

WCAP-13360-NP-A,
Supplement 1,
Revision 0

March 2012

Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial Plant Start-up Applications



Westinghouse

**WCAP-13360-NP-A
Supplement 1,
Revision 0**

**Clarification on Use of
Dynamic Rod Worth Measurement (DRWM)
in Initial Plant Start-up Applications**

March 2012

Authors:

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Section A

February 27, 2012

Mr. James A. Gresham, Manager
Regulatory Compliance and Plant Licensing
Westinghouse Electric Company
1000 Westinghouse Drive
Cranberry Township, PA 16066

SUBJECT: FINAL SAFETY EVALUATION FOR WESTINGHOUSE ELECTRIC COMPANY
(WESTINGHOUSE) TOPICAL REPORT WCAP-13360-NP, SUPPLEMENT 1,
REVISION 0, "CLARIFICATION ON USE OF DYNAMIC ROD WORTH
MEASUREMENT (DRWM) IN INITIAL PLANT START-UP APPLICATIONS"
(TAC NO. ME5851)

Dear Mr. Gresham:

By letter dated March 9, 2011 (Agencywide Documents Access and Management System Accession No. ML110740612), Westinghouse Electric Company (Westinghouse) submitted Topical Report (TR) WCAP-13360-NP, Supplement 1, Revision 0, "Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial Plant Start-up Applications," to the U.S. Nuclear Regulatory Commission (NRC) staff.

By letter dated November 10, 2011 (ADAMS Accession No. ML112770169), an NRC draft safety evaluation (SE) regarding our approval of TR WCAP-13360-NP, Supplement 1, Revision 0, was provided for your review and comments. By letter dated November 17, 2011, Westinghouse commented on the draft SE. The NRC staff's disposition of Westinghouse's comments on the draft SE are discussed in the attachment to the final SE enclosed with this letter. In addition, the NRC staff has made minor editorial changes.

The NRC staff has found that TR WCAP-13360-NP, Supplement 1, Revision 0, is acceptable for referencing in licensing applications for use of the DWRM methodology to initial plant start-ups with initial cores limited to Westinghouse-designed Nuclear Steam Supply System with Westinghouse licensed fuel products subject to the criteria specified in the SE.

Our acceptance applies only to material provided in the subject TR. We do not intend to repeat our review of the acceptable material described in the TR. When the TR appears as a reference in license applications, our review will ensure that the material presented applies to the specific plant involved. License amendment requests that deviate from this TR will be subject to a plant-specific review in accordance with applicable review standards.

In accordance with the guidance provided on the NRC website, we request that Westinghouse publish accepted proprietary and non-proprietary versions of this TR within three months of receipt of this letter. The accepted versions shall incorporate this letter and the enclosed final SE after the title page. Also, they must contain historical review information, including NRC

J. Gresham

- 2 -

requests for additional information (RAIs) and your responses. The accepted versions shall include an "-A" (designating accepted) following the TR identification symbol.

As an alternative to including the RAIs and RAI responses behind the title page, if changes to the TR were provided to the NRC staff to support the resolution of RAI responses, and the NRC staff reviewed and approved those changes as described in the RAI responses, there are two ways that the accepted version can capture the RAIs:

1. The RAIs and RAI responses can be included as an Appendix to the accepted version.
2. The RAIs and RAI responses can be captured in the form of a table (inserted after the final SE) which summarizes the changes as shown in the approved version of the TR. The table should reference the specific RAIs and RAI responses which resulted in any changes, as shown in the accepted version of the TR.

If future changes to the NRC's regulatory requirements affect the acceptability of this TR, Westinghouse and/or licensees referencing it will be expected to revise the TR appropriately, or justify its continued applicability for subsequent referencing.

Sincerely,

/RA/

Robert A. Nelson, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 700

Enclosures:

1. Final SE
2. Resolution of comments

cc:

Mr. Kris Cummings, Manager
Nuclear Fuel Engineering Licensing
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355
cumminkw@westinghouse.com

requests for additional information (RAIs) and your responses. The accepted versions shall include an "-A" (designating accepted) following the TR identification symbol.

As an alternative to including the RAIs and RAI responses behind the title page, if changes to the TR were provided to the NRC staff to support the resolution of RAI responses, and the NRC staff reviewed and approved those changes as described in the RAI responses, there are two ways that the accepted version can capture the RAIs:

1. The RAIs and RAI responses can be included as an Appendix to the accepted version.
2. The RAIs and RAI responses can be captured in the form of a table (inserted after the final SE) which summarizes the changes as shown in the approved version of the TR. The table should reference the specific RAIs and RAI responses which resulted in any changes, as shown in the accepted version of the TR.

