



Program Management Office
20 International Drive
Windsor, Connecticut 06095

May 8, 2018

Project 99902037

OG-18-108

Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Subject: PWR Owners Group
Transmittal of Changes to Pages 2-2 and 2-3 for PWROG-17034-P/-NP, Revision 0, "Evaluation of the WCAP-10325-P-A Westinghouse LOCA Mass & Energy Release Methodology" (PA-ASC-1420)

References:

1. PWR Owners Group Letter OG-18-75, Transmittal of PWROG-17034-P, Revision 0, "Evaluation of the WCAP-10325-P-A Westinghouse LOCA Mass & Energy Release Methodology".
2. CAW-18-4728, "Application for Withholding Proprietary Information from Public Disclosure," March 26, 2018.
3. WCAP-10325-P-A (proprietary), WCAP-10326-A (non-proprietary), "Westinghouse LOCA Mass and Energy Release Model for Containment Design March 1979 Version," May 1983.
4. CAW-18-4742, "Application for Withholding Proprietary Information from Public Disclosure," May 7, 2018.

The purpose of this letter is to transmit changes to Pages 2-2 and 2-3 of Pressurized Water Reactor Owners Group (PWROG) Topical Report (TR), PWROG-17034-P, Revision 0, "Evaluation of the WCAP-10325-P-A Westinghouse LOCA Mass & Energy Release Methodology," which was transmitted for NRC review and approval via Reference 1, in accordance with the Nuclear Regulatory Commission (NRC) TR program for review and acceptance for referencing in regulatory actions.

One of the changes is associated with the time that was reported on page 2-2 for the termination time for the FROTH computer code. The time that was originally reported was a general time that could apply to the end of the FROTH code computer time for any Westinghouse PWR with a dry or sub-atmospheric containment. The time that is reported will be made to be specific to the transients presented in the TR. The other changes on pages 2-2 and 2-3 clarify the differences between the current and previously NRC approved TRs with respect to the identification and descriptions for events that are

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associated with the post-reflood phase of the long-term loss-of-coolant accident transient when using the NRC approved methodology in WCAP-10325-P-A (Reference 3).

The changes identified in Enclosures 1 and 2 will be incorporated into the NRC approved versions of the proprietary and non-proprietary topical report that will be transmitted to the NRC after the Final Safety Evaluation for the TR is issued.

Enclosure 1 contains the tracked change versions of pages 2-2 and 2-3 for the proprietary version of the TR. Enclosure 2 contains the tracked change versions of pages 2-2 and 2-3 for the non-proprietary version of the TR.

This letter transmits two copies of "PWROG-17034-P, Revision 0 Change Pages 2-2 and 2-3" (Enclosure 1), one copy of "PWROG-17034-NP, Revision 0 Change Pages 2-2 and 2-3" (Enclosure 2) and CAW-18-4742 (Enclosure 3).

Correspondence related to this transmittal should be addressed to:

Mr. W. Anthony Nowinowski, Program Manager
PWR Owners Group, Program Management Office
Westinghouse Electric Company
1000 Westinghouse Drive, Suite 380
Cranberry Township, Pennsylvania, 16066

If you have any questions, please do not hesitate to contact me at (805) 545-4328 or Mr. W. Anthony Nowinowski, Program Manager of the PWR Owners Group, Program Management Office at (412) 374-6855.

Sincerely yours,



Ken Schrader, Chief Operating Officer and Chairman
PWR Owners Group

KS:WAN:am

Enclosure 1: Two copies of "PWROG-17034-P, Revision 0 Change Pages 2-2 and 2-3"
Enclosure 2: One copy of "PWROG-17034-NP, Revision 0 Change Pages 2-2 and 2-3"
Enclosure 3: CAW-18-4742 (Reference 4)

cc: PWROG Management Committee
PWROG Analysis Committee
PWROG PMO
B. Benney, US NRC
J. P. Molkenthin, Westinghouse
J. D. Andrachek, Westinghouse
K. W. Bonadio, Westinghouse
J. T. Maruschak, Westinghouse
R. M. Jakub, Westinghouse
C. P. Logan, Westinghouse



Westinghouse Electric Company
1000 Westinghouse Drive
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) 940-8542
e-mail: greshaja@westinghouse.com

CAW-18-4742

May 7, 2018

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: PWROG-17034-P, Revision 0, Change Pages 2-2 and 2-3 (Proprietary)

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 Nuclear Regulatory Commission's ("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 in the above-referenced report is further identified in Affidavit CAW-18-4742 signed by the owner of the proprietary information, Westinghouse. The Affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying Affidavit by Pressurized Water Reactor Owners Group (PWROG).

