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Proprietary Notice
This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 2, the balance of this letter may be considered non-proprietary.

MFN 09-216 Supplement 1

Docket No. 52-010

August 26, 2009

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

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – LTR NEDE-33083P, Supplement 3, Revision 1 – RAI Number 21.6-96 S03**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH response to RAI Number 21.6-96 S03 is addressed in Enclosure 1.

Enclosure 2 is Attachment 1 to Enclosure 1, Appendix E to LTR NEDE-33083P, Supplement 3, Revision 1. Enclosure 2 contains GEH proprietary information as defined by 10 CFR 2.390. GEH customarily maintains this information in confidence and withholds it from public disclosure. Enclosure 3 is the non-proprietary version of Enclosure 2, does not contain proprietary information and is suitable for public disclosure.

The affidavit contained in Enclosure 4 identifies that the information contained in Enclosure 2 has been handled and classified as proprietary to GEH. GEH hereby requests that the information of Enclosure 2 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 09-472, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application,* July 1, 2009

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – LTR NEDE-33083, Supplement 3, Revision 1 – RAI Number 21.6-96 S03
2. Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – to LTR NEDE-33083, Supplement 3, Revision 1 – RAI Number 21.6-96 S03 – Attachment 1, Appendix E – GEH Proprietary Information
3. Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – LTR NEDE-33083, Supplement 3, Revision 1 – RAI Number 21.6-96 S03 -- Attachment 1, Appendix E – Public Version
4. Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – LTR NEDE-33083, Supplement 3, Revision 1 – RAI Number 21.6-96 S03 – Affidavit

cc:

AE Cubbage	USNRC (with enclosures)
JG Head	GEH (with enclosures)
DH Hinds	GEH (with enclosures)
eDRF	0000-0105-5599

Enclosure 1

MFN 09-216 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 357

Related to ESBWR Design Certification Application

LTR NEDE-33083, Supplement 3, Revision 1

RAI Number 21.6-96 S03

NRC RAI 21.6-96 S03

Staff requests that the content found in the response to RAI 21.6-96 S02 (MFN 09-216), part (d) be placed in an Appendix to LTR 33083P Supplement 3.

GEH Response

The response to RAI 21.6-96, Supplement 02, Part A, Item d, is added to the LTR as requested.

DCD Impact

LTR NEDE-33083P, Supplement 3, Rev 1, will have Item d of the RAI 21.6-96 Supplement 02 response added as shown in the attached markup.

ATTACHMENTS

1. NEDE-33083P, Supplement 3, Rev. 1, Appendix E – RAI 21.6-96 S02, Part A, Item d (Proprietary Version)
2. NEDE-33083P, Supplement 3, Rev. 1, Appendix E – RAI 21.6-96 S02, Part A, Item d (Non-Proprietary Version)

Enclosure 4

MFN 09-216 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 357

Related to ESBWR Design Certification Application

LTR NEDE-33083P, Supplement 3, Revision 1

RAI Number 21.6-96 S03

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Larry J. Tucker, state as follows:

(1) I am the Manager, ESBWR Engineering, GE Hitachi Nuclear Energy ("GEH"), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in enclosure 2 of GEH's letter, MFN 09-216 Supplement 1 Mr. Richard E. Kingston to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 357 – Related to ESBWR Design Certification Application – LTR NEDE-33083P, Supplement 3, Revision 1 – RAI Number 21.6-96 S03,*" dated August 26, 2009. The proprietary information in enclosure 2, which is entitled "*MFN 09-216 Supplement 1 – Response to Portion of NRC Request for Additional Information Letter No. 357 – Related to ESBWR Design Certification Application – LTR NEDE-33083P, Supplement 3, Revision 1 – RAI Number 21.6-96 S03 -- Attachment 1, Appendix E – GEH Proprietary Information,*" is indicated as the content contained between opening double brackets ([[) and closing double brackets (]]). [[This sentence is an example {3}]]. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information which, if used 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 of a similar product;

c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) is classified as proprietary because it contains details of GEH's design and licensing methodology. The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost to GEH.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's

comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 26th day of August 2009.

Larry J. Tucker
GE-Hitachi Nuclear Energy Americas LLC

Enclosure 3

MFN 09-216 Supplement 1

Response to Portion of NRC Request for

Additional Information Letter No. 357

Related to ESBWR Design Certification Application

LTR NEDE-33083, Supplement 3, Revision 1

RAI Number 21.6-96 S03

Attachment 1, Appendix E

Public Version

APPENDIX E
NRC RAI 21.6-96 S02, Part A, Item d

E.1 NRC RAI 21.6-96 S02, Part A, Item d

Provided in GEH letter MFN 09-216, "Response to Portion of NRC Request for Additional Information Letter No. 293 - Related to ESBWR Design Certification Application – RAI Number 21.6-96 Supplement 2," dated April 9, 2009.