If future changes to the NRC's regulatory requirements affect the acceptability of this TR, Westinghouse and/or licensees referencing it will be expected to revise the TR appropriately, or justify its continued applicability for subsequent referencing.

Sincerely,

/RA/

Robert A. Nelson, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 700

Enclosures:

1. Final SE
2. Resolution of comments

cc:

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ADAMS Accession Nos.: Package: ML120170247; Letter: ML120170265;
Final SE: ML120170259; Comment Resolution: ML120170266

NRR-106

OFFICE	PLPB/PM	PLPB/LA	SNPB/BC	PLPB/BC	DPR/DD
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DATE	1/17/2012	2/2/2012	2/8/2012	2/21/2012	2/27/2012

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FINAL SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT WCAP-13360-NP, SUPPLEMENT 1, REVISION 0,

"CLARIFICATION ON USE OF DYNAMIC ROD WORTH MEASUREMENT (DRWM)

IN INITIAL PLANT START-UP APPLICATIONS"

WESTINGHOUSE ELECTRIC COMPANY

PROJECT NO. 700

1.0 INTRODUCTION

In a letter dated March 9, 2011 (Reference 1), the Westinghouse Electric Company (Westinghouse) submitted to the U.S. Nuclear Regulatory Commission (NRC) staff Topical Report (TR) WCAP-13360-NP, Supplement 1, Revision 0, "Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial Plant Start-up Applications," for the staff review and approval. Specifically, this submittal is to request NRC approval to use the DRWM on initial plant start-ups.

The DRWM technique is a method of measuring the reactivity worth of individual control and shutdown rod banks. It is a fast process that is accomplished by inserting and withdrawing the bank at the maximum stepping speed, without changing boron concentration, and recording the signals on the ex-core detectors. The recorded signals are processed on a conventional reactivity meter, which solves the inverse point kinetics equation with proper analytical compensation for spatial effects.

The DRWM has proven to be an accurate and safe physics testing method with over 200 applications around the world. In this submittal, Westinghouse is requesting to use this accurate and proven methodology for initial plant start-ups.

This application would be limited to Westinghouse-designed Nuclear Steam Supply System (NSSS) with Westinghouse licensed fuel products and would include the additional requirements noted herein.

ENCLOSURE

By letter dated January 5, 1996 (Reference 2), the NRC approved the use of the DRWM technique at Westinghouse pressurized water reactors. In the Safety Evaluation Review, the NRC staff made the following conclusions about the DRWM technique:

Based on our review as outlined in the evaluation in Section 2.0 above, we conclude that the dynamic rod worth measurement technique is acceptable for measurement of rod worth at the beginning of reload cycles for two, three, and four loop Westinghouse cores.

This acceptance is based on using the technique as outlined in Attachment B of Reference 3, and applying the evaluation criteria and remedial actions also outlined in Reference 1. It is also limited to use with the rod patterns and rod worths bounded by those used in the sensitivity studies provided in Reference 2.

2.0 TECHNICAL EVALUATION

In this submittal, Westinghouse pointed out that the original TR, WCAP-13360-P, did not stipulate that the DRWM methodology was limited to reload applications only. However, the NRC staff did stipulate this requirement in the approval, which Westinghouse accepted at that time, since initial plant start-ups were not envisioned when the TR was initially approved. The Westinghouse DRWM methodology calculates the dynamic spatial factors for the banks each cycle, on a plant-specific basis. Consequently, there is no reliance on previous cycle data to determine sensitivity correlations.

2.1 Changes to review criteria

An initial core has no history; consequently, there is a lack of fuel burnup and fission product distribution data. The measurements performed on a clean core (initial core) are expected to be much more accurate than those of a reload core. For that reason, Westinghouse has tightened the review criteria on individual bank worths to 10 percent or 75 percent mille (pcm). The criteria specified in the NRC approved TR are 15 percent or 100 pcm. This change to the review and criteria is specific to the initial plant start-up applications only and is based on prior initial plant start-up experience.

2.2 Replacement of 5 percent FLUX map

Attachment B of Reference 3 describes the actions to be taken upon failure of the individual bank worth review criteria. Failure of these criteria indicates a possible inconsistency in the core power distribution caused by differences between the design and the as built core, or a core anomaly (dropped rod, misloading, etc.). For this reason, a power distribution measurement (full core flux map) is required prior to exceeding 5 percent power when the measurement difference is confirmed. This is consistent with the misload analysis in place for Westinghouse plants at the time of the approval.

