalytic hydrogen recombiners where enough oxygen is added to reduce the hydrogen to a residual level. After the resulting water vapor is condensed and removed, the cooled gas stream is discharged from the recombiner, routed to a WGDT, and sent back to the compressor suction to complete the loop circuit. During this process the in-service WGDT's pressure and radioactivity level gradually increase. When these parameters approach established limits, another WGDT is placed in service and the previously used WGDT is isolated. This tends to equalize the radioactivity of the WGDTs and minimizes the off-site dose consequences of a WGDT rupture or leak.

The primary source of radioactive gas input to the WG System is the VCT purge. Smaller quantities are received from the recycle evaporator gas strippers, the NC Drain Tanks (NCDTs) and the Recycle Holdup Tanks (RHTs).

The WG compressors are water sealed, centrifugal displacement compressors. Gas enters the compressor suction at a pressure of 0.5 psig and at a temperature of 130 deg. F or lower. After compression, the gas is discharged along with the seal water into the moisture separator (where the seal water is removed), and the gas is then discharged to the recombiner. The seal water is returned to the compressor after being cooled and passed through a Y-strainer. An adjustable back pressure control valve maintains the normal moisture separator pressure at 50 to 60 psig to provide the motive force for compressor seal water circulation.

The Auxiliary Building Ventilation (VA) System is designed to provide the normal ventilation/heating and emergency exhaust requirements for the Auxiliary Building. Control of airborne radioactivity in the Auxiliary Building is accomplished by exhausting air supplied to clean areas through potentially contaminated areas, through the filtered exhaust ducts. This provides a positive flow of air from areas not expected to be contaminated to areas of potential contamination. The filtered exhaust normally bypasses the installed high efficiency particulate absolute (HEPA) (EIIS:FLT) filters and charcoal adsorber banks, and is routed directly to the Unit vents.

Process Radiation Monitor (EMF) 1EMF41 monitors the gaseous airborne radioactivity levels of the Auxiliary Building air by sequentially sampling 1 cubic foot per minute of air taken from 12 pre-selected points in the VA filtered exhaust ducting. When the monitor detects the gaseous radioactivity levels corresponding to a 2 mR/hr submersion dose rate in a Xenon-133 cloud (Trip 2 setpoint), the filtered exhaust is automatically switched to the FILTER MODE and an audible alarm is received in the Control Room. A visual alarm (Trip 1) occurs at 75% of the Trip 2 setpoint.

The Fuel Pool Ventilation (VF) Systems, Containment Purge (VP) Systems, VA Systems, Containment Air Release and Addition (VQ) Systems, Annulus Ventilation (VE) Systems, condensate steam air ejectors, WGDT releases, and other potentially radioactive sources are exhausted to the Unit vents. Unit 1&2EMF 35, 36, and 37 are designed to continuously monitor the particulate, gaseous and iodine radioactivity levels of the air being exhausted through the Unit vents to the atmosphere.

Upon detection of high radioactivity levels by the Unit vent radioactivity monitors, the affected Unit's VF, VP, VA and VQ System fans will automatically be secured and an alarm will sound in the Control Room. Additionally, any open VP, WG, or VQ release isolation valves will automatically close in an attempt to isolate the probable sources of the high radioactivity. The Unit vent gaseous radioactivity monitor's (1&2EMF36) alarm/trip setpoints are established and set to limit the annual Site Boundary whole body dose to any member of the public from gaseous radioactivity, to 0.5 Rem.

Technical Specification 3.11.2.6 limits the quantity of radioactivity contained in any WGDT to 97,000 Curies of noble gases (considered as Xenon-133 equivalent). This limit is based upon assuring that whole body exposure to a member of the public at the nearest Exclusion Area Boundary (EAB) will not exceed 0.5 Rem following an uncontrolled release of the tank's contents. In-service WGDTs are sampled and isotopically analyzed daily to determine the Curie content.

DESCRIPTION OF INCIDENT

On January 13, 1988, at 1230 hours, Radwaste Chemistry (RDW) originated Work Request 554 RDW to allow cleaning the Y-strainer on WG Compressor B. The compressor had recently been rebuilt and yet low flow alarms were being received on the hydrogen recombiner when this compressor was in service. It was suspected that the compressor was not receiving adequate seal water due to its Y-strainer being obstructed.

