

RESOLUTION OF COMMENTS ON DRAFT SAFETY EVALUATION FOR
TOPICAL REPORT WCAP-16260-P/WCAP-16260-NP, REVISION 2, “THE SPATIALLY
CORRECTED INVERSE COUNT RATE (SCICR) METHOD FOR
SUBCRITICAL REACTIVITY MEASUREMENT”
WESTINGHOUSE ELECTRIC COMPANY

By letter dated March 8, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19072A058), Westinghouse Electric Company (Westinghouse) provided comments on the draft safety evaluation (SE) for Topical Report (TR) WCAP-16260-P/WCAP-16260-NP, Revision 2, “The Spatially Corrected Inverse Count Rate (SCICR) Method for Subcritical Reactivity Measurement.” Westinghouse stated that there is proprietary information in the draft SE. The following is the U.S. Nuclear Regulatory Commission (NRC) staff’s resolution of these comments:

Draft SE comments for TR WCAP-16260-P/WCAP-16260-NP, Revision 2:

1. Second sentence of the first paragraph of Section 1.0, “Introduction,” reads in the draft SE:

The NRC had previously reviewed and approved Revision 0 to WCAP-16260-P (Ref. 3); however, Westinghouse has made several fundamental changes to the application of subcritical physics testing (SPT) that is the subject of WCAP-16260-P, and hence stated that Revision 2 supersedes Revision 1 in its entirety.

Westinghouse suggested that the second sentence of the first paragraph of Section 1.0, “Introduction,” should be re-worded to read:

The NRC had previously reviewed and approved Revision 0 to WCAP-16260-P (Ref. 3); however, Westinghouse has made several fundamental changes to of Subcritical Physics Testing (SPT) application of the SCICR method that is the subject of WCAP-16260-P, and hence stated that Revision 2 supersedes Revision 1 in its entirety.

NRC Resolution for Comment 1 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that proposed wording provides additional clarification. The NRC staff has updated the second sentence of the first paragraph of Section 1.0, “Introduction.”

Second sentence of the first paragraph of Section 1.0, "Introduction," reads now:

The NRC had previously reviewed and approved Revision 0 to WCAP-16260-P (Ref. 3); however, Westinghouse has made several fundamental changes of Subcritical Physics Testing (SPT) application of the SCICR method that is the subject of WCAP-16260-P, and hence stated that Revision 2 supersedes Revision 1 in its entirety.

2. First sentence of the first paragraph of Section 2.0, "Regulatory Evaluation," reads:

The theory and methods described in WCAP-16260-P, Revision 2, describe a subset of startup physics tests that are performed at the beginning of a cycle in a pressurized water reactor (PWR) to ensure that core characteristics are maintained (e.g., shutdown margin) and the core is operating as designed.

Westinghouse suggested that the first sentence of the first paragraph of Section 2.0, "Regulatory Evaluation," should be re-worded to read:

The theory and methods described in WCAP-16260-P, Revision 2, describe a subset of startup physics tests that are performed at the beginning of a cycle in a pressurized water reactor (PWR) to confirm core characteristics via measurement as a means to demonstrate that the core is operating as designed.

NRC Resolution for Comment 2 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that proposed wording provides additional clarification. The NRC staff has updated the second sentence of the first paragraph of Section 2.0, "Regulatory Evaluation."

First sentence of the first paragraph of Section 1.0, "Introduction," reads now:

The theory and methods described in WCAP-16260-P, Revision 2, describe a subset of startup physics tests that are performed at the beginning of a cycle in a pressurized water reactor (PWR) to confirm core characteristics via measurement as a means to demonstrate that the core is operating as designed.

3. Sixth sentence of the second paragraph of Section 2.3, "Review Objectives," reads:

Westinghouse responded that the requirement for HZP CBC with rods inserted was removed in the 1997 revision of ANSI/ANS-19.6.1 and was only used to confirm reactivity computer performance for the rod swap and sequential dilution LPPT programs; therefore, it is not needed for more advanced LPPT programs, such as dynamic rod worth measurement (DRWM), and the SPT program under evaluation in this SE.