When WCAP-13360-P-A was written, it was applicable only for plants equipped with a moveable in-core detector system; however, many of the Westinghouse NSSS plants that will be going through initial start-ups will have a fixed in-core detector system. Although fixed in-core detector systems have been reviewed and approved by the staff, fixed in-core detectors lack the ability to perform a power distribution measurement below ~20 percent power.

Westinghouse has proposed in this submittal that for the initial plant start-up, any bank that is confirmed to fail the individual bank worth review criteria, as stated above, will be re-measured by either Boron Dilution or the Rod Swap methodology. Both of these methods are NRC approved for first cores and within the licensing basis for these new units coming on-line.

In addition, in any case that the results from subsequent measurement using either of these other two methods fails the bank worth criteria, then power ascension is halted. The collected data will be reviewed considering other measurement information to determine a possible cause (e.g., unlatched rod control cluster assembly, misloaded assembly). The core design analyst will then assess the particulars of the failure, such as magnitude and consequences, and provide a safety assessment to allow power ascension to ~25 percent rated thermal power (RTP).

The plant will then perform a fixed in-core detector based power distribution measurement. In addition, Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Revision 2, specifically recognizes that initial flux maps can be taken above 5 percent power, depending on the sensitivity and approval of the in-core instrumentation.

Westinghouse pointed out in this submittal, that throughout WCAP-13360-P-A, Westinghouse did not stipulate that this methodology was limited to reload applications only. The NRC stipulated this requirement in the approval, which Westinghouse accepted at that time, since initial plant start-ups were not envisioned when the TR was initially approved. Since Westinghouse calculates the dynamic spatial factors for the banks each cycle, for each plant, there is no reliance on previous cycle data to determine sensitivity correlations. Table 1 below from the Westinghouse submittal (Reference 1) compares reload core review criteria and resolution with the initial core review criteria and resolution.

Table 1: Reload vs. Initial Core Criteria and Resolution

<u>Reload Core Review Criteria and Resolution</u>	<u>Initial Core Review Criteria and Resolution</u>
Individual Bank Worth Review Criteria	Individual Bank Worth Review Criteria
<input type="checkbox"/> Within 15 percent or 100 pcm	<input type="checkbox"/> Within 10 percent or 75 pcm
If the individual bank worth fails	If the individual bank worth fails
<input type="checkbox"/> Investigate the failure by re-measurement	<input type="checkbox"/> Investigate the failure by re-measurement with Dynamic Rod Worth Measurement
If the individual bank worth fails the investigation/re-measurement	If the individual bank worth fails the investigation/re-measurement
<input type="checkbox"/> Measure the bank by dilution or swap	<input type="checkbox"/> Measure the bank by dilution or swap
If any of the failures cannot be resolved by re-measurement	If any of the failures cannot be resolved by re-measurement
<input type="checkbox"/> Review data in detail to see if there is a probable cause (e.g., unlatched rod cluster control assembly (RCCA), misloaded assembly).	<input type="checkbox"/> Review data in detail to see if there is a probable cause (e.g., unlatched RCCA, misloaded assembly).
<input type="checkbox"/> Perform a full core flux map prior to exceeding 5 percent power	<input type="checkbox"/> The core design analyst will evaluate the magnitude of the failure and provide a safety assessment to allow power ascension to ~25 percent Rated Thermal Power to perform a fixed in-core detector based power distribution measurement.

3.0 CONCLUSION

In summary, the NRC staff has reviewed the request by Westinghouse dated March 9, 2011. The submittal contained a request to utilize the DRWM for initial plant start-ups. The requested application is limited to Westinghouse-designed NSSS and Westinghouse licensed fuel products. The submittal also contained additional requirements for use of the DWRM methodology for initial plant start-ups. Based on the review, the staff concludes that the DRWM methodology is acceptable for use with initial cores subject to the criteria specified in the Table 1 of the submittal (Reference 1), and the acceptance criteria stipulated in Appendix B of Reference 3.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the safety evaluation will not be inimical to the common defense and security of the health and safety of the public.

4.0 REFERENCES

1. J. Gresham, Westinghouse Electric Company, LTR-NRC-11-9, WCAP-13360-NP, Supplement 1, Revision 0, "Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial Plant Start-up Applications," dated March 9, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110740612).
2. NRC Letter, submitted to the N. Liparulo, Westinghouse Electric Company, WCAP-13360-P, "Westinghouse Dynamic Rod worth Measurement Technique," dated January 5, 1996 (ADAMS Accession No. ML063410295 (Non-publicly available)).
3. NRC Letter, submitted to the N. Liparulo, Westinghouse Electric Company, Appendix B of "Westinghouse Dynamic Rod worth Measurement Technique," dated July 30, 1998 (ADAMS Accession No. ML063410295 (Non-publicly available)).

