



Westinghouse Electric Company
Engineering, Equipment and Major Projects
1000 Westinghouse Drive, Building 3
Cranberry Township, Pennsylvania 16066
USA

U.S. Nuclear Regulatory Commission
Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Direct tel: (412) 374-4643
Direct fax: (724) 720-0754
e-mail: greshaja@westinghouse.com

LTR-NRC-14-33

June 13, 2014

Subject: Submittal of Westinghouse Responses to "WCAP-16996-P, 'Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)' Request for Additional Information – RAIs 108, 120 and 121" (Proprietary/Non-Proprietary), Project 700, TAC No. ME5244.

Enclosed are copies of the proprietary and non-proprietary versions of Westinghouse responses to NRC RAIs 108, 120 and 121 on WCAP-16996-P, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)".

Also enclosed is:

1. One (1) copy of the Application for Withholding Proprietary Information from Public Disclosure, AW-14-3979 (Non-Proprietary), with Proprietary Information Notice and Copyright Notice.
2. One (1) copy of Affidavit (Non-Proprietary).

This submittal contains proprietary information of Westinghouse Electric Company LLC. In conformance with the requirements of 10 CFR Section 2.390, as amended, of the Commission's regulations, we are enclosing with this submittal an Application for Withholding Proprietary Information from Public Disclosure and an Affidavit. The Affidavit sets forth the basis on which the information identified as proprietary may be withheld from public disclosure by the Commission.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse Affidavit should reference AW-14-3979 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 310, 1000 Westinghouse Drive, Building 3, Cranberry Township, Pennsylvania 16066.

Very truly yours,


James A. Gresham, Manager
Regulatory Compliance

Enclosures

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11555 Rockville Pike
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e-mail: greshaja@westinghouse.com

AW-14-3979

June 13, 2014

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: LTR-NRC-14-13 P-Attachment, "Submittal of Westinghouse Responses to WCAP-16996-P, 'Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)' Requests for Additional Information - RAIs 108, 120 and 121" (Proprietary)

Reference: Letter from James A. Gresham to Document Control Desk, LTR-NRC-14-33, dated June 13, 2014

The Application for Withholding Proprietary Information from Public Disclosure is submitted by Westinghouse Electric Company LLC (Westinghouse), pursuant to the provisions of paragraph (b)(1) of Section 2.390 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary information for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10 CFR Section 2.390, Affidavit AW-14-3979 accompanies this Application for Withholding Proprietary Information from Public Disclosure, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the proprietary aspects of the application for withholding or the accompanying Affidavit should reference AW-14-3979 and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 310, 1000 Westinghouse Drive, Building 3, Cranberry Township, Pennsylvania 16066.

Very truly yours,


James A. Gresham, Manager
Regulatory Compliance

Enclosures

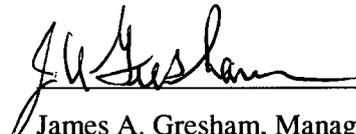
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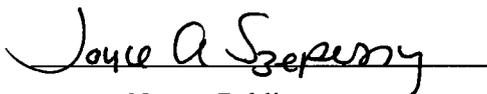
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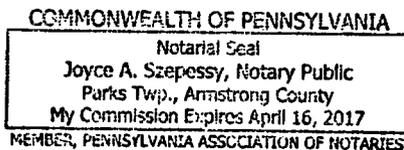
COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared James A. Gresham, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:


James A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 13th day of June 2014


Notary Public



- (1) I am Manager, Regulatory Compliance, in Engineering, Equipment and Major Projects, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

 - (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
 - (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
 - (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
 - (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
 - (f) It contains patentable ideas, for which patent protection may be desirable.
- (iii) There are sound policy reasons behind the Westinghouse system which include the following:
- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
 - (b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.
 - (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

- (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iv) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.
- (v) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (vi) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in LTR-NRC-14-33 P-Attachment, "Submittal of Westinghouse Responses to WCAP-16996-P, 'Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)' Requests for Additional Information – RAIs 108, 120 and 121 (Proprietary)", for submittal to the Commission, being transmitted by Westinghouse letter, LTR-NRC-14-33 and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with Westinghouse's request for NRC approval of WCAP-16996-P, and may be used only for that purpose.

