



***Revision to Loss of Feedwater Heating  
Transient in Boiling Water Reactors Topical Report***

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## Overview of Presentation

- Purpose for submittal
- Currently Approved Methodology
- Changes to Topical Report
- Summary and Calculations

## Introduction

- > SER for ANF-1358 Revision 1 Issued in April 1992
- > Topical being updated by adding more data to cover modern fuel designs
- > Analysis added to address LHGR impact

## *SER Conditions in Current Generic LFWH Methodology*

**> SER Conditions:**

- ♦ The methodology applies to BWR-3, 4, 5, and 6 plant types if the [ ] are within  
the range covered by the data points presented in the report.
- ♦ The methodology only applies to the MCPR operating limit for the LFWH event.

## *Range of Applicability*

Restricted Parameters	Range of Applicability	
	ANF-1358 Rev. 1	ANF-1358 Rev. 3
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## *Summary of Currently Approved Generic LFWH Methodology*

- > Analysis of simulated LFWH events performed for a range of operating conditions.
- > 1067 simulated LFWH events from 540 operating state points (nine BWR-6 cycles, six BWR-4 cycles, and two BWR-3 cycles).
- > Analysis with 3-D Simulator (MICROBURN-B).
- > Manual Flow Control Mode.
- > FANP 8x8, FANP 9x9 and GNF 8x8 fuel designs considered.

## *Summary of Currently Approved Generic LFWH Methodology - Benchmark 3-D Simulator.*

- > The LFWH transient is a relatively slow event.
- > The reactor core is essentially in steady-state throughout the event. The transient parameters behave smoothly with no sudden increases or decreases.
- > These trends have been verified in startup tests as part of plant startup test program.
- > Results from BWR-4, 5, and 6 plants show the time to attain 95% of the temperature change is greater than 100 seconds.

*Summary of Currently Approved Generic LFWH  
Methodology - continued*

- > **Two calculations were performed for each simulated LFWH event.**

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*Summary of Currently Approved Generic LFWH  
Methodology - continued*

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- ◆ **This correlation represents the generic LFWH methodology.**

# Summary of Currently Approved Generic LFWH Methodology - Benchmark 3-D Simulator

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# Summary of Currently Approved Generic LFWH Methodology - Benchmark 3-D Simulator

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## *Summary of Currently Approved Generic LFWH Methodology – Correlation of Results*

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## Summary of Currently Approved Generic LFWH Methodology – Correlation of Results

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## Summary of Currently Approved Generic LFWH Methodology – Correlation of Results

- > Therefore, a bounding relation (using the bounding coefficients) was used to establish the MCPR operating limit based on the LFWH event being the limiting transient.

## Changes to Approved Generic LFWH Methodology

- > No change in methodology approach.
- > Added supplemental data to extend range of applicability to cover modern core loadings.
- > Added LHGR impact of event.

## Changes to Approved Generic LFWH Methodology – Range of Applicability

- > Changing operating conditions requires extension of range of applicability.

Restricted Parameters	Range of Applicability	
	ANF-1358 Rev. 1	ANF-1358 Rev. 3
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## *Changes to Approved Generic LFWH Methodology - LHGR*

- > **The LFWH transient event is an infrequent, anticipated operational occurrence (AOO). Therefore, the revised generic methodology also considered an increase in the linear heat generation rate (LHGR) as a direct result of LFWH event.**

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- > **ANF-1358 Rev. 1 applies only to the MCPR. Currently, a cycle-specific analysis on LHGR increase due to LFWH event is performed.**

## *Changes to Approved Generic LFWH Methodology*

- > **Revised results based on 529 new operating state points and 540 original operating state points. The total number of simulated LFWH events are now 1686 cases, up from 1067 cases.**
- > **3-D simulators MICROBURN-B and MICROBURN-B2 were used.**

*Changes to Approved Generic LFWH Methodology*

- > The process in the currently approved methodology was used to generate the results for correlating.
  
- > To bound all of the combined simulated results, the B<sub>5</sub> coefficient is adjusted.

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*Changes to Approved Generic LFWH Methodology*

- > The benchmark results in ANF-1358(P)(A) Revision 1 demonstrate that the evaluation of MCPR operating limit from the end points of the event by a 3-D steady-state core simulator is

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- > **Revision of LFWH Topical consists primarily of adding more data to cover modern core designs.**
- > **No change in methodology approach.**
- > **Added results to disposition impact on LHGR.**