Principal Contributor: A. Attard

Date:

RESOLUTION OF WESTINGHOUSE ELECTRIC COMPANY
COMMENTS ON DRAFT SAFETY EVALUATION FOR
TOPICAL REPORT WCAP-13360-NP, SUPPLEMENT 1, REVISION 0,
"CLARIFICATION ON USE OF DYNAMIC ROD WORTH MEASUREMENT (DRWM)
IN INITIAL PLANT START-UP APPLICATIONS"
WESTINGHOUSE ELECTRIC COMPANY
PROJECT NO. 700

By letter dated November 17, 2011, Westinghouse Electric Company (Westinghouse) provided three comments on the draft safety evaluation (SE) for Topical Report (TR) WCAP-13360-NP, Supplement 1, Revision 0, "Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial plant Start-up Applications." The following are the U.S. Nuclear Regulatory Commission (NRC) staff's resolution of these comments:

Draft SE comments for TR WCAP-13360-NP, Supplement 1, Revision 0:

1. Westinghouse proposed the removal of the Paragraph 3 of Section 2.2. The NRC staff does not find this comment acceptable – the paragraph further clarifies the NRC staff position and will remain a part of the final SE. The NRC staff had explained its position to the Westinghouse staff and Westinghouse agreed with it.

NRC Resolution for Comment 1 on Draft SE:

Paragraph 3 of Section 2.2 will remain a part of the SE.

2. Westinghouse provided two comments related to typographical errors and stylistic changes.

NRC Resolution for Comment 2 on Draft SE:

The NRC staff reviewed the Westinghouse recommendation and found it acceptable, because the changes are editorial in nature.

Section B



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Nuclear Services
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U.S. Nuclear Regulatory Commission
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11555 Rockville Pike
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Direct tel: (412) 374-4643
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LTR-NRC-11-9

March 9, 2011

Subject: Submittal of WCAP-13360-NP, Supplement 1, Revision 0, "Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial Plant Start-up Applications" (Non-Proprietary) for Review and Approval

Enclosed is a non-proprietary copy of WCAP-13360-NP, Supplement 1, Revision 0 "Clarification on Use of Dynamic Rod Worth Measurement (DRWM) in Initial Start-up Applications," dated February 2011 submitted to the Nuclear Regulatory Commission for review and approval. This licensing topical report supplement provides information on the use of DRWM in new plant start-up applications. Approval of this supplement is requested by June 30, 2011.

In support of NRR's prioritization efforts, the following prioritization scheme matrix was completed and justification for the points assigned is provided on the following page.

Correspondence with respect to this topical should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.


Very truly yours,

A handwritten signature in black ink, appearing to read 'W. J. Gresham / FOR'.

J. A. Gresham, Manager
Regulatory Compliance

Enclosures

cc: E. Lenning
A. Mendiola

TR Prioritization Scheme Matrix *Industry input on shaded areas was not requested.			
Factors	Select the Criteria That the TR satisfies	Points Assigned For Each Criteria	Total Points (if points are cumulative, total them for each factor in this column)
TR Classification (Points are cumulative)	Generic Safety Issue	6	1
	Emergent Technical Issue	3	
	Standard TR	1	
Applicability (Points are not cumulative)	Industry-wide Implementation	3	1
	Applicable to entire groups of licensees (BWROG, PWROG, BWRVIP, etc.)	2	
	Applicable only to partial groups of licensees	1	
Specialized Resource Availability (Points are cumulative)			0.5
	A SE is requested by a certain date (less than two years) to support a licensing activity. Provide justification.	0.5	
Total Points (Add the total points from each factor and total here):			2.5

TR Classification: The use of DRWM has already been reviewed and approved by the NRC and is used at a number of currently operating plants. The NRC's review and approval of extending the application of DRWM to initial start up will provide an update to the application of an already approved method.

Applicability: Supplement 1 of this Topical Report (TR) is applicable to plants licensed under 10CFR Part 50 and Part 52.

Specialized Resource Availability: The SER for the attached Supplement is requested by June 30, 2011 in order to maintain the start-up schedule for TVA's Watts Bar Unit 2, which is currently scheduled to start up in 2012.