Correspondence with respect to the proprietary aspects of the Application for Withholding or the Westinghouse Affidavit should reference CAW-18-4742 and should be addressed to James A. Gresham, Consulting Engineer, Licensing and Regulatory Affairs, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 2 Suite 259, Cranberry Township, Pennsylvania 16066.

A handwritten signature in black ink, appearing to read "JA Gresham".

James A. Gresham, Consulting Engineer
Licensing and Regulatory Affairs

AFFIDAVIT

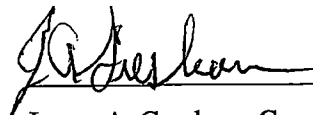
COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF BUTLER:

I, James A. Gresham, am authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC ("Westinghouse") and declare that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief.

Executed on: 5/7/18



James A. Gresham, Consulting Engineer
Licensing and Regulatory Affairs

- (1) I am Consulting Engineer, Licensing and Regulatory Affairs, 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 Nuclear Regulatory Commission's ("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 constitute Westinghouse policy and provide 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, 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 as pages titled "PWROG-17034-P, Revision 0, Change Pages 2-2 and 2-3"(Proprietary), for submittal to the Commission, being transmitted by PWROG Letter OG-18-108 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 a PWR Owners Group topical report, which provides the technical basis for the continued use of the proprietary WCAP-10325-P-A methodology with the original metal material properties.
- (a) This information is part of that which will enable Westinghouse to obtain NRC review and approval of PWROG-17034 and obtain NRC acceptance for the continued use of the proprietary WCAP-10325-P-A methodology with the original metal material properties.

- (b) Further this information has substantial commercial value as follows:
- (i) Westinghouse plans to sell the use of similar information to its customers for the purpose of calculating LOCA mass and energy releases using the proprietary WCAP-10325-P-A methodology.
 - (ii) Westinghouse can sell support and defense of industry guidelines and acceptance criteria for plant-specific applications.
 - (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 non-proprietary versions of change pages 2-2 and 2-3 for PWROG-17034, furnished to the NRC in connection with requests for PWR Owners Group generic topical report 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.

Letter for Transmittal to the NRC

The following paragraphs should be included in your letter to the NRC Document Control Desk:

Enclosed are:

1. PWROG-17034-P, Revision 0, Change Pages 2-2 and 2-3 (Proprietary)
2. PWROG-17034-NP, Revision 0, Change Pages 2-2 and 2-3 (Non-Proprietary)

Also enclosed are the Westinghouse Application for Withholding Proprietary Information from Public Disclosure, CAW-18-4742, accompanying Affidavit, Proprietary Information Notice, and Copyright Notice.

As Item 1 contains information proprietary to Westinghouse Electric Company LLC ("Westinghouse"), it is supported by an Affidavit signed by Westinghouse, the owner of the information. The Affidavit sets forth the basis on which the information may be withheld from public disclosure by the Nuclear Regulatory Commission ("Commission") and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the 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 copyright or proprietary aspects of the item listed above or the supporting Westinghouse Affidavit should reference CAW-18-4742 and should be addressed to James A. Gresham, Consulting Engineer, Licensing and Regulatory Affairs, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 2 Suite 259, Cranberry Township, Pennsylvania 16066.

side. For additional conservatism, it is also assumed [

] ^{a,c} Heat transfer from thick metal (reactor vessel shell), thin metal (reactor internals), and the fuel assemblies is also accounted for during reflood. The key updates to the WREFLOOD code version used in WCAP-10325-P-A are: a two-phase pressure drop multiplier is included, mixing of the steam in the loops with safety injection fluid is accounted for, a transient core heat release calculation was included, and the SG effluent modeling was updated. The update to the SG effluent modeling in the WCAP-10325-P-A methodology was based on test data which indicated that the degree of superheating was less than previously assumed when calculating the steam releases with the WCAP-8264-P-A, Revision 1 methodology. In WCAP-10325-P-A, it was assumed that the mixture exiting the SGs during the reflood period was at saturation. This update was shown within the framework of the WCAP-10325-P-A methodology to be conservative with respect to the containment peak pressure calculations, as it allowed for a higher mass release rate, and therefore a higher total energy release relative to a superheated condition.