E.2 RAI 21.6-96 S02

The PCCS is not over capacity starting at about 3 hours; include the response in a licensing document & Code qualification assessment and justification.

Part A: GEH's response to RAI 21.6-96 Supplement 1 states that "For the long-term Passive Containment Cooling System (PCCS) operation, the PCCS is over capacity starting at about 3 hours. Under this overcapacity condition, the PCCS regulates the heat removal rate to match the decay heat by accumulating non-condensable (NC) gases in the lower part of the PCCS tubes."

[a] The statement that "the PCCS is over capacity starting at about 3 hours" is misleading. Both GEH's TRACG and the staff's MELCOR results show that the PCCS does not operate at overcapacity: energy removal rate from the PCCS is below the decay heat generation leading to continuous containment pressurization and heat up for 72 hours after a LOCA.

Each PCCS is designed to remove 11 MW at design conditions stated in ESBWR DCD Tier 2 Rev. 5 Table 6.2-10. It may appear that six PCCS would be able to remove 66 MW which is significantly higher than the decay power (e.g., 29 MW at 24 hours and 21 MW at 72 hours). (See ESBWR DCD Tier 2 Rev. 5 Figure 6.2-14c1.) The PCCS is unable to remove the design capacity power of 66 MW and arrest the containment pressurization during the first 72 hours after a LOCA because it operates at containment conditions which are less favorable than its design conditions. An example is that the design conditions include that the operation of PCCS at 100 percent steam environment but the presence of non-condensables in the drywell adversely affects the steam condensation rate, and thus, the efficiency of PCCS.

Please clarify the statement "the PCCS is over capacity starting at about 3 hours."

[b] Explain what physical conditions force the PCCS to regulate the heat removal rate to match the decay heat.

[c] Update the DCD or a topical report incorporated by reference as appropriate to provide this technical description.

[d] NRC TRACG Inspection 12/15/08 to 12/19/08. The response to RAI 21.6-96 S01 (MFN 08-644) provided assessment comparisons for TRACG04 V53 and TRACG04 V40 against test data. Because some assessment results were degraded (compared to the earlier versions) while some cases were improved, please provide an additional column with qualification justification in the tables listed in RAI 21.6-96 S01. Since the latest version of TRACG04P Level-2 code V5711 was used for DCD safety analysis, provide a similar assessment for V5711 to RAI21.6-96 S01.

E.3 GEH Response to Part A, Item d

(d) The following 6 TRACG cases were excluded in the assessments performed with the latest Version 5711 of the TRACG04P code.

Case GIRH1 in GIRAFFE Helium Test

Case M10b in PANDA Transient Test (M-Series)

Case P04 and Case P06 in PANDA Transient Test (P-Series)

Case TE1CE2 and Case TE1CE2_70 in PANDA Exploratory Test

Please note that cases for the test facility are all included where multiple cases are needed to provide the assessment. The reduced set of cases covers all the test facilities. Results from the assessment using the latest TRACG04P Version 5711 Level 2 code are presented in Tables E-1 through E-17 and Figures E-1 through E-18 of this appendix. The sequence numbering of the tables and figures is the same as was presented in the response to RAI 21.6-96 S02 (Reference 1). In general, results from TRACG04P Version 5711 Level 2 do not show any significant deviation from the test data and the previous TRACG version results with the exception of the PANTHERS Isolation Condenser (IC) Performances Tests under Component Performance Tests and One-Sixth Scale Boron Mixing Test under Integral Systems Tests.