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1 INTRODUCTION

Dynamic Rod Worth Measurement (DRWM™) has proven to be an accurate and safe physics testing method with over 200 applications around the world. With the advent of the nuclear renaissance, it is desired to use this accurate and proven methodology for initial plant start-ups. This application would be limited to Westinghouse-designed Nuclear Steam Supply System (NSSS) with Westinghouse licensed fuel products and would include the additional requirements noted here-in. This clarification request is to request U.S. Nuclear Regulatory Commission (NRC) approval to use DRWM on initial plant start-ups.

By letter dated January 5, 1996, the NRC approved the use of the Dynamic Rod Worth Measurement (DRWM) technique at Westinghouse Pressurized Water Reactors. The NRC made the following conclusions about the DRWM technique:

"Based on our review as outlined in the evaluation in Section 2.0 above, we conclude that the dynamic rod worth measurement technique is acceptable for measurement of rod worth at the beginning of reload cycles for two, three, and four loop Westinghouse cores. This acceptance is based on using the technique as outlined in Attachment B of Reference 4 and applying the evaluation criteria and remedial actions also outlined in this attachment. It is also limited to use with the rod patterns and rod worths bounded by those used in the sensitivity studies."

The aforementioned Attachment B describes the actions to be taken upon failure of the individual bank worth review criteria. Failure of these criteria indicates a possible inconsistency in the core power distribution caused by differences between the design and the as built core, or a core anomaly (dropped rod, misloading, etc.). For this reason, a power distribution measurement (full core flux map) is required prior to exceeding 5% power when the measurement difference is confirmed. This is consistent with the misload analysis in place for Westinghouse plants at the time of the approval.

Westinghouse plans to meet the intent of WCAP-13360-P-A, Revision 1 (henceforth referred to as WCAP-13360-P-A) for initial plant start-ups in the following manner. An outline of the approach that will be taken by Westinghouse is provided at the end of this document.

It should be noted that throughout WCAP-13360-P-A, Westinghouse did not stipulate that this methodology was limited to reload applications only. The NRC stipulated this requirement in their approval, which Westinghouse accepted at that time, since initial plant start-ups were not envisioned when the topical report was initially approved. The one item in WCAP-13360-P-A where Westinghouse referred to previous cycles is in Section 3.3, page 3-4. Since Westinghouse calculates the dynamic spatial factors for the banks each cycle, for each plant, there is no reliance on previous cycle data to determine sensitivity correlations.

DRWM™ is a trademark of Westinghouse Electric Company LLC, its Affiliates and/or Subsidiaries in the United States of America and may be registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited. Other names may be trademarks of their respective owners.

2 CHANGE TO REVIEW CRITERIA

Because of the lack of fuel burnup and fission product distribution changes, the measurements performed on a clean core are expected to be much more accurate than those of a reload core. For that reason, Westinghouse has historically tightened the review criteria on individual bank worths to 10% or 75 pcm. The review criteria specified in the topical report is 15% or 100 pcm. This change to the review and criteria is specific to the initial plant start-up applications only and is based on prior initial plant start-up experience.

3 REPLACEMENT OF 5% FLUX MAP

In the event of a review criterion failure, WCAP-13360-P-A states that a power distribution measurement (full core flux map) is required prior to exceeding 5% power in order to determine the cause of the failure. When WCAP-13360-P-A was written, it was applicable only for plants equipped with a moveable incore detector system; however, many of the Westinghouse NSSS plants that will be going through initial start-ups will have a fixed incore detector system. Fixed incore detector systems lack the ability to perform a power distribution measurement below ~20% power.

For the initial plant start-up, any bank that is confirmed to fail the individual bank worth review criteria will be re-measured by either Boron Dilution or the Rod Swap methodology. Both of these methods are approved for first cores and within the licensing basis for these new units coming on-line. In the unlikely case that the results from the subsequent measurement using either of these other two methods fails the bank worth criteria, then the data will be reviewed considering other measurement information to determine a possible cause (e.g., unlatched Rod Control Cluster Assembly, misloaded assembly). The core design analyst will evaluate the magnitude of the failure and provide a safety assessment to allow power ascension to ~25% Rated Thermal Power (RTP) to perform a fixed incore detector based power distribution measurement. Note that Regulatory Guide 1.68 Revision 2 specifically recognizes that initial flux maps can be taken above 5% power, depending on the sensitivity of the incore instrumentation.