On February 5, 1988, at 1315 hours, a Chemistry Supervisor originated Tagout (R&R) 18-48 to allow draining the WG Compressor B moisture separator prior to beginning Y-strainer cleaning. The draining would eliminate spilling of seal water when the Y-strainer was opened. The R&R directed the RDW personnel to open the moisture separator drain valves to the sump (after securing and isolating the compressor) and after the moisture separator level stopped decreasing, to remove the vent plug on the side which would allow air to enter and all the water to drain out. The R&R said to allow approximately 10 minutes before reinstalling the vent plug and clearing the R&R.

At 1345 hours, the Chemistry Supervisor originated R&R 18-49 to allow cleaning of the Y-strainer. The R&R specified the proper equipment alignments to be made following completion of the work and stated that the vent plug was to be checked for leakage upon returning the compressor to service.

On February 7, 1988, at 1338 hours, a Health Physics (HP) Technician obtained the daily in-service WGDT gas sample from WGDT D and submitted the sample for isotopic analysis. The analysis showed the WGDT contained 6.3482 Curies (Xenon 133 equivalent) of noble gases.

At approximately 2300 hours, on February 7, 1988, a RDW Specialist initiated R&R 18-48 which included securing, draining, and isolating WG Compressor B. When the moisture separator level stabilized, the RDW Specialist attempted to remove the vent plug to completely drain the water from the separator. The vent plug would not move. The Mechanical Maintenance (MM) crew then attempted to remove the vent plug, but also were not successful. No one was aware that the vent plug had turned. At 2330 hours, the RDW and MM Supervisors agreed that the work could continue since the moisture separator level indicated zero. At 2350 hours, R&R 18-48 was cleared by the RDW personnel.

On February 8, 1988, at 0030 hours, R&R 18-49 was initiated by RDW personnel to allow MM to clean the Y-strainer. At approximately 0300 hours, MM personnel removed, cleaned, and replaced the strainer.

At 0400 hours, the RDW Specialist recorded the 4 hour WGDT pressures. WGDT D pressure was recorded as 42.8 psig. The WGDT pressures are printed hourly by the Operator Aid Computer (OAC). The RDW personnel record these pressures only every 4 hours in the RDW logbook (i.e., only the 0400, 0800, 1200...pressures are recorded). At 0500 hours, WGDT D pressure was 42.4 psig according to the OAC printout.

At 0530 hours, the RDW Specialist cleared R&R 18-49 and started WG Compressor B. The RDW Specialist and a MM Technician performed a leak check of the Y-strainer and no leaks were found. The leak check was performed by spraying a liquid (SNOOP) on the sealing surfaces and observing for bubbles. The vent plug was not checked since it had not been removed and no one believed it had been moved by the attempts to remove it. The noise level from the running compressor would have made it difficult to hear any leakage.

At 0600 hours, WGDT D pressure was 30.1 psig according to the OAC printout (a 12.3 psig decrease since 0500 hours).

At 0615 hours, the RDW Specialist signed off the work request as completed. Low flow and high oxygen alarms on the hydrogen recombiner began to occur intermittently. The RDW Specialist reverified the WG valve alignments. The RDW Technician informed the RDW Specialist that he was having trouble establishing eduction of the RHTs. They verified the valve alignments were correct. Since it was nearly shift turnover time, the RDW Specialist began making preparations for turnover. When calculating the in-service WGDT pressure change for the shift, the RDW Specialist mistakenly utilized the 0500 hour, 42.4 psig OAC reading instead of the 0600 hour, 30.1 psig OAC reading and documented a 1.3 psig WGDT pressure increase during the shift.

During turnover to the on-coming RDW shift personnel, the RDW Specialist discussed the problems with the high oxygen alarms and RHT eduction. The RDW Specialist speculated that the oxygen analyzer may have been going out of calibration. Shift turnover was completed at approximately 0655 hours.

At 0700 hours, WGDT D pressure was 14.7 psig according to the OAC. At 0710 hours, WG Compressor B automatically tripped on low suction pressure. By 0720 hours, RDW personnel had verified the valve alignment from R&R 18-49 in an attempt to discover the cause of the compressor trip. The valve alignment was correct. At 0735 hours, the cause was discovered to be the loss of all pressure in WGDT D. The RDW personnel contacted and informed their General Supervisor of the situation.

At 0745 hours, RDW personnel notified HP and Operations (OPS) personnel of the loss of all pressure in WGDT D. At the same time, an HP Scientist and HP Technician in the Control Room observed that the 1EMF41 chart recorder was showing approximately 1000 counts per minute (cpm) for sample points 11 and 12 at approximately 0715 hours. The Trip 2 setpoint was set at 4000 cpm and the Trip 1 setpoint was 3000 cpm. They informed the Control Room Operators (CROs) of their findings.