- (a) This information is part of that which will enable Westinghouse to:
- (i) Obtain NRC approval of the FULL SPECTRUM LOCA Methodology documented in WCAP-16996-P, “Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)”.
- (b) Further this information has substantial commercial value as follows:
- (i) Westinghouse plans to sell the use of the information to its customers for the purpose of assisting customers in obtaining license changes for a Westinghouse pressurized water reactor (PWR).
 - (ii) Westinghouse can sell support and defense of the FULL SPECTRUM LOCA Methodology documented in WCAP-16996-P, “Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)”.
 - (iii) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the Affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

**WCAP-16996-P, “Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes
(FULL SPECTRUM LOCA Methodology)”
Request for Additional Information – (Non-Proprietary)
RAIs 108, 120 and 121**

June 2014

Westinghouse Electric Company LLC
1000 Westinghouse Drive
Cranberry Township, PA 16066

RAI Question #108: WCOBRA/TRAC-TF2 Assessment Using Counter-Current Flow Data by Costigan et al.

A simple experimental study of counter-current flow limitation was carried out at Harwell by Costigan et al., "Counter-current two-phase flow in horizontal channels of circular cross-section," 2nd international Conference on Multiphase Flow, Paper F3, London, 1985. The apparatus operated at close to atmospheric pressure and consistent of a H-shaped test section. Water was injected into the left-hand limb, simulating the SG, and air into the right-hand limb representing the reactor upper plenum.

- (1) Please compare WCOBRA/TRAC-TF2 predictions of the observed flooding phenomena against the experimental data of Costigan et al. Present sensitivity studies showing the impact of the H_SLUG parameter variation. Plot the comparison results using the phase Wallis parameters or any other appropriately defined dimensionless number.
- (2) Please present sensitivity results illustrating the effect of nodalization refinement in representing the horizontal limb of the H-shaped test facility. For this purpose, please present code predictions using fine noding with cell length-to-hydraulic diameter ratio less than or equal to one and coarse noding with cell length-to-hydraulic diameter ratio greater two.

Response:

The cited experiment was an air-water test at near-atmospheric pressure designed to simulate counter-current flow limitation (CCFL) in a horizontal tube. CCFL in the hot leg and steam generator is of significance for the calculation of a Small Break LOCA (SBLOCA) transient.

A summary of the May 2014 Nuclear Regulatory Commission (NRC) audit of the FULL SPECTRUM™ LOCA (FSLOCA™) evaluation model was documented in LTR-NRC-14-29 [108-1]. As discussed in the presentation starting on page P-86 of the P-Attachment to LTR-NRC-14-29, [

]^{a,c}

FULL SPECTRUM™ and FSLOCA™ are trademarks in the United States of Westinghouse Electric Company LLC, its subsidiaries and/or its affiliates. These marks may be used and/or registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited. Other names may be trademarks of their respective owners.

In summary, a comparison of the UPTF facility versus the facility for the CCFL experiments carried out by Costigan reveals that the [

] ^{a,c}

Reference(s)

- 108-1) LTR-NRC-14-29, "Summary of May 2014 NRC Audit of the FULL SPECTRUM LOCA (FSLOCA) Evaluation Model," June 5, 2014.
- 108-2) Glaeser, H., and Karwat, H., "The contribution of UPTF experiments to resolve some scale-up uncertainties in countercurrent two phase flow," *Nuclear Engineering and Design*, 145, pp. 63-84, 1993.
- 108-3) WCAP-16996-P, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)," November 2010.
- 108-4) Ohnuki, A., "Experimental Study of Counter-Current Two-Phase Flow in Horizontal Tube Connected to Inclined Riser," *Journal of Nuclear Science and Technology*, 23(3), pp. 219-232, 1986.
- 108-5) Ohnuki, A., et al., "Scale Effects on Countercurrent Gas-Liquid Flow in a Horizontal Tube Connected to an Inclined Riser," *Nuclear Engineering and Design*, 107, pp. 283-294, 1988.

