



Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

November 30, 2015

10 CFR 50.73

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units 1, 2, and 3  
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68  
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Licensee Event Report 50-259/2015-004-00**

The enclosed Licensee Event Report provides details of Containment Atmospheric Dilution B train supply system inoperable longer than allowed by Technical Specifications. The Tennessee Valley Authority is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications, and 10 CFR 50.73(a)(2)(v)(C) and (D), as any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to control the release of radioactive material or to mitigate the consequences of an accident.

There are no new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact J. L. Paul, Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

A handwritten signature in black ink, appearing to be 'S. M. Bono', written over a circular scribble.

S. M. Bono  
Site Vice President

Enclosure: Licensee Event Report 50-259/2015-004-00 – Containment Atmospheric Dilution B Train Supply System Inoperable Longer Than Allowed by Technical Specifications

cc (w/ Enclosure):

NRC Regional Administrator - Region II  
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

**ENCLOSURE**

**Browns Ferry Nuclear Plant  
Units 1, 2, and 3  
Licensee Event Report 50-259/2015-004-00**

**Containment Atmospheric Dilution B Train Supply System Inoperable Longer Than Allowed by  
Technical Specifications**

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**See Enclosed**

<b>NRC FORM 366</b> (02-2014)	<b>U.S. NUCLEAR REGULATORY COMMISSION</b>	<b>APPROVED BY OMB NO. 3150-0104</b>	<b>EXPIRES 10/31/2017</b>
<b>LICENSEE EVENT REPORT (LER)</b>		Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.	

<b>1. FACILITY NAME</b> Browns Ferry Nuclear Plant (BFN), Unit 1	<b>2. DOCKET NUMBER</b> 05000259	<b>3. PAGE</b> 1 of 6
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**4. TITLE:**  
Containment Atmospheric Dilution B Train Supply System Inoperable Longer Than Allowed by Technical Specifications

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR		
09	29	2015	2015 - 004 - 00			11	30	2015	BFN, Unit 2 05000260	
									BFN, Unit 3 05000296	

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> <i>(Check all that apply)</i>									
<b>10. POWER LEVEL</b>  100	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)						
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)						
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER						
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A							

**12. LICENSEE CONTACT FOR THIS LER**

Licensee Contact <b>Eric Bates, Licensing Engineer</b>	TELEPHONE NUMBER <i>(Include Area Code)</i> <b>(256) 614-7180</b>
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	LK	PSP	X000	Y	N/A	N/A	N/A	N/A	N/A

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>	<b>15. EXPECTED SUBMISSION DATE</b>	<b>MONTH</b>	<b>DAY</b>	<b>YEAR</b>
<input type="checkbox"/> YES <i>(If yes, complete 15. EXPECTED SUBMISSION DATE)</i> <input checked="" type="checkbox"/> NO		N/A	N/A	N/A

**ABSTRACT** *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On September 29, 2015, during excavation for a potable water leak approximately 46 feet downstream of the Containment Atmospheric Dilution (CAD) B train, a hole was discovered in the 2-inch stainless steel underground CAD supply piping. CAD B train was declared inoperable and Technical Specification Limiting Condition for Operation 3.6.3.1 Condition A was entered. A past operability evaluation determined that the CAD B train would not have been able to provide its specified safety function in Modes 1 and 2 with the identified condition. On October 10, 2015, the CAD B train was declared Operable following repairs. A review of the past three years of operating history determined that both CAD A and B trains were concurrently inoperable/unavailable for a period of nine days. Therefore, this event is also considered a Safety System Functional Failure. Based on a probabilistic risk assessment, the safety significance of this event was low for all three operating units.

The cause for the hole in the CAD B train supply piping is unknown and the time of occurrence was indeterminate. This is considered to be a legacy issue. Corrective actions include developing and performing a piping integrity test to identify any other potential holes in the supply piping for the CAD A and B trains.

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## NARRATIVE

**I. Plant Operating Conditions Before the Event**

At the time of discovery, Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3 were operating in Mode 1 at approximately 100 percent rated thermal power.

**II. Description of Events****A. Event:**

On September 29, 2015, Operations was notified, during excavation for a potable water leak near the east side of the plant approximately 46 feet downstream of the Containment Atmospheric Dilution (CAD) [LK] B train, that the two-inch stainless steel supply piping was discovered to have a hole roughly 1.2 square inches in area. After the hole was discovered, Operations declared the CAD B train inoperable, entered Technical Specification (TS) Limiting Condition for Operation (LCO) 3.6.3.1, Condition A which requires the CAD subsystem to be declared operable within 30 days, and requested a Past Operability Evaluation (POE).