Westinghouse suggested that the second paragraph of Section 2.3, "Review Objectives," should be re-worded to read:

Westinghouse responded that the requirement for HZP CBC with rods inserted was removed in the 1997 revision of ANSI/ANS-19.6.1 and was only used to confirm reactivity computer performance for the rod swap and sequential dilution LPPT programs; therefore, it is not needed for more advanced LPPT programs, such as Dynamic Rod Worth Measurement (DRWM™) technique, and the SPT program under evaluation in this SE.

NRC Resolution for Comment 3 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that proposed wording provides additional clarification. The NRC staff has updated the second sentence of the first paragraph of Section 2.3, "Review Objectives."

First sentence of the first paragraph of Section 2.3, "Review Objectives," reads now:

Westinghouse responded that the requirement for HZP CBC with rods inserted was removed in the 1997 revision of ANSI/ANS-19.6.1 and was only used to confirm reactivity computer performance for the rod swap and sequential dilution LPPT programs; therefore, it is not needed for more advanced LPPT programs, such as Dynamic Rod Worth Measurement (DRWM™) technique, and the SPT program under evaluation in this SE.

4. Third sentence of the fifth paragraph of Section 3.1, "Basic Theory," reads:

Because, in power operations, the [] contribute a negligible amount of reactivity compared to the remainder of the core, they are typically omitted from core design codes.

Westinghouse suggested that the third sentence of the fifth paragraph of Section 3.1, "Basic Theory," should be re-worded to read:

Because, in power operations, the [] contribute a negligible amount toward the overall neutron flux distribution, they are typically omitted from core design codes.

NRC Resolution for Comment 4 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that proposed wording provides additional clarification. The NRC staff has updated the third sentence of the fifth paragraph of Section 3.1, "Basic Theory."

Third sentence of the fifth paragraph of Section 3.1, "Basic Theory," reads now:

Because, in power operations, the [] contribute a negligible amount² toward the overall neutron flux distribution, they are typically omitted from core design codes.

5. Westinghouse indicated that the word "factor" in the first sentence and in the last sentence of the fourth paragraph of Section 3.1, "Basic Theory," should be replaced with word "function."

NRC Resolution for Comment 5 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees with the comment. The NRC staff has updated first sentence and the last sentence of the fourth paragraph of Section 3.1, "Basic Theory."

First sentence of the fourth paragraph of Section 3.1, "Basic Theory," reads now:

The NRC staff were initially concerned that the calculation of [] would potentially introduce calculational errors or biases.

Last sentence of the fourth paragraph of Section 3.1, "Basic Theory," reads now:

Therefore, even if the [] calculation were to introduce additional uncertainty, it would only contribute to an overall higher uncertainty as compared to the [] measurements, which would be reflected in [] (as will be discussed later in this SE).

6. Westinghouse proposed to delete "[]" from the first sentence of the second paragraph of Section 3.2, "Prior Methodological Issues."

NRC Resolution for Comment 6 on Draft SE

The NRC staff reviewed the Westinghouse comment and agrees that it provides additional clarification. The NRC staff updated first sentence of the second paragraph of Section 3.2, "Prior Methodological Issues," to read:

Although the present construction of the SCICR methodology relies on the same theoretical foundation, the application approach has been revised to compare []

]

7. Third sentence of the fourth paragraph of Section 3.3, "Proposed SCICR Applications and Process," reads:

Westinghouse's response to SNPB RAI 5 clarified that []

]

Westinghouse suggested that the third sentence of the fourth paragraph of Section 3.3, "Proposed SCICR Applications and Process," should be re-worded to read:

Westinghouse's response to SNPB RAI 5 clarified that []

]

NRC Resolution for Comment 7 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that the sentence needs additional clarification. NRC staff added some changes to the proposed by Westinghouse language and updated the third sentence of the fourth paragraph of Section 3.3, "Proposed SCICR Applications and Process," that reads now:

Westinghouse's response to SNPB RAI 5 clarified that [

]

8. Westinghouse proposed to replace the words "weighting factors" in the third sentence of the second paragraph of Section 3.5.1, "Regression Analysis," should be replaced with words "correction factors and weighting function."