At 0750 hours, RDW personnel entered the WG compressor room and checked the manual drain valves. The valves were found to be closed. In the room, they discovered a small amount of water on the floor directly beneath the moisture separator vent plug. The plug was only hand tight.

At 0800 hours, WGDT D pressure was 0 psig according to the OAC.

At 0810 hours, HP and OPS personnel in the Control Room removed the 1EMF41 chart recorder paper. Review of the chart showed that all 12 sample point readings began to increase at approximately 0530 hours, with points 11 and 12 being consistently highest. Normal background readings for the EMF are less than 100 cpm. However, between 0530 and 0730 hours, points 1 through 10 had increased to between 200 and 800 cpm. Point 11 reached 2100 cpm and point 12 reached 1500 cpm. All readings increased abruptly at approximately 0530 hours, and remained relatively constant until approximately 0715 hours, when all 12 readings began trending downward. All 12 readings had returned to normal by 0730 hours.

At 0815 hours, RDW personnel isolated WGDT D. At 0840 hours, RDW personnel filled WGDT D with nitrogen gas to 45 psig for functional testing and to allow for leak identification. At 0945 hours, WGDT D was unisolated. HP personnel then collected an air sample and performed a radiation survey in the WG compressor room.

At 1018 hours, RDW personnel entered the room and leak checked the vent plug. The plug was leaking and could not be tightened enough to stop the leakage. The compressor was then secured and isolated. At 1050 hours, RDW personnel placed WG Compressor A in service. Work Request 564 RDW was originated to repair the leaking vent plug.

At 1135 hours, HP personnel generated Gaseous Waste Release (GWR) package 57 to document the inadvertent release of the contents of WGDT D. The sample obtained on February 7, 1988, at 1338 hours, and the February 8, 1988, 0500 hour, tank pressure were used to calculate the total amount of radioactivity released (7.46 Curies of noble gases). The whole body dose at the Site Boundary due to this release was calculated to be less than 0.00004 Rem. At 1140 hours, the Operations Shift Supervisor was informed that the Site Boundary whole body dose limit had not been exceeded.

On February 18, 1988, MM personnel removed the old vent plug, cleaned the plug hole threads, applied sealant to a new vent plug and installed it. The new plug leaked during the functional verification. On February 19, 1988, MM personnel removed the vent plug, cleaned the threads, reapplied sealant and installed the plug. On February 20, 1988, RDW personnel functionally verified that the vent plug did not leak and the compressor was returned to service.

CONCLUSION:

The release of the contents of WGDT D occurred due to the leaking vent plug on the WG compressor's moisture separator. The attempts by RDW and MM personnel to remove the vent plug apparently moved the plug sufficiently to unseat it and cause the leak. None of the personnel involved believed that the vent plug had moved and therefore, they did not check it for leaks upon returning the compressor to service. Although this incident would have been prevented if the leak check had been performed by the involved personnel, there were no procedure violations or obvious personnel errors identified. Additionally, the procedure for the WG System was not determined to be inadequate.

This incident is also attributed to a personnel error. The RDW Specialist incorrectly calculated a pressure increase in the WGDT during the shift while preparing for turnover. This occurred because the 0500 hour pressure was used instead of the 0600 hour pressure. If the correct pressure reading had been used for the calculation, the leak would have become apparent and could have been terminated before all the radioactive gas was released. The calculation was performed at approximately 0645 hours, and the majority of the gaseous radioactivity had escaped by that time.

This incident has been discussed with the RDW Specialist involved. Additionally, the importance of attention to system status and trends, and ensuring accuracy of

information submitted has been stressed to all Chemistry personnel through staff meetings.

RDW Technicians are now required to log WGDT pressures hourly instead of every four hours to increase the probability of detecting a leak. The RDW procedure for returning the WG System to service following maintenance is being enhanced to require leak checks even if an attempted system breach appears to have been unsuccessful.

The Chemistry Section has recommended that a program change request be submitted to have the OAC provide an alarm upon decreasing pressure in the WGDTs. This alarm should provide rapid notification of WGDT leakage and appears to be the best solution to prevent this type of incident from recurring.

A Station Problem Report (SPR) had been previously originated which recommended that the vent plugs be replaced with isolation valves. This SPR was placed on the inactive list to permit completion of modifications of higher priority. Station Management is currently evaluating the need to activate the SPR.

There has been one previous incident at Catawba involving an inadvertent release from a WGDT (see LER 413/87-01) The corrective actions taken as a result of the previous incident could not have prevented this event. This is considered to be a recurring event.

CORRECTIVE ACTION:

SUBSEQUENT

(1) The leak was identified, isolated and repaired.

(2) The incident was discussed with the individual involved.

(3) All Chemistry personnel were reminded of the importance of attention to system status and trends and the submittal of accurate information.

(4) A change to the RDW WG System maintenance procedure was initiated to require performance of leak checks even if a WG System breach appeared to be unsuccessful.

(5) RDW personnel are now required to log WGDT pressures every hour.

(6) Chemistry recommended that a program change request be submitted to have the OAC provide an alarm upon decreasing pressure in the WGDTs.

PLANNED

(1) The need for activating the SPR to add a valve instead of the plug on the moisture separator will be reviewed.

(2) A completed OAC program change request will be submitted to add computer points necessary to obtain an OAC alarm on decreasing WGDT pressure.

SAFETY ANALYSIS:

The leakage of the entire contents of WGDT D resulted in the release to the environment of an estimated 7.46 Curies of noble gases. A radioactive gas leak of this type is bounded by Catawba's Final Safety Analysis Report (FSAR), Section 15.7.1, Radioactive Waste Gas Decay Tank Leak or Failure. The maximum radioactivity level in a single WGDT is limited to 97,000 Curies by Technical Specification 3.11.2.6. This limit assures that in the event of an uncontrolled release of the tank's contents, the resulting whole body exposure to an individual at the EAB will not exceed 0.5 Rem. The EAB whole body exposure resulting from this release is calculated to be less that 0.00004 Rem.

The release to the environment was continuously monitored by 1&2EMF36, and no high radiation alarms were generated during the release. Additionally, 1EMF41 detected the increased gaseous radioactivity levels in the area of the leak. However, the concentration of radioactive gases was below the alarm and trip setpoints of the EMF. The highest 1EMF41 reading was approximately 2100 cpm, with the Trip 1 setpoint of 3000 cpm and Trip 2 setpoint of 4000 cpm.

Throughout the incident there were no cases of personnel contaminations, and no abnormally high exposures to radiation occurred. The release of the estimated 7.46 Curies of radioactive noble gases into the WG compressor room consisted of 2233.5 standard cubic feet of gas released over a 2 hour period (approximately 18.7 standard cubic feet per minute (SCFM) average). The designed VA exhaust from the compressor room is 1300 SCFM. Therefore, the gases released into the room were immediately diluted by the large amount of clean air make-up into the room. The exhaust duct inlet is approximately 10 feet directly above the leaking vent plug and creates a sweeping current of air through the room's wall penetrations, across the compressor package, and up to the duct where it is exhausted. A smoke test of the room later verified this. This may explain why the HP Technician present for the leak check at 0530 hours did not detect abnormally high Beta and Gamma radiation levels in the room.

If workers in the room had been exposed to significant concentrations of noble gases, they would have found themselves to be contaminated with short lived particulate daughters when frisking after exiting the room. The room is a contaminated area which requires the use of protective clothing for entry and whole body frisking upon exiting.

If the WGDT had contained approximately twice the amount of radioactivity (15 Curies or more), Control Room personnel would have received a Trip 1 and 2 alarm on 1EMF41 and VA would have automatically switched to the FILTER MODE. This would have prompted an immediate search by Station personnel (including RDW and HP) of the area indicating the highest activity on 1EMF41. It is probable that RDW personnel would have closely examined the WG System parameters, noticed the decreasing WGDT pressure, and isolated the compressor that had just been returned

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

to service. Thus, a majority of the WGDT's contents would likely not have been released to the environment.

This event was determined not to be reportable. This LER is being submitted as a voluntary report for information purposes.

The health and safety of the public and Station personnel were not affected by this incident.

DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

March 31, 1988

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Catawba Nuclear Station, Units 1 and 2
Docket Nos. 50-413 and 50-414
LER 413/88-12

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Licensee Event Report 413/88-12 concerning an inadvertent release from the in-service radioactive waste gas decay tank due to leakage following system maintenance. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

JGT/10015/sbn

Attachment

xc: Dr. J. Nelson Grace
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

M&M Nuclear Consultants
1221 Avenue of the Americas
New York, New York 10020

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, Georgia 30339

American Nuclear Insurers
c/o Dottie Sherman, ANI Library
The Exchange, Suite 245
270 Farmington Avenue
Farmington, CT 06032

Mr. P. K. Van Doorn
NRC Resident Inspector
Catawba Nuclear Station

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