The POE determined that, with the identified condition, the CAD B train would not have been able to provide its specified safety function in Modes 1 and 2. On October 10, 2015, at 0115 Central Daylight Time (CDT), the CAD B train was declared operable after repairs were made.

**B. Status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event:**

There were no structures, components, or systems that were inoperable at the start of the event that contributed to the event.

**C. Dates and approximate times of occurrences:**

September 29, 2015, at 1225 CDT	After discovery of the hole in the CAD B train supply piping, the CAD B train was declared inoperable, and TS LCO 3.6.3.1.A was entered.
October 10, 2015, at 0115 CDT	Following repair of the supply piping, the CAD B train was declared operable.

**D. Manufacturer and model number (or other identification) of each component that failed during the event:**

The supply pipe for the CAD B train was identified as the failure. The manufacturer of this pipe was Sandvik Steel. The original piping was classified as 2-inch seamless stainless steel, schedule 406, ASME SA 312, Grade TP-304. This pipe was the originally installed piping from the initial plant construction.

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**E. Other systems or secondary functions affected:**

There were no other systems or secondary systems affected.

**F. Method of discovery of each component or system failure or procedural error:**

Operations personnel were notified by Modifications/Facilities personnel that during excavation of potable water piping near the east side of the plant, the CAD B train supply piping was discovered to have a hole in it.

**G. The failure mode, mechanism, and effect of each failed component, if known:**

The hole in the 2 inch CAD B train supply piping is considered to be a legacy issue. The cause is unknown and the time of occurrence was indeterminate. Based on walkdowns of the piping, the hole appears to have existed for some time and was not caused by a backhoe or hand digging activities used to reach the potable water leak.

**H. Operator actions:**

Upon being notified of the hole in the CAD B train supply pipe, Operations personnel declared the CAD B train inoperable.

**I. Automatically and manually initiated safety system responses:**

There were no automatic or manually initiated safety system responses as a result of the hole in the pipe of the CAD B train.

**III. Cause of the event****A. The cause of each component or system failure or personnel error, if known:**

Upon visual inspection of the hole in the pipe, the edges along the periphery of the hole were smooth and not shiny which would indicate that the hole in the pipe was not caused by contemporary backhoe or hand digging activities used to reach the potable water leak. The cause for the hole in the two-inch CAD B train supply piping was determined to be unknown, and the time of occurrence was indeterminate. This is considered to be a legacy issue

**B. The cause(s) and circumstances for each human performance related root cause:**

There were no known human performance errors associated with this event.

**IV. Analysis of the event:**

The Tennessee Valley Authority (TVA) is submitting this report in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.73(a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications, and (10 CFR) 50.73(a)(2)(v)(C) and (D), as any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to control the release of radioactive material or to mitigate the consequences of an accident. On September 29, 2015, Operations personnel were notified, during excavation for a potable water leak near the east side of the plant approximately 46 feet downstream of the CAD B train, that the two-inch stainless steel supply piping was discovered to have a hole roughly 1.2 square inches in area. After the hole was discovered, Operations

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personnel declared the CAD B train inoperable, entered TS LCO 3.6.3.1, Condition A which requires the Containment Atmospheric Dilution Subsystem to be declared operable within 30 days, and requires a POE to be performed.

The POE determined that the CAD B train was inoperable from an indeterminate date in the past to October 10, 2015, at 0115 CDT; therefore, Units 1, 2, and 3 would have been required to enter TS LCO 3.6.3.1, Condition C which requires the units to be in Mode 3 within 12 hours. Additionally, TS LCO 3.0.4 was not met for each applicable Mode change for each unit.

The hole in the 2 inch CAD B train supply pipe is considered to be a legacy issue. The cause is unknown and the time of occurrence was indeterminate. Based on walkdowns and visual inspections of the piping, this hole has existed for some time.

This 2 inch hole in the CAD B train was repaired and the CAD B train was declared Operable on October 10, 2015, at 0115 CDT.

#### V. Assessment of Safety Consequences

The CAD System is a shared system which consists of two independent trains, each of which is capable of supplying nitrogen through separate piping systems to the drywell and suppression chamber of any of the three units. Each train includes a liquid nitrogen supply tank, an ambient vaporizer, an electric heater, a supply line which branches to each primary containment, and pressure, flow, and temperature controls. The safety-related CAD System is designed to inject nitrogen inside the primary containment following a Loss of Coolant Accident (LOCA) in order to ensure that a combustible gas mixture does not occur, oxygen concentration is kept less than 5.0 volume percent, or hydrogen concentration is kept less than 4.0 volume percent.