NRC Resolution for Comment 8 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees with the comment. The NRC staff has updated the third sentence of the second paragraph of Section 3.5.1, [

Third sentence of the second paragraph of Section 3.5.1, [] reads now:

However, in reality, there is an uncertainty in both the measured [] (resulting from the instrumentation system used to take the ICRR measurement and transient fluctuations in the system parameters) and an uncertainty in the predicted ICRR (resulting from the use of analytical methodologies, including [

]

9. Westinghouse proposed to replace "[]" in the second sentence of the first paragraph of Section 3.5.2, "Criticality Prediction," with "count rate."

NRC Resolution for Comment 9 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that such change provides additional clarification. The NRC staff has updated second sentence of the first paragraph of Section 3.5.2, "Criticality Prediction."

Second sentence of the first paragraph of Section 3.5.2, "Criticality Prediction," reads now:

The reactivity bias adjustment that [] is termed [] which is an estimate of the true global reactivity bias.

10. Westinghouse proposed to replace "[]" in the sixth sentence of the second paragraph of Section 3.5.2, "Criticality Prediction," with "[]"

NRC Resolution for Comment 10 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that such change provides additional clarification. The NRC staff has updated sixth sentence of the second paragraph of Section 3.5.2, "Criticality Prediction."

Sixth sentence of the second paragraph of Section 3.5.2, "Criticality Prediction," reads now:

[]

11. Westinghouse proposed to replace "rod worth" in the last sentence of the last paragraph of Section 3.5.3, "Test Results and Acceptance Criteria," with "reactivity balance."

NRC Resolution for Comment 11 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that such change provides additional clarification. The NRC staff has updated last sentence of the last paragraph of Section 3.5.3, "Test Results and Acceptance Criteria."

Last sentence of the last paragraph of Section 3.5.3, "Test Results and Acceptance Criteria," reads now:

Since these criteria relate directly to shutdown margin and reactivity balance requirements, the NRC staff agrees that failure to meet the application acceptance criteria appropriately preclude entry into MODE 1.

12. Last sentence of Section 5.0, "Conclusions," reads:

Therefore, the NRC staff concludes that WCAP-16260-P, Revision 2, is acceptable for use as a method for performing PWR startup physics tests to ensure that certain core characteristics (e.g., shutdown margin) are maintained within their TS limits and the core is operating as designed.

Westinghouse suggested that the last sentence of Section 5.0, "Conclusions," should be re-worded to read:

Therefore, the NRC staff concludes that WCAP-16260-P, Revision 2, is acceptable for use as a method for performing PWR startup physics tests to confirm core characteristics via measurement as a means to demonstrate that the core is operating as designed.

NRC Resolution for Comment 12 on Draft SE

The NRC staff has reviewed the Westinghouse comment and agrees that proposed wording provides additional clarification. The NRC staff has updated the last sentence of Section 5.0, "Conclusions."

Last sentence of Section 5.0, "Conclusions," reads now:

Therefore, the NRC staff concludes that WCAP-16260-P/WCAP-16260-NP, Revision 2, "The Spatially Corrected Inverse Count Rate (SCICR) Method for Subcritical Reactivity Measurement," is acceptable for use as a method for performing PWR startup physics tests to confirm core characteristics via measurement as a means to demonstrate that the core is operating as designed.

13. Westinghouse provided proprietary markings on the draft SE.

NRC Resolution for Comment 13 on Draft SE:

The NRC staff reviewed the Westinghouse markings and incorporated them into the final SE.

14. Westinghouse provided editorial comments.

NRC Resolution for Comment 14 on Draft SE:

The NRC staff reviewed the Westinghouse comments and finds them acceptable because the changes are editorial in nature.