After the core is quenched and the liquid level is recovered, typically at approximately 200 seconds after break initiation, the WCAP-10325-P-A methodology transitions into the post-reflood, or froth phase of the LOCA transient. The post-reflood mass and energy calculation methodology is described in Section II.D of WCAP-8264-P-A, Revision 1. The FROTH model consists of a noding structure similar to the WREFLOOD structure. The downcomer is assumed to be full at all times, which provides a driving head to move flow through the system. The flow exiting the core due to boil off contains entrained droplets, which are transported to the intact loop and broken loop SGs. Heat is transferred from the secondary side of the SG, [^{a,c}] to the primary side flow. The flow exiting the intact loop SG interacts with the cold safety injection flow, where perfect mixing is assumed to occur. Energy release from stored RCS metal energy is also accounted for in the break flow. The version of FROTH described in WCAP-10325-P-A is a modified version of the WCAP-8264-P-A, Revision 1 FROTH code. The updates include modeling saturated conditions for the flow exiting the SGs, if the fluid and heat transfer conditions are appropriate (Reference 14) and a containment backpressure depressurization calculation for SG energy removal. The first of these updates was shown to provide a slightly higher mass and energy release rate into the containment. The containment backpressure is typically set to the containment design pressure for the FROTH code calculations, and the second update allows for removal of SG energy below the saturation temperature at the containment design temperature (basically an automation of the depressurization energy release described in WCAP-8264 Section II.D) via the EPITOME code. It is this depressurization calculation that forces the stored SG energy into the M&E releases at a very conservative rate. The overall FROTH model provides a conservative release rate of stored SG fluid and metal energy. The froth phase of the large break LOCA transient ends when the intact loop SGs are depressurized to the containment design pressure. The froth phase ends at about [^{a,c}] after break initiation.

The long term steaming phase of the LOCA transient is typically calculated by the containment code after the WCAP-10325-P-A mass and energy releases are terminated and all of the stored energy in the RCS and SGs has been released. The long term steaming calculation is a simple boil-off calculation, where the decay heat is assumed to vaporize the safety injection water,

which flows directly to containment. This is a conservative calculation to maximize the long term steam release as no credit is taken for heating all of the safety injection fluid prior to vaporizing any of it.

2.2 WCAP-17721-P-A

The NRC issued the Final SE for the WCAP-17721-P-A WCOBRA/TRAC LOCA M&E release methodology (Reference 7) in September 2015. The LOCA M&E transient that is calculated with WCOBRA/TRAC progresses through stages that are analogous to those of the WCAP-10325-P-A methodology. Unlike the WCAP-10325-P-A methodology, the WCOBRA/TRAC calculation uses a single code for all stages up through post-reflood. The WCAP-10325-P-A methodology is very conservative because of the non-mechanistic stored energy release, and the WCAP-17721-P-A methodology was developed in response to provide a LOCA M&E release calculation which was more mechanistic while still being conservative. The main difference in the WCAP-17721-P-A methodology with respect to the WCAP-10325-P-A methodology in terms of the M&E releases is that the WCOBRA/TRAC code used in the WCAP-17721-P-A methodology does not force stored energy out at a non-mechanistic rate.

The blowdown portion of WCOBRA/TRAC is similar to that of SATAN-VI in terms of the mass and energy released, because it is controlled by the initial RCS fluid mass and enthalpy. Stored RCS metal energy is a minimal factor in this portion of the transient. Unlike WREFLOOD, WCOBRA/TRAC performs a mechanistic calculation for the refill of the lower plenum. This is a relatively small period of time (10-20 seconds) and is followed by core reflooding as safety injection provides flow. During the reflood period the flow begins to exit the top of the core, and by the time the core is quenched, there is a significant amount of liquid transported to the intact and broken loop SGs for a double-ended pump suction or cold leg break. [

]^{a,c} While this heat transfer is less limiting than the heat transfer in the WCAP-10325-P-A methodology, it is conservative and was benchmarked to test data as described in WCAP-17721-P-A.

WCOBRA/TRAC is run for a duration sufficient to capture the time of peak containment pressure and transition to sump recirculation. One hour of transient time is sufficient for a typical large dry containment. [

]^{a,c}