A probabilistic risk assessment was performed which determined the time period that the CAD B train was considered unavailable corresponds to a very low safety significance for all three operating units.

##### A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event:

During the period of time when both CAD trains were inoperable, no other credited systems or components were available to perform CAD's safety function of maintaining hydrogen and oxygen concentrations in the primary containment below explosive levels.

##### B. For events that occurred when the reactor was shut down, availability of systems or components needed to shut down the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident:

This event was not discovered when the reactor was shut down.

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**C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from discovery of the failure until the train was returned to service:**

The event resulted in inoperability of the CAD B train for an indeterminate period of time in the past until October 10, 2015, at 0115 CDT when the CAD B train was declared operable following piping repair. The hole in the 2-inch supply pipe was determined not to be caused by excavation activities to locate a potable water leak on September 29, 2015.

**VI. Corrective Actions:**

Corrective actions are being managed by TVA's Corrective Action Program (CAP) under Condition Report (CR) 1087766. The following corrective actions are in progress:

1. Develop and perform a piping integrity test to identify any current holes that may exist in the supply piping for the CAD A and B trains.

**VII. Additional Information:**

**A. Previous Similar Events:**

Maximo was used to search Condition Reports (CR) from September 29, 2010 to November 9, 2015 for occurrences applicable to this evaluation. The search returned numerous CRs from all NPG sites by using the following search terms: buried piping, core drilling, hole in pipe, and Containment Atmospheric Dilution piping. Each CR was reviewed for lessons learned by searching for specific and similar issues as reported in CR 1087766.

To evaluate the external Operating Experience, the INPO Database was searched for occurrences applicable to this evaluation. The search was performed using the same search terms as for the internal OE review. The most applicable OE follows:

- Big Rock Point 1 – Embedded Diesel Fuel Line Damaged by Drilling Activity 12/6/1993 OE 6417
  - A worker drilling a 6-inch hole into an 18-inch concrete floor punctured an embedded diesel fire pump fuel line. A ground detection protection device was not used because it was mistakenly believed that the device was not commercially available. Ultrasonic testing did not locate the line.
- BFN Unit 1 - Drilling Through Conduit Results in Actuation of Fire Suppression System 7/19/1999 OE 181083
  - Workers drilling on the diesel generator building roof cut through imbedded conduit. Water from the drilling entered the conduit and caused the building carbon dioxide system to actuate. Work practice deficiencies associated with the installation of a plant modification resulted in failure to identify the presence of imbedded conduit in the vicinity. Repairs were made, personnel were briefed, and guidance for drilling activities has been modified.

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Although the internal and external OE review found similar conditions related to the search terms such as holes in piping due to corrosion, core drilling, and mechanical damage occurring during excavation, none were determined to have been applicable to preventing the hole from occurring in the Train B CAD system supply line. The causes of the two OE events described above were not associated with identification of piping, and BFN uses various methods to mitigate buried piping damage both prior to and during excavation. Therefore, no corrective actions were deemed necessary to address these OE.

**B. Additional Information:**

There is no additional information.

**C. Safety System Functional Failure Consideration:**

LCO 3.6.3.1 states that "Two CAD subsystems must be OPERABLE. This ensures operation of at least one CAD subsystem in the event of a worst case single active failure. Operation of at least one CAD subsystem is designed to maintain primary containment post-LOCA oxygen concentration <5.0 v/o for 7 days." The CAD B train was considered inoperable from an indeterminate date in the past until the piping was repaired and returned to service on October 10, 2015. This is in violation of Action A.1 which states, "If one CAD subsystem is inoperable, it must be restored to OPERABLE status within 30 days." In the past three years, the CAD A train was also considered unavailable from July 29, 2013, at 0730 CDT to August 7, 2013, at 1515 CDT. Actions B.1 and B.2 requires the ability to control the hydrogen control function via alternate capabilities be verified by administrative means within 1 hour. Action C.1 states, "If any Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply." Therefore, the above LCO actions were not met.

Although surveillances were completed satisfactorily, it cannot be concluded that with the hole in the pipe that the CAD B Train would have met its mission time and provided seven days of nitrogen during accident conditions. Therefore, with both CAD A and B trains inoperable/unavailable for a period of nine days in the past three years, this condition is considered to be a Safety System Function Failure, in accordance with NUREG-1022.

**D. Scram with Complications Consideration:**

This event did not result in a reactor scram.

**VIII. COMMITMENTS**

There are no new commitments.