

Tennessee Valley Authority, Post Office 2000, Spring City, Tennessee 37381-2000

Mike Skaggs
Site Vice President, Watts Bar Nuclear Plant

APR 18 2007

10 CFR 50.73

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

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

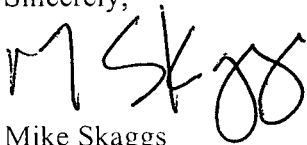
Docket No. 50-390

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1 - FACILITY OPERATING
LICENSE NPF-90 - LICENSEE EVENT REPORT (LER) 50-390/2005-002

This submittal provides Revision 2 to LER 390/2005-002. TVA initially submitted Revision 0 of this LER on January 13, 2006. This LER documents the results of an inspection of spent fuel that was performed on November 14, 2005. During the inspection an opening was found to exist in the cladding of a fuel pin in fuel assembly G45. The degradation of the fuel assembly cladding was initially reported under 10 CFR 50.72(b)(3)(ii)(A) on November 14, 2005 as Event Notification 42140. TVA's January 13, 2006, letter contained preliminary information regarding the event and was provided in accordance with 10 CFR 50.73(a)(2)(ii)(A). Revision 1 of the LER was submitted on July 13, 2006, and indicated a future report would be submitted updating the results of the planned inspections. Provided in the enclosure is the update to LER 390/2005-002.

There are no regulatory commitments associated with this letter. Should there be questions regarding this submittal, please contact James D. Smith at (423) 365-1824.

Sincerely,


Mike Skaggs

cc: See page 2

U.S. Nuclear Regulatory Commission
Page 2

APR 18 2007

Enclosure
cc (Enclosure):

NRC Resident Inspector
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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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.

1. FACILITY NAME Watts Bar Nuclear Plant	2. DOCKET NUMBER 05000 390	3. PAGE 1 OF 6
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4. TITLE
G45 Fuel Assembly Clad Damage

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	14	2005	2005	- 002	- 02	04	18	2006		05000
									FACILITY NAME	DOCKET NUMBER
										05000

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

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME Jerry Bushnell, WBN Licensing Engineer	TELEPHONE NUMBER (Include Area Code) (423) 365-8048
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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

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE MONTH: DAY: YEAR:
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On November 14, 2005, WBN Unit 1 was at 100 percent power and inspection results were being reviewed to establish the cause of a cladding leak in fuel assembly G45. The existence of a cladding leak was initially established during Cycle 6 operation through sampling of the Reactor Coolant System (RCS) that identified elevated levels of Iodine 131 (I-131) and Xenon 133 (Xe-133). This condition was documented in TVA's corrective action program and one element of the planned actions was the examination of the spent fuel during the Cycle 6 refueling outage. In-mast sipping was performed during the outage and established that fuel assemblies E59, G45 and H03 were leaking. The inspections identified a one-inch gap in the fuel cladding on fuel rod P-9 of fuel assembly G45. The visible damage to the rod was located approximately six inches above grid number 7. Due to this damage, it was concluded that some fuel pellet material (up to three fuel pellets) has been dislocated from rod P-9. Fragments of the pellets appeared to be lodged on the top of grid number 7. The corrective actions include measures to limit the radiological consequences of the fuel degradation and establish limitations on power escalation.

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R
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LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Watts Bar Nuclear Plant	50-390	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 of 6
		2005	002	02	

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

I. Plant Conditions:

Watts Bar Nuclear Plant (WBN) Unit 1 was in Mode 1 and operating at 100 percent power.

II Description of Event:

A. Event:

On November 14, 2005, WBN Unit 1 was at 100 percent power and inspection results were being reviewed to establish the cause of a cladding leak in fuel assembly G45. The existence of a cladding leak was initially established during Cycle 6 operation through sampling of the Reactor Coolant System (RCS) that identified elevated levels of Iodine 131 (I-131) and Xenon 133 (Xe-133). This condition was documented in TVA's corrective action program as Problem Evaluation Report (PER) 9174. A limit for the concentration of I-131 is defined in Limiting Condition for Operation (LCO) 3.4.16, "Reactor Coolant System (RCS) Specific Activity." In order to ensure this limit was closely monitored during Cycle 6, the RCS was sampled three times a week and reviewed by site management. The I-131 concentration for the samples taken throughout Cycle 6 remained well below the LCO limit. One element of the planned actions was the examination of the spent fuel during the Cycle 6 refueling outage. In-mast sipping was performed during the outage and established that fuel assemblies E59, G45 and H03 were leaking.

The inspection of the assemblies identified a one inch gap in the fuel cladding on fuel rod P-9 of fuel assembly G45. The damage to the rod was located approximately six inches above grid number 7. Due to this damage, it was concluded that some fuel pellet material (up to three fuel pellets) has been dislocated from rod P-9. Fragments of the pellets appeared to be lodged on the top of grid number 7. The damage to fuel assembly G45 was documented as PER 92432.

The degradation of the fuel assembly cladding (a principal safety barrier) was initially reported under 10 CFR 50.72(b)(3)(ii)(A) on November 14, 2005 as Event Notification 42140. This report is provided in accordance with 10 CFR 50.73(a)(2)(ii)(A).

Revision 1 of LER 2005-002 was submitted to NRC on July 13, 2006, and indicated that an updated report would be provided that addresses the results of a planned inspection of the affected fuel assembly. This inspection is currently planned to be performed during 2007. However, the Description of Event, Assessment of Safety Consequences, and Corrective Actions address the event as it occurred during Cycle 6 operation and its impact on Cycle 7 operation. WBN is currently in operating Cycle 8 and therefore, the information in the LER is historical. The issue outstanding for the LER is the final determination of the cause of the cladding failure. Revision 2 of LER 2005-002 provides supplemental information regarding the Cause of the Event and the Assessment of Safety Consequences.

B. Inoperable Structures, Components, or Systems that Contributed to the Event

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

R
2

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Watts Bar Nuclear Plant	50-390	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 of 6
		2005	002	02	

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

II. DESCRIPTION OF EVENT (continued)

C. Dates and Approximate Times of Major Occurrences

Date	Occurrences
October 20, 2003	WBN Unit 1 returned to power operation (Mode 1) to begin operating Cycle 6.
October 27, 2003	An analysis of reactor coolant identified elevated levels of Iodine 131 (I-131) and Xenon 133 (Xe-133). This is an indication of a potential leak in the fuel cladding.
February 22, 2005	The Cycle 6 refueling outage begins.
March 1, 2005	Fuel sipping performed to identify leaking fuel assemblies.
March 31, 2005	The Cycle 6 refueling outage is completed.
November 12 - 14, 2005	Inspections of the spent fuel identified a gap in the cladding on fuel assembly G45.
November 14, 2005	The degradation of the fuel assembly cladding (a principal safety barrier) was confirmed to exceed expected values and was reported under 10 CFR 50.72(b)(3)(ii)(A).

D. Other Systems or Secondary Functions Affected

No other systems or secondary functions were affected by this event.

E. Method of Discovery

A half-face visual examination was conducted on fuel assembly G45 in the spent fuel pool. During this visual inspection, damage was observed on fuel rod P-9.

F. Operator Actions

At the time a fuel leak was initially identified in October 2003, Operations personnel notified appropriate site management of the problem and ensured the problem was documented in TVA's corrective action program. When the cladding defect in rod G45 was identified in November 2005, the Operations staff ensured the required notifications were made to NRC in accordance with 10 CFR 50.72.

G. Safety System Responses

There were no automatic or manual safety system responses and none were necessary.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Watts Bar Nuclear Plant	50-390	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 6
		2005	002	02	

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

III. CAUSE OF EVENT

Fuel assembly G45 is a 17 x 17 Vantage+/Performance+ fuel assembly. The mechanical design features of this fuel includes the following: integral fuel burnable absorbers (IFBA), reconstitutable top nozzle (RTN), debris filter bottom nozzle (DFBN), extended burnup capability, axial blankets, and an advanced zirconium alloy known as ZIRLO™ for fuel cladding and many structural components. The G45 assembly has been ultrasonically and visually inspected and the failure is in a high power IFBA rod and is believed to have occurred during the initial power ascension for Cycle 6. This is evident by the secondary hydriding of the failed rod and the high Iodine concentrations experienced in the Reactor Coolant System (RCS) during Cycle 6.

Assembly G45 is one of the Westinghouse assemblies that falls into the category of an assembly susceptible to missing pellet surface on an IFBA fuel rod. Analysis of fuel failures on assemblies with large missing pellet surface versus power escalation schemes has shown that if WBN fuel assemblies had similar large missing pellet surface, then the power escalation rates used during Cycle 6 would have resulted in failures similar to those actually seen at WBN and at the Braidwood Nuclear Station. However, a debris related failure can not be ruled out since the failure of assembly H03 was caused by debris fretting during Cycle 6. Based on the preceding, WBN has concluded that the apparent cause of the failure of assembly G45 is attributed to missing fuel surface pellet clad interaction or debris fretting.

IV. ASSESSMENT OF SAFETY CONSEQUENCES

Although the G45 assembly is in the spent fuel pool and not part of the Cycle 7 core, TVA took steps to consider the possible impact of the cladding degradation on Cycle 7 operation. Based on a sample of the RCS, the fuel core in use at Watts Bar during Cycle 7 appears to have two leaking fuel assemblies. The current values of I-131 and Xe-133 activity are within the values defined in Technical Instruction (TI) 7.004, "Fuel Integrity Assessment Program." The limit for the concentration of I-131 is defined in LCO 3.4.16, "Reactor Coolant System (RCS) Specific Activity." The controls provided in TI-7.004 require monitoring, notification and evaluation of the RCS activity at levels much lower than Technical Specification limit. Cycle 7 had indications of multiple leakers, but the in-mast sipping campaign identified only one leaking fuel assembly, H43. This fuel assembly was removed and the core redesigned. WBN has not experienced any leaking fuel during Cycle 8 operation.

As of July 6, 2006 (Cycle 7), Watts Bar's Dose Equivalent Iodine (DEI) value was 2.24E-02 micro curies per gram (µCi/gm). The DEI value was 1.14E-02 µCi/gm at the end of Cycle 6. These numbers are comparable and are a small fraction of the Technical Specification limit of .265 µCi/gm. Should the DEI concentration increase by factor of 10 from the present DEI value during Cycle 7, the projected DEI will be slightly above 80 percent of the Technical Specification limit. Near the end of Cycle 6 the 100/EBAR (total RCS activity) was 401 µCi/gm and coolant gross specific activity at shutdown was 2.5 µCi/gm. Presently, 100/EBAR is 215 µCi/gm and coolant gross specific activity is 1.7 µCi/gm. In addition, Chemistry Manual (CM) 3.01, "Chemistry Specifications" requires that the Operations staff be notified whenever the I-131 or Xe-133 concentrations change by more than 25 percent above the previous value. Based on the preceding, the RCS activity levels as of July 6, 2006, were a small fraction of the Technical Specification limits and the existing procedural controls ensured adequate sampling and oversight of the RCS activity levels.

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LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Watts Bar Nuclear Plant	50-390	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 of 6
		2005	002	02	

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

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

1. A night order was issued to ensure that Radiological Controls department surveys for hot particles and hot spots when system breaches are made to the Reactor Coolant, Chemical and Volume Control, the Refueling Water Storage Tank, the Residual Heat Removal, Safety Injection, the Spent Fuel Pool Cooling Systems and to the Reactor side and Auxiliary Building side of the fuel transfer canal system.
2. A night order was issued to ensure during the upcoming Cycle 7 outage, that ALARA preplanning reports include the surveys described in Item 2 above.
3. A forced outage plan was developed to ensure the proper contingencies are defined to address an event caused by significant fuel degradation.

B. Corrective Actions to Prevent Recurrence (TVA does not consider these items to constitute regulatory commitments. TVA's corrective action program tracks completion of these actions.):

1. A limitation on power escalation has been established to decrease the possibility of cladding degradation. This is in addition to continued adherence to WBN's foreign material control process.

VI. ADDITIONAL INFORMATION

A. Failed Components

The cladding failed as described in Section III, "Cause of the Event."

B. Previous LERs on Similar Events

There have been no previous LERs initiated for Watts Bar that addressed fuel degradation issues.

C. Additional Information:

None.

D. Safety System Functional Failure

This fuel cladding degradation event is not considered a safety system functional failure in accordance with Nuclear Energy Institute (NEI) 99-02, Revision 3.

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LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Watts Bar Nuclear Plant	50-390	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 of 6
		2005	002	02	

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

VI. ADDITIONAL INFORMATION (continued)

E. Loss of Normal Heat Removal Consideration

This event is not considered a scram with loss of normal heat removal.

VII. COMMITMENTS

None