For the PANTHERS IC Performances Tests under Component Performance Tests, different behaviors are observed in Test T12 case. Two peaks are predicted in the Inlet Pressure Transient and Heat Transfer as shown in Figure E-2a and Figure E-3a. The earlier pressure rise in the TRACG04P Version 5711 Level 2 prediction of Test T12 relative to test data is attributed to entrainment and possibly dissolution of non-condensable gas in the drain flow in the test. Gas dissolution is not modeled in TRACG and entrainment under the conditions produced in the IC test facility may be under predicted. Greater retention of noncondensable gases in the condenser tubes in the TRACG simulation would cause a more rapid increase in the pressure required for condensation of the inlet steam flow. This behavior is similar to that seen in analyses performed with previous versions of TRACG. The noncondensable gas holdup calculated by TRACG is sensitive to calculation parameters such as the condensate velocity and interfacial shear. The initial drop in pressure seen in Figure E-2a is due to a momentary increase in the calculated noncondensable gas entrainment resulting in a sharply reduced gas holdup. This calculation has shown some sensitivity to the time step size used in the TRACG calculations. A sensitivity study was conducted by reducing the maximum time step size by half. The results are shown in Table E-5, Figure E-2 and Figure E-3. The resulting calculations show pressure and heat transfer trajectories close to the previous results. The peak pressure and timing of the peak are not significantly altered. This shows that while some of the details of this transient are sensitive to the time step size, the overall behavior of the transient calculated by TRACG is not affected.

For the One-Sixth Scale Boron Mixing Test, results for the cases using the TRACG04P Version 5711 code provide better agreement with the data than any other code version that has been used so far to analyze this test, see Figure E-6 through Figure E-13. This study

was re-done with a better simulation of the facility using air and water. Previous calculations had simulated an equivalent steam-water condition.

In all, the conclusions drawn from previous submittals (listed below) remain valid.

- GE Hitachi Nuclear Energy, NEDC-32725P (Ref. 2)
- GE Hitachi Nuclear Energy, NEDC-33080P (Ref 3)
- Letter No. MFN 04-059, dated June 2, 2004 (Ref 4)

E.4 References

1. MFN 09-216, Letter from Richard E. Kinsey to U.S. Nuclear Regulatory Commission, Enclosure 1, "Response to Portion of NRC Request for Additional Information Letter No. 293 - Related to ESBWR Design Certification Application – RAI Number 21.6-96 Supplement 2," dated April 9, 2009
2. GE Hitachi Nuclear Energy, NEDC-32725P, "TRACG Qualification for SBWR," Revision 1 August 2002.
3. GE Hitachi Nuclear Energy, NEDC-33080P, "TRACG Qualification for ESBWR," Revision 0, August 2002.
4. MFN 04-059, dated June 2, 2004, "Update of ESBWR TRACG Qualification for NEDC-32725P and NEDC-33080P Using the 9-Apr-2004 Program Library Version of TRACG04."

Table E-1
Summary of TRACG Results for the Toshiba Low Pressure Void Fraction Tests

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Table E-2
Summary of TRACG Results for the Ontario Hydro Void Fraction Tests

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Table E-3
Summary of TRACG Results for the PANTHERS PCC SS Steam-Air Tests

[redacted]

Table E-4
Summary of TRACG Results for the PANTHERS PCC SS Pure Steam Tests

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Table E-5
Summary of TRACG Results for the PANTHERS IC Tests

Table E-6
Summary of TRACG Results for the PANDA PCC Tests

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Table E-7
Summary of TRACG Results for the Suppression Pool Stratification Test (PSTF Test 5807-29)

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Table E-8
Summary of TRACG Results for the GIST Test (Test C01A)

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Table E-9
Summary of TRACG Accuracy for GIRAFFE Helium Tests

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II

Table E-10
Summary of TRACG Results for the GIRAFFE Systems Interactions Test

II						

Table E-10
Summary of TRACG Results for the GIRAFFE Systems Interactions Test

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Table E-11
Summary of TRACG Results for the PSTF MARK III Test 5703-01

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Table E-12
Summary of TRACG Results for the 4T MARK II Test 5101-34

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II

Table E-13
Summary of TRACG Results for the PANDA M-Series

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Table E-14
Summary of TRACG Results for the PANDA P-Series

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Table E-15
Summary of TRACG Results for the Dodewaard Startup Test

II					

II

Table E-16
Summary of TRACG Results for the CRIEPI Low Pressure Tests

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Table E-17
Summary of TRACG Results for the SIRIUS Two-Phase Instability Tests

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Figure E-1. Comparison of TRACG and PANTHERS Inlet Pressure for Test 54 (Figure 4.1-28, Ref. 4)

II II

Figure E-2. Comparison of TRACG and PANTHERS Inlet Pressure Transient for Test 12 (Reduced maximum time step size) (Figure 4.2-6, Ref. 4)

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Figure E-2a. Comparison of TRACG and PANTHERS Inlet Pressure Transient for Test 12 (Figure 4.2-6, Ref. 4)

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Figure E-3. Comparison of TRACG and PANTHERS Heat Transfer for Test 12 (Reduced maximum time step size)
(Figure 4.2-7, Ref. 4)

II II

Figure E-3a. Comparison of TRACