



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

October 16, 2012

10 CFR 50.46

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

Watts Bar Nuclear Plant, Unit 2  
NRC Docket No. 50-391

**Subject: WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 - 10 CFR 50.46 - ESTIMATED INCREASE IN PEAK CLAD TEMPERATURE (PCT) DUE TO THE EFFECT OF FUEL PELLET THERMAL CONDUCTIVITY DEGRADATION AND PEAKING FACTOR BURNDOWN NOT BEING CONSIDERED - 30 DAY REPORT**

Reference 1: Supplemental Safety Evaluation Report (SSER) 24, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Unit 2, Docket No. 50-391, Tennessee Valley Authority," published September 2011

The purpose of this letter is to report, in accordance with 10 CFR 50.46, a significant change in PCT of greater than 50 degrees (i.e., 175°F increase). TVA was recently notified by Westinghouse letter, LTR-LIS-12-413, dated September 20, 2012, that fuel pellet thermal conductivity degradation (TCD) and peaking factor burndown were not explicitly considered in the Watts Bar Unit 2 Best Estimate Large Break Loss-of-Coolant Accident (BE LBLOCA) Analysis of Record (AOR). Taking TCD and peaking factor burndown into account resulted in the 175°F increase in PCT. This results in a new PCT of 1,727°F, replacing the 1,552°F value previously accepted by NRC in Reference 1.

Enclosure 1 provides an evaluation of this estimated effect. Since the estimated increase of 175°F PCT is based on the generic Westinghouse Owner's Group analysis, a specific WBN Unit 2 analysis will be performed to provide a unit-specific AOR PCT value prior to Unit 2 licensing. This action is captured as SSER open item no. 61; therefore, this action does not represent a new commitment. Enclosure 2 provides the Unit 2 Westinghouse Rackup Sheet.

5030  
A002  
NRR

U.S. Nuclear Regulatory Commission  
Page 2  
October 16, 2012

There are no new commitments made in this letter.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 16<sup>th</sup> day of October, 2012.

If you have any questions, please contact me at (423) 365-2004.

Respectfully,



Raymond A. Hruby, Jr.  
General Manager, Technical Services  
Watts Bar Unit 2

Enclosures:

1. Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown
2. Westinghouse Rackup Sheet

cc (Enclosures):

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## Enclosure 1

### Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown

#### Background

Fuel pellet thermal conductivity degradation (TCD) and peaking factor burndown were not explicitly considered in the Watts Bar Unit 2 Best Estimate Large Break Loss-of-Coolant Accident (BE LBLOCA) Analysis of Record (AOR). NRC Information Notice 2011-21 (Reference 1) notified addressees of recent information obtained concerning the impact of irradiation on fuel thermal conductivity and its potential to cause significantly higher predicted peak cladding temperature (PCT) results in realistic emergency core cooling system (ECCS) evaluation models. This evaluation provides an estimated effect of fuel pellet TCD and peaking factor burndown on the PCT calculation for the WBN Unit 2 BE LBLOCA AOR. This change represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451 (Reference 2).

#### Affected Evaluation Model

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

#### Estimated Effect

A quantitative evaluation, as discussed in Reference 3, was performed to assess the PCT effect of fuel pellet TCD and peaking factor burndown on the WBN Unit 2 BE LBLOCA analysis and concluded that the estimated PCT impact is 175°F for 10 CFR 50.46 reporting purposes. The peaking factor burndown included in the evaluation is provided in Table 1 and is conservative for the first cycle. Tennessee Valley Authority and its vendor, Westinghouse Electric Company LLC, utilize processes which ensure the LOCA analysis input values conservatively bound the as-operated plant values for those parameters and will be validated as part of the reload design process.

**Table 1: Peaking Factors Assumed in the Evaluation of TCD**

<b>Rod Burnup (MWd/MTU)</b>	<b>FdH <sup>(1), (2)</sup></b>	<b>FQ Transient <sup>(1)</sup></b>	<b>FQ Steady-State</b>
0	1.650	2.500	2.000
30,000	1.650	2.500	2.000
60,000	1.400	1.875	1.500
62,000	1.400	1.875	1.500

(1) Includes uncertainties.

(2) Hot assembly average power follows the same burndown, since it is a function of FdH.

## **Enclosure 1**

### **References**

1. NRC Information Notice 2011-21, McGinty, T. J., and Dudes, L. A., "Realistic Emergency Core Cooling System Evaluation Model Effects Resulting From Nuclear Fuel Thermal Conductivity Degradation," December 13, 2011. (NRC ADAMS # ML113430785)
2. WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting," October 1992.
3. OG-12-386, "For Information Only – Input Supporting the PWROG LBLOCA Program Regarding Nuclear Fuel Thermal Conductivity Degradation (PA-ASC-1073, Revision 0) (Proprietary/Non-Proprietary)," September 18, 2012.

## Enclosure 2 Westinghouse Rackup Sheet

Westinghouse LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break

**Future**

Plant Name: Watts Bar Unit 2  
Utility Name: Tennessee Valley Authority  
Revision Date: 9/20/2012

**Analysis Information**

EM:	ASTRUM (2004)	Analysis Date:	10/14/2009	Limiting Break Size:	Split
FQ:	2.5	FdH:	1.65		
Fuel:	RFA-2	SGTP (%):	10		

Notes:

	Clad Temp (°F)	Ref.	Notes
<b>LICENSING BASIS</b>			
Analysis-Of-Record PCT	1552	1	
<b>PCT ASSESSMENTS (Delta PCT)</b>			
<b>A. PRIOR ECCS MODEL ASSESSMENTS</b>			
1 . None	0		
<b>B. PLANNED PLANT MODIFICATION EVALUATIONS</b>			
1 . None	0		
<b>C. 2012 ECCS MODEL ASSESSMENTS</b>			
1 . Evaluation of Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	175	2	(a)
<b>D. OTHER*</b>			
1 . None	0		
<b>LICENSING BASIS PCT + PCT ASSESSMENTS</b>	<b>PCT =</b>	<b>1727</b>	
* It is recommended that the licensee determine if these PCT allocations should be considered with respect to 10 CFR 50.46 reporting requirements.			

**References:**

- 1 . WCAP-17093-P, Revision 0, "Best-Estimate Analysis of the Large-Break Loss-of-Coolant Accident for Watts Bar Unit 2 Nuclear Power Plant Using the ASTRUM Methodology," December 2009.
- 2 . LTR-LIS-12-413, "Watts Bar Units 1 and 2, 10 CFR 50.46 Notification and Reporting for Fuel Pellet Thermal Conductivity Degradation and Peaking Factor Burndown," September 20, 2012.

**Notes:**

- (a) This evaluation credits peaking factor burndown, see Reference 2.