RAI Question #120: IVO Loop Seal Clearance Data and WCOBRA/TRAC-TF2 Assessment

A full-scale separate effect test facility, constructed by Imatran Voima Oy (IVO) in Finland, was used to study two-phase flow phenomena in a PWR loop seal region following a cold leg break LOCA. The full-scale loop seal test facility used a piping with an ID of 0.850 m (33.46 inch or 2.8 ft) and a length of the horizontal section of the seal of 4.3 m (169.3 inch or 14.1 ft), which resulted in a L/D of 5.1 for this section. The tests were conducted at atmospheric pressure and room temperature using air and water. As part of this experimental effort, two reduced-scale loop seal models were constructed using transparent pipes with an ID of 0.080 m (3.15 inch) to examine effects of scaling and geometry on the loop seal processes and flow regime transitions. Test data from these facilities were used for comparison against the full-scale loop seal geometry tests. The IVO tests are described by H. Tuomisto, "Large-Scale Air/Water Flow Tests for Separate Effects During LOCAs in PWRs," *Nuclear Engineering and Design*, Vol. 102, No.2, pp. 171-176, 1987 and by H. Tuomisto and P. Kajanto, "Two-Phase Flow in a Full-Scale Loop Seal Facility," *Nuclear Engineering and Design*, Vol. 107, No.3, pp. 295-305, 1988.

IVO separate effect loop seal clearance test data has have been used for assessing various reactor safety thermal hydraulic codes. Results from a RELAP5 assessment study are documented by O. Kymäläinen, "The Assessment of RELAP5/MOD2 against IVO Loop Seal Tests," NUREG/IA-0082, April 1992. In this work, RELAP5/MOD2 analyses for both the full-scale and the 1/10-scale atmospheric air-water loop seal facilities were performed. The calculated residual water levels differed from the measured data and the code yielded lower values. Also, the predicted gas superficial velocities, needed for loop seal clearing, was lower than the experimentally values. Even with interfacial drag modifications, agreement with the experimental data was not found. Results from a more recent TRACE assessment study are presented by S. Hillberg, "Full Scale Loop Seal Experiments with TRACE V5 Patch 1," NUREG/IA-0403, December 2011. The assessment was focused on the code capability to predict the residual water level in the horizontal pipe section of the loop seal and examined the pressure behavior during the clearance of the loop seal. Effects related to loop seal nodalization, maximum time step size, and initial liquid levels were studied. The simulations revealed sensitivities to loop seal nodalization particularly with regard to representing the 90° bends of the seal piping.

IVO full-scale loop seal experiments are discussed in WCAP-16996-P/WCAP-16996-NP, Volumes I, II, and III, Revision 0, Section 18, "Loop Seal Clearance," Subsection 18.2.2.4, "Effect of Scale," and void fraction data points are compared against three different limiting lines in Figure 18.2.2-12, "IVO Full-Scale Final Void Fraction and Limit Lines." However, no assessment of WCOBRA/TRAC-TF2 prediction results against IVO separate effect loop seal experiments was reported.

- (1) Please perform an additional assessment study for WCOBRA/TRAC-TF2 using IVO separate effect atmospheric air-water test data obtained from both the full-scale and the 1/10-scale loop seal test facilities. Please describe the applied WCOBRA/TRAC-TF2 models for the IVO test facilities as requested in RAI Question No. 112 Items (1) through (4) with regard to the WCOBRA/TRAC-TF2 UPTF loop seal model. Also, describe the IVO loop seal tests instrumentation, test data, and assessed code prediction results as requested in RAI Question No. 113, Items (1) and (2), with regard to the WCOBRA/TRAC-TF2 UPTF TRAM loop seal clearance test data. Document user defined parameters, multipliers, and/or options used in the WCOBRA/TRAC-TF2 IVO loop seal models as requested in RAI Question No. 114, Items (1) and (2), with regard to the WCOBRA/TRAC-TF2 UPTF TRAM loop seal model.
- (2) Please present detailed results from the WCOBRA/TRAC-TF2 assessment using IVO separate effect atmospheric air-water test data from the full-scale and the 1/10-scale loop seal test facilities as requested in RAI question #115 items (1) through (4) with regard to the WCOBRA/TRAC-TF2 UPTF TRAM loop seal tests assessment study.
- (3) Please perform and present results from sensitivity calculations assessing effects related to IVO the full-scale and 1/10-scale loop seal test facilities nodalization in the applied WCOBRA/TRAC-TF2 IVO loop seal models as requested in RAI question #116 items (1) through (3) with regard to the WCOBRA/TRAC-TF2 assessment using the UPTF TRAM

loop seal tests. The length of the bottom horizontal section of the full-scale IVO loop seal piping had an L/D ratio of 5.1, which was significantly larger than the corresponding ratio in the full-scale UPTF loop seal facility characterized by an L/D ratio of 2.3. Therefore, please adjust the number of cells in the WCOBRA/TRAC-TF2 IVO full-scale loop seal model so that the cell length-to-diameter ratios in the IVO full-scale loop seal model are close to the ratios examined in the UPTF full-scale loop seal model (L/D of 1.16, 0.77, and 0.58). Examine any additional nodalization schemes, as deemed appropriate.

- (4) Please provide results from WCOBRA/TRAC-TF2 sensitivity studies based on the IVO separate effect full-scale and 1/10-scale loop seal clearance tests, which show the effect of varying or sampling of parameters, multipliers, and/or options relevant to the prediction of the loop clearance process. Perform and document the code assessment results as requested in RAI question #118 with regard to the WCOBRA/TRAC-TF2 UPTF loop seal model.
- (5) Please provide results from WCOBRA/TRAC-TF2 sensitivity calculations based on the IVO separate effect full-scale and 1/10-scale loop seal clearance tests that show the effects related to the applied maximum allowed time step size (DTMAX). Perform and document the code assessment results as requested in RAI question #119 with regard to the WCOBRA/TRAC-TF2 UPTF TRAM loop seal assessment study.

Response:

See the response to RAI 121.

RAI Question #121: ECTHOR Loop Seal Clearance Data and WCOBRA/TRAC-TF2 Assessment

WCAP-16996-P/WCAP-16996-NP, Volumes I, II, and III, Revision 0, Section 18, "Loop Seal Clearance," Subsection 18.2.2, "PWS 2.3 Loop Seal Tests," discusses scaled air-water experiments examining the hydraulic behavior of a U-tube under conditions similar to those encountered in a PWR loop seal during a small break LOCA. The tests were performed as part of the ECTHOR (an acronym from French "Ecoulements dans des Tuyauteries Horizontales en Eau-Air," which stands for Water-Air Flow in Horizontal Pipes) Program carried out under an agreement between Framatome, Électricité de France, Commissariat à l'Énergie Atomique, and Westinghouse. Description of the ECTHOR tests is provided by J. P. Bourteele, "Investigation of Stratified and Countercurrent Flows in Horizontal Piping during a Loss-of-Coolant Accident," European Two-Phase Flow Group Meeting, Glasgow, June 3-6, 1980, and by R. J. Skwarek, "Experimental Evaluation of PWR Loop Seal Behavior during Small LOCAs,"

Proceedings of the ANS Specialists Meeting on Small Break Loss-of-Coolant Accident Analyses in LWRs: Conference Papers, August 25-27, 1981, Monterey, California, pp. 5.1-5.12.

The ECTHOR separate effect air-water scaled loop seal tests were performed at atmospheric pressure in a U-tube pipe with an inner diameter of 0.25 m (9.84 inch or 0.82 ft) representing the geometry of a PWR loop seal at a scaling ratio of 0.32 (approximately 1/3). ECTHOR loop seal tests have been used in the past for interfacial drag model development and assessment of various reactor safety thermal hydraulic codes such as CATHARE (acronym from Code for Analysis of Thermalhydraulics during an Accident of Reactor and safety Evaluation) and RELAP5.

WCAP-16996-P/WCAP-16996-NP, Volumes I, II, and III, Revision 0, Section 18, "Loop Seal Clearance," Subsection 18.2.2, "PWS 2.3 Loop Seal Tests," Figures 18.2.2-3 shows residual liquid level data, Figures 18.2.2-4 and 18.2.2-5 depict average void fraction data, and Figure 18.2.2-9 plots U-tube differential pressure data from the ECTHOR tests. The test data are compared against limiting lines for governing participating processes in Figures 18.2.2-7 and 18.2.2-8. However, no assessment of WCOBRA/TRAC-TF2 prediction results against ECTHOR separate effect air-water scaled loop seal data was reported.

Please perform an additional assessment study for WCOBRA/TRAC-TF2 using ECTHOR separate effect air-water scaled loop seal test data. Perform this study and document the code assessment results as requested in RAI question #120 items (1) through (5) with regard to the WCOBRA/TRAC-TF2 IVO separate effect atmospheric air- water tests.

Response:

The IVO and ECTHOR loop seal clearing experiments were air-water tests at near-atmospheric pressure designed to study loop seal clearing behavior. The calculation of loop seal clearing is significant to the progression of a SBLOCA transient. As noted in the RAIs, the test data associated with these experiments was reviewed and discussed in the topical report. However, the experiments were not simulated with WCOBRA/TRAC-TF2. Rather, the Upper Plenum Test Facility (UPTF) loop seal clearing Separate Effects Tests (SETs) were simulated. The UPTF loop seal clearing SETs were selected because they were full-scale geometry, steam-water tests that were run at two different, elevated pressures.

A summary of a May 2014 Nuclear Regulatory Commission (NRC) audit of the FULL SPECTRUM LOCA evaluation model was documented in LTR-NRC-14-29 [121-1]. Additional investigation into loop seal clearing behavior observed in experimental data, as well as WCOBRA/TRAC-TF2 sensitivity studies are discussed in Section 3.0 of the P-Attachment to LTR-NRC-14-29. The FSLOCA methodology was then modified based on the results of the data investigation and WCOBRA/TRAC-TF2 sensitivity studies as described therein to better capture the behavior observed in the integral experiments.

In conclusion, the loop seal clearing phenomenon was evaluated by a review of the ECTHOR, IVO, and UPTF SET data. The code calculation of loop seal clearing was evaluated via simulation of the UPTF

loop seal clearing SETs with WCOBRA/TRAC-TF2. The loop seal clearing behavior was then evaluated as part of the integral SBLOCA response via the simulation of numerous Rig of Safety Assessment (ROSA) Large-Scale Test Facility (LSTF) experiments. Additional investigation of loop seal clearing in integral test facilities was performed, and the methodology was updated as described in LTR-NRC-14-29 to appropriately reflect the data. Given the SET and IETs simulated with WCOBRA/TRAC-TF2, and the methodology changes described in LTR-NRC-14-29, there is sufficient assurance that the loop seal clearing behavior is appropriately predicted with the WCOBRA/TRAC-TF2 code.

Reference(s)

- 121-1) LTR-NRC-14-29, "Summary of May 2014 NRC Audit of the FULL SPECTRUM LOCA (FSLOCA) Evaluation Model," June 5, 2014.