Table 1: Reload vs. Initial Core Criteria and Resolution

<u>Reload Core Review Criteria and Resolution</u>	<u>Initial Core Review Criteria and Resolution</u>
Individual Bank Worth Review Criteria	Individual Bank Worth Review Criteria
<ul style="list-style-type: none"> • Within 15% or 100 pcm 	<ul style="list-style-type: none"> • Within 10% or 75 pcm
If the individual bank worth fails	If the individual bank worth fails
<ul style="list-style-type: none"> • Investigate the failure by re-measurement with DRWM 	<ul style="list-style-type: none"> • Investigate the failure by re-measurement with DRWM
If the individual bank worth fails the investigation/re-measurement	If the individual bank worth fails the investigation/re-measurement
<ul style="list-style-type: none"> • Measure the bank by dilution or swap 	<ul style="list-style-type: none"> • Measure the bank by dilution or swap
If any of the failures cannot be resolved by re-measurement	If any of the failures cannot be resolved by re-measurement
<ul style="list-style-type: none"> • Review data in detail to see if there is a probable cause (e.g., unlatched RCCA, misloaded assembly). 	<ul style="list-style-type: none"> • Review data in detail to see if there is a probable cause (e.g., unlatched RCCA, misloaded assembly).
<ul style="list-style-type: none"> • Perform a full core flux map prior to exceeding 5% power 	<ul style="list-style-type: none"> • The core design analyst will evaluate the magnitude of the failure and provide a safety assessment to allow power ascension to ~25% RTP to perform a fixed incore detector based power distribution measurement.

BWR OWNERS' GROUP

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BWROG-12006
March 13, 2012

Project No. 691

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Attention: Robert B. Elliott, Branch Chief – NRR/DSS/STSB

Subject: BWROG Comments on Enforcement Guidance Memorandum (EGM) 11-003

References: 1) Memorandum, M. Honcharik (USNRC) to J. Jolicoeur (USNRC),
"Forthcoming Meeting With The Technical Specifications Task Force (TSTF)," January 25, 2012 (ML120180495)
2) Memorandum, R. Zimmerman (USNRC) to W. Dean, et al., (USNRC),
"Enforcement Guidance Memorandum On Dispositioning Boiling Water Reactor Licensee Noncompliance With Technical Specification Containment Requirements During Operations With A Potential For Draining The Reactor Vessel," October 14, 2011 (ML11277A279)

In a recent public meeting (Ref 1), the BWROG had the opportunity to provide the Staff with operating experience with the EGM on OPDRV activities during plant refueling outages (Ref 2). This discussion brought to light several items within the Staff's guidance that are proving impractical to implement and, based upon our discussions with the Staff, are not in keeping with the original intent of the EGM. Other items are not as clear in their language as they could be, resulting in numerous questions from licensees trying to implement these guidelines. The Staff requested that the BWROG provide specific comments and recommendations for changes to the EGM that would alleviate these issues and questions. To that end, the BWROG has provided in the enclosure to this letter, markups of the suggested changes to the EGM for the Staff's consideration. These changes are annotated with explanatory notes at the end of the document.

In addition, the BWROG has encouraged its members to seek plant-specific clarifications, as needed, to address unique concerns that they may have in utilizing the Staff's guidelines, such as dual unit plants with common Refuel Floors, Mark III containment configurations, etc.

The BWROG is available to hold a conference call to discuss our comments with the Staff, as deemed necessary.

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Given the importance of the EGM, until such time as permanent changes can be made to the plant's TS, we encourage the Staff to re-issue the EGM with the recommended changes as soon as practical so that licensees with upcoming spring refuel outages can utilize the revised guidance.

Please feel free to contact Tony Browning, BWROG Licensing Committee Chairman (319-851-7750, tony.browning@nexteraenergy.com), to discuss this matter further. Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read 'F. Schiffley II', with a stylized flourish at the end.

Frederick P. "Ted" Schiffley, II
Chairman
BWR Owners' Group

cc: C.J. Nichols, BWROG Program Manager
BWROG Licensing Committee
BWROG Outage Management Committee
Brian Mann (EXCEL Services Corp.)
Michelle Honcharik (USNRC)
Joe Golla (USNRC)

Commitments: None

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Basis for Granting Enforcement Discretion

To improve regulatory clarity for BWR plants in the interim and to allow implementation of specific interim actions as an alternative to full compliance with plant technical specifications while this improvement is under development, the staff will exercise limited enforcement discretion.

