NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Browns Ferry Nuclear Plant (BFN) Unit 2	05000260	1 OF 10

TITLE (4) An invalid local leak rate test on the drywell head seals resulted in a condition prohibited by Technical Specifications

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 NAME NA	DOCKET NUMBER
05	25	93	93	011	01	02	27	95	FACILITY NAME NA	DOCKET NUMBER

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)	000		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)		OTHER
			20.405(a)(1)(iii)	X	50.73(a)(2)(i)(B)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
			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 (Include Area Code)
James E. Wallace, Compliance Licensing Engineer	(205)729-7874

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 15 single-spaced typewritten lines) (16)

On October 2, 1994, during the Unit 2 Cycle 7 refueling outage, TVA was removing the Unit 2 drywell head when it was noticed that a sealant material (i.e., Room Temperature Vulcanizing [RTV]) caused the LLRT performed during the last outage to be invalid. This condition existed when Unit 2 was restarted on May 25, 1993. This event is reportable in accordance with 10 CFR 50.73 (a)(2)(i)(B) as a condition prohibited by BFN Technical Specifications. The root causes of the event were a result of schedular pressure and a commonly held belief that all engineering requirements will be met by the use of the sealant material. This belief also resulted in the bypassing of approved work practices and in an unquestioning attitude by the personnel involved. Corrective actions to preclude recurrence are: a design change notice was issued controlling the amount of RTV, the drywell head was installed using an approved procedure, an incident investigation (II) of this event was reviewed by the involved individuals, a site-wide bulletin on this event was issued to emphasize the lessons learned from the II, and an associated notice of violation reply addressing this event was incorporated into the appropriate mechanism for indoctrinating personnel.

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I. PLANT CONDITIONS

At the time this event was discovered, Unit 2 was shutdown for a scheduled refueling outage. Units 1 and 3 were shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event

On October 2, 1994, TVA was removing the BFN Unit 2 drywell head during a scheduled refueling outage. While removing the drywell head, personnel observed an excessive amount of sealing material (i.e., Room Temperature Vulcanizing (RTV)-102) on the lower flange. The sealant had been used to facilitate installation of the drywell head O-rings during the Cycle 6 refueling outage. Additionally, approximately three inches of the inner O-ring protruded from its groove (the drywell head flange O-ring configuration is shown on page 10).

Based on the observations of the O-rings [SEAL] when the drywell head [NH] was removed this outage, it was concluded that an invalid LLRT had been performed before the restart of Unit 2 on May 25, 1993. Specifically, the RTV was in the area between the O-rings, and the inner O-ring seal was broken. Thus, the excessive amount of RTV obstructed the LLRT test volume. Further details of this event are provided below.

On May 13, 1993, during the Unit 2 Cycle 6 refueling outage, the drywell head seal failed its initial as-left LLRT. RTV-102 was placed in the O-ring grooves to augment the sealing characteristics of the O-rings. The drywell head was subsequently reset, the bolts were retorqued, and the LLRT was reperformed on May 15, 1993. The follow-up LLRT measured 0.0036 SCFH of seal leakage which was within the acceptance criteria for this test.

The use of RTV-102 was not documented on applicable drawings; therefore, the use of this material should have required a design change to implement the addition of the RTV to the O-rings. On May 16, 1993, after the drywell head was installed and leak rate tested, a Design Change Notice (DCN) was processed to justify the use of RTV-102 to augment the sealing characteristics of the O-rings. However, the engineering evaluation for the DCN failed to identify that excessive RTV would be forced out of the O-ring groove upon compression of the O-rings by the head flange. This amount would have been sufficient to obstruct the LLRT test volume. BFN Technical

Specification 4.7.A requires that a LLRT of primary containment penetrations be performed once per operating cycle. The LLRT performed on the drywell head during the last refueling outage was determined to be invalid. Thus, this event is reportable pursuant to 10 CFR 50.73 (a)(2)(i)(B) due to a condition prohibited by the BFN Technical Specifications. The event date of this report is May 25, 1993 when Unit 2 was restarted with an invalid LLRT. The discovery date of this event was October 2, 1994, which initiated the 30-day timeclock for reportability purposes.

As described further in Section IV of this report, TVA has not observed any abnormal leakage from the drywell O-rings during the past operating cycle.

B. <u>Inoperable Structures, Components, or Systems that Contributed to the Event</u>:

None

C. <u>Dates and Approximate Times of Major Occurrences</u>:

May 13, 1993	The drywell head LLRT failed three times.
May 14, 1993	The drywell head was lifted, the grooves were cleaned, RTV-102 was placed in the O-ring grooves, the drywell head was reset, and the bolts were retorqued.
May 15, 1993	The drywell head LLRT was performed.
May 25, 1993	Unit 2 was restarted.
October 2, 1994	This condition was detected when the drywell head was lifted at the start of the next refueling outage.

D. <u>Other Systems or Secondary Functions Affected</u>:

None.

E. <u>Method of Discovery</u>:

This condition was discovered when the drywell head was being lifted off its lower flange during a scheduled outage after operating Cycle 7.

F. Operator Actions:

None

G. Safety System Responses:

None

III. CAUSE OF THE EVENT

A. Immediate Cause:

The RTV was applied without an approved procedure, without proper authorization, and was not incorporated into the design prior to installation. A design change notice was issued without correctly specifying the limit for the amount of RTV applied.

B. Root Cause:

TVA performed an Incident Investigation (II) of this event to determine the root causes and corrective actions to prevent recurrence. This II determined that schedular pressure and a commonly held belief that all engineering requirements will be met by the use of the sealant material (i.e., RTV). This belief also resulted in the bypassing of approved work practices and an unquestioning attitude by the personnel involved. The specific reasons that led to this event are described below:

- Failure to follow procedures and approved work practices

  The procedure for installation of the drywell head O-rings did not include provisions for use of a sealant. Refuel floor personnel presumed that craft personnel could determine the methods for using RTV by practical observation and without technical instructions. Because of its unique features and its ability to affect the LLRT, the use of RTV on the O-rings should have required a design change prior to its installation.

- Inadequate communication

  On the day the RTV was installed in the O-rings (i.e., May 14, 1993), various engineering and technical support managers questioned the validity of using this sealant

material. However, this information was not communicated to maintenance personnel; consequently, no effort was made to stop work pending the resolution of these concerns.

- <u>Inadequate design output document</u>

  The drywell head was installed with the RTV, and a LLRT was performed with apparent satisfactory results on May 15, 1993. Site Engineering was then requested, after the fact, to issue a design change notice (DCN) to authorize the use of RTV. The refueling contractor, General Electric (GE), agreed to provide documentation supporting the acceptability of RTV.

  On May 16, 1993, a design team was assembled to issue a DCN approving the use of RTV. The designers recognized that excessive RTV could block the LLRT test volume. However, based on information from GE, they believed that this concern had been addressed since excess RTV was wiped from the flange during O-ring installation. It was not recognized that the sealant would be displaced from the grooves by compression of the O-rings when the head was installed. Therefore, no calculations were performed, as part of the "after the fact" design change, to determine the effect of RTV on the LLRT test volume.

- <u>Insufficient critical, self-questioning attitude</u>

  Pressure to approve actions already taken led to a "group-think" attitude that did not question whether concerns regarding the validity of the LLRT had been adequately resolved.

  Furthermore, on May 17, 1993, following the installation of the drywell head, a Problem Evaluation Report (PER) was issued by a Technical Support engineer that, in part, questioned the validity of the LLRT due to the use of RTV. The PER was subsequently closed based on the issued DCN authorizing the use of RTV. However, the concern on the validity of the LLRT was not adequately addressed by the DCN.

IV. ANALYSIS OF THE EVENT

The top portion of the drywell is removable during refueling operations. The drywell head is connected to the remainder of the drywell via a flange connection held together by 208 bolts. This flange connection is sealed via a double captured seal ring

arrangement. The dual O-ring configuration and the intermediate leak rate testing tap permits leak rate testing of the drywell head flange seal.

As stated previously, an excessive amount of RTV was observed on the lower flange of the drywell head. The RTV was found to be uniformly distributed around the lower flange surface from near the inner radius of the flange across the O-rings outward past the O-ring grooves. Examination of the RTV on the lower flange of the drywell head indicated that it was adhering tightly to the flange surface. The LLRT volume between the inner and outer O-rings was completely filled. Approximately three inches of the inner O-ring flange groove was empty because the O-ring had been dislodged and was crushed between the flange surfaces with a small portion extending from between the flange surfaces into the drywell interior.

Examination of the outer O-ring indicated that it was seated in its associated groove and compressed along the entire circumference of the drywell head flange. Only one O-ring is required to provide the seal between the upper and lower flange surfaces for the drywell head. Therefore, the drywell head was effectively sealed.

Additionally, a calculation was performed to determine the pressure in the drywell that would be required to overcome the bolt preload and lift the head. This calculation showed a pressure in excess of twice the design basis accident drywell pressure.

No abnormal nitrogen makeup [LK] requirements for drywell inerting were observed during operating Cycle 7 (See Chart 1 on page 9). The average amount of nitrogen consumed for the first 81 days was less than the amount that was used during operating Cycle 6 when the drywell head was sealed without RTV [see Chart 2 on page 9). However, the average amount of nitrogen consumed did increase over the remainder of the operating Cycle 7. This increase was due to a drywell air compressor problem. If the drywell air compressor problem had not occurred, TVA believes that the nitrogen consumption would have continued to follow the trend of the first 81 days (i.e., less than Cycle 6 nitrogen consumption). During the last two operating cycles, the amount of nitrogen consumed was significantly below the Technical Specifications limit.

Based on the examination of the joint flange, and the amount of nitrogen used to maintain the inerting of the drywell during the operating cycle, TVA has determined that an effective seal was in place.

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

V. CORRECTIVE ACTIONS

A. <u>Immediate Corrective Actions</u>:

The Unit 2 replacement of the drywell head O-rings for the Unit 2, Cycle 7 restart was performed using an approved procedure that addressed the use of RTV. Prior to reinstalling the head during the Unit 2 Cycle 7 refueling outage, a DCN was issued which controlled the amount of RTV so that it would not interfere with the LLRT. Additionally, this evolution was performed using an approved procedure that addressed the use of RTV. Additional management oversight was provided on the refuel floor during the Unit 2 Cycle 7 refueling outage to ensure adequate control of refueling evolutions.

B. <u>Corrective Actions to Prevent Recurrence</u>:

Corrective actions to heighten personnel awareness and to prevent recurrence are:

- The II of this event was reviewed with the appropriate individuals in affected organizations (i.e., Operations, Technical Support, Quality Assurance, Maintenance, and Site Engineering) to emphasize the causes of this event.

- A site-wide bulletin on this event was issued to emphasize the lessons learned from the II. The bulletin emphasized safety over schedule and the importance of personnel to maintain a critical, self-questioning attitude.

- An associated NOV response (94-27) was incorporated in the appropriate mechanism for indoctrinating personnel on this event (e.g., General Employee Training, Engineering Support Personnel Training).

VI. ADDITIONAL INFORMATION

A. <u>Failed Components</u>:

None

B. <u>Previous LERs on Similar Events</u>:

None

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VII. Commitments

None

Energy Industry Identification System (EIIS) system and component codes are identified in the text with brackets (e.g., [XX].

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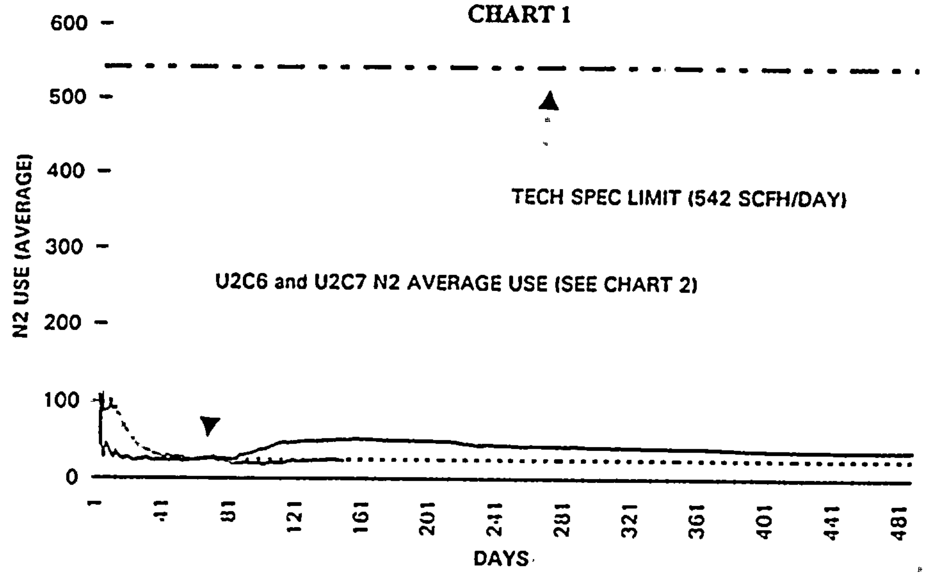
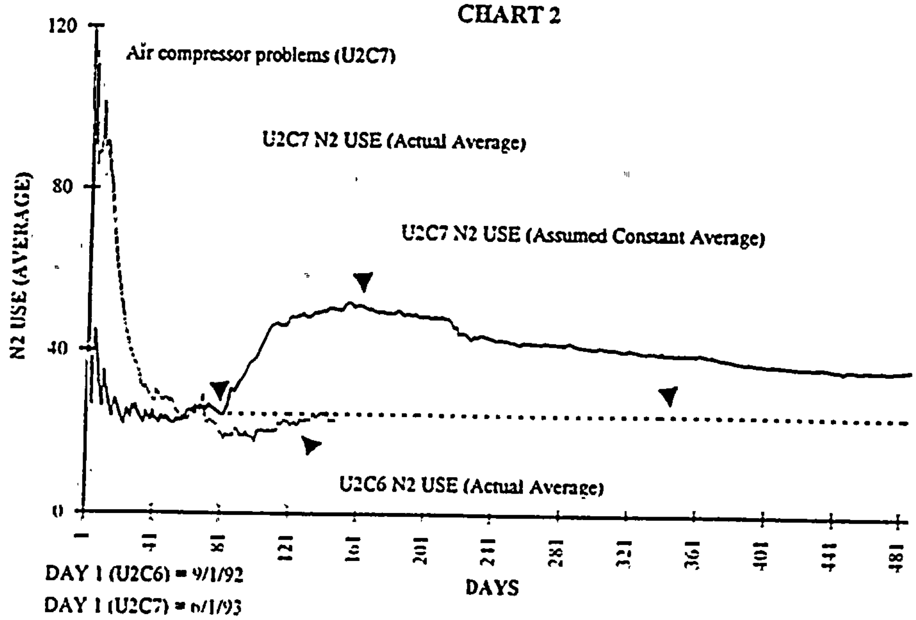
U2C6 - U2C7 N2 USE COMPARISON

CHART 1



U2C6 - U2C7 N2 USE COMPARISON

CHART 2



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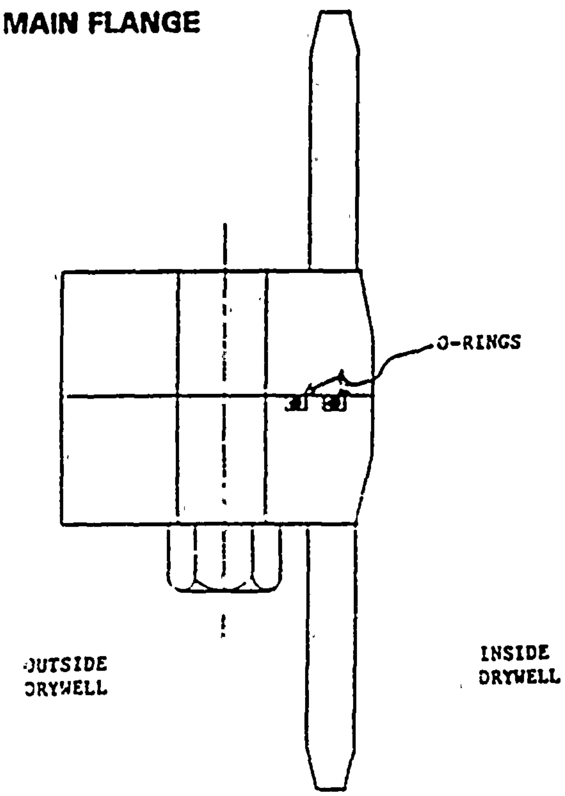
MAIN FLANGE



DRYWELL HEAD FLANGE O-RING CONFIGURATION