The NRC staff intends to use the enforcement discretion described in this EGM, integrated with the license amendment process, to resolve TS compliance issues created by the lack of clear regulatory guidance on the meaning of OPDRV and inconsistent licensee implementation of the plain language meaning of the term OPDRV. The NRC considers enforcement discretion related to secondary containment operability during Mode 5 OPDRV activities appropriate because the associated interim actions necessary to receive the discretion ensure an adequate level of safety by requiring licensees' immediate actions to (1) adhere to the NRC plain language meaning of OPDRV activities, (2) meet the requirements which specify the minimum makeup flow rate and water inventory based on OPDRV activities with long drain down times, (3) ensure that adequate defense in depth is maintained to minimize the potential for the release of fission products by monitoring RPV level to identify the onset of a loss of inventory event, by maintaining the capability to isolate the potential leakage paths, by prohibiting Mode 4 (cold shutdown) OPDRV activities without Secondary Containment Operable¹ and by prohibiting movement of irradiated fuel with the spent fuel pool gates removed², and (4) ensure that licensees follow all other Mode 5 TS requirements for OPDRV activities. During the time period of enforcement discretion, the staff will work with the BWROG to develop an improvement to the STS that licensees will be able to adopt through the license amendment process.

To be eligible for enforcement discretion, licensees must meet the minimum criteria established in this EGM as described below. In addition, each licensee that receives the discretion must submit a license amendment request (LAR) to resolve the issue for its plant which the NRC staff LAR acceptance review finds acceptable in accordance with LIC-109, "Acceptance Review Procedures." The generic solution will be a generic change to the STS, and the NRC will publish a notice of availability (NOA) for the TSs solution in the *Federal Register*. Each licensee that receives discretion must submit its amendment request within 4 months of the NRC staff's issuance of the NOA. Licensees may submit LARs to adopt the NRC-approved approach or to propose an alternative approach for their plants.

ACTIONS:

Immediate Actions

In accordance with Section 3.5, "Violations Involving Special Circumstances," of the NRC Enforcement Policy, the agency will exercise enforcement discretion and will not

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cite licensees for TS violations related to the conduct of OPDRV activities with secondary containment inoperable. Enforcement discretion will only be granted for outages occurring through December 31, 2013. Enforcement discretion is appropriate because the issue has low safety significance since licensees must implement compensatory measures to provide an adequate level of safety when using the discretion provided herein. The NRC will exercise enforcement discretion only if the licensee demonstrates that it has met the following criteria during an OPDRV activity:

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1. The licensee shall consider any activity that could potentially result in draining or siphoning the RPV water level below the top of the fuel, without taking credit for mitigating measures, to be an OPDRV activity. The licensee shall declare (log) that they are in an OPDRV and document the actions being taken to ensure water inventory is maintained and defense-in-depth criteria are in place prior to entering the OPDRV activity. Note: use of normal system alignments and operations, following approved plant procedures, for steady state water level control is exempted from these requirements, provided automatic isolation of the draindown path remains available.³
2. The licensee shall meet the following requirements, which specify the minimum makeup flow rate and water inventory:
 - a) During OPDRV activities the water level shall be equal to or greater than [23]⁴ feet (RHR – High Water Level) over the top of the RPV flange and the gate to the spent fuel storage pool and to the upper containment cavity to dryer pool (as applicable) shall be removed.
 - b) During OPDRV activities, at least one safety-related pump shall be available (preferably aligned to the division with the required operable EDG) and shall be aligned to a makeup water source with the capability to inject water equal to, or greater than, the maximum potential leakage rate from the RPV for a minimum time period of 4 hours. If at any time the water inventory requirement is not met or inventory makeup capability is lost, then actions shall be initiated to immediately suspend OPDRV activities.
 - c) During OPDRV activities, the time to drain down the water inventory from the RHR- High Water Level to the top of the RPV flange shall be greater than 24⁵ hours based on the best estimate ⁶ leak rate for OPDRV activities.
3. OPDRV activities shall be performed, to the maximum extent practicable, in a manner that maintains defense in depth against the release of fission product inventory. The following limitations shall apply:
 - a) OPDRV activities are prohibited during Mode 4 with secondary containment inoperable.
 - b) During OPDRV activities movement of [recently] irradiated fuel is prohibited with the spent fuel pool gates removed.⁷
 - c) The capability to isolate the potential leakage path during OPDRV activities before the water inventory reaches the RPV flange shall be maintained.

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- d) At least two independent means of monitoring the RPV water level shall be available for identifying the onset of loss of inventory events during an OPDRV activity; at least one of these shall be an alarming indicator in the control room. One of the two indications may be by direct observation of the RPV water level, provided that such observation is continuous. It is not necessary to modify existing instrumentation to provide the required indication (e.g., recalibration to cold-shutdown conditions). The RPV water level monitoring capability shall ensure that a draining event is detected with sufficient time to (1) close at least

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one secondary containment access door in each access opening before water reaches the top of the RPV flange and (2) close secondary containment equipment hatches before water reaches the top of the RPV flange.⁸

4. Licensees must follow all other TS Applicability and Action requirements for Mode 5 and Mode 5 OPDRV activities. If a licensee has a TS requirement that is more restrictive or conservative than the criteria stated herein, it must follow its TSs.
 - a) Violations of other requirements (e.g., 10 CFR 50.59 and Criterion III, "Design Control," or Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities") that may have contributed to the above TS violation may be considered for enforcement discretion under this EGM on a case-by-case basis. Regions should consult with the Office of Enforcement in those instances.
 - b) Violations associated with this enforcement discretion do not require discussion at an enforcement panel. They do require, however, the assignment of an enforcement action tracking number, and they shall be documented in an inspection report. The cover letter to the inspection report that discusses the violation should include the following or similar language: A violation of technical specifications [insert the applicable TS number] was identified. Because the violation was identified during the discretion period described in Enforcement Guidance Memorandum 11-003, the NRC is exercising enforcement discretion in accordance with Section 3.5, "Violations Involving Special Circumstances," of the NRC Enforcement Policy and, therefore, will not issue enforcement action for this violation, subject to a timely license amendment request being submitted.

Long-Term Actions

1. The BWR Owners' Group has indicated that they intend to submit a proposed Technical Specifications Task Force (TSTF) Traveler that revises BWR/4 and BWR/6 OPDRV STS requirements for staff review. The generic resolution of this issue will include the development of a clear meaning of the term OPDRV within TS, additional clarification of the TS requirements for Mode 4 and Mode 5 OPDRV activities, model license amendment requests (LARs), model safety evaluations, model no significant hazards consideration determinations using the NRC consolidated line-item improvement process, issuance of NOAs for the models, and the timely processing of license amendments by the NRC staff.

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¹ This is an editorial clarification that is consistent with the EGM guidance in Item 3.a and will eliminate potential confusion in interpretation.

² Because the EGM references the TS Applicability for RHR - High Water Level (LCO 3.9.8) and not ECCS Shutdown (LCO 3.5.2), the EGM does not require the spent fuel pool gates to be removed per requirement 2.a. With the spent fuel pool gates in place, an OPDRV will not drain the spent fuel pool and cannot uncover an irradiated fuel assembly being moved within the spent fuel pool. For licensees that have adopted the Alternative Source Term (10 CFR 50.67), movement of "recently" irradiated fuel assemblies is permitted without Secondary Containment being Operable. "Recently Irradiated" is for those plants that have adopted TSTF-51. We do not believe that it was the intent of the EGM to prohibit activities that were otherwise allowed under the plant's TS.

³ Because control rod drives require cooling water, even during shutdown conditions, water is constantly being added to the RPV. Without the ability to remove this small amount of water (approximately 60 gpm) from the RPV, the water level would continuously rise. The normal means to remove this excess water inventory is through drainage paths below the Top of Active Fuel, which would cause this ongoing evolution to be classified as OPDRVs, per the EGM definition. Because this is essentially a continuous activity, it would preclude refueling activities from being performed per EGM requirement 3.b. Defense in depth is maintained by having the associated automatic isolation capability (instrumentation and valves) remain available.

⁴ The addition of the [brackets] is intended to show that this value is plant-specific and should be the same as that used in the plant's TS for RHR - High Water Level, which is the intent of the EGM statement. Not all plants have the same 23 feet used in the EGM; this has generated numerous questions from licensees.

⁵ The original 72 hours was impractical, as the resulting draindown rate was small enough that virtually all OPDRV activities would be precluded. The requested 24 hours will allow most routine activities to take place.

⁶ Without detailed guidance on how to perform a "calculated maximum leak rate" (i.e., assumptions on seismic events, single active failures, loss of power, etc.) the proposed language will allow operating experience with the activity to predict an expected leak rate without having to perform a detailed engineering calculation.

⁷ See Note 2 above.

⁸ We are requesting a clarification of intent here. Does this last sentence establish an actual requirement that we be able to close all Secondary Containment doors, hatches, utility penetrations, etc. within this timeframe, or is this merely establishing the response time for the water level indication? If the Staff is expecting a licensee to develop a formal plan for restoration/closure of doors, hatches and utility penetrations, then this should be broken out as new item 3.e, with a clear nexus to item 2.c, and 3.d be rewritten as follows: "The RPV water level monitoring capability shall ensure that a draining event is detected with sufficient time to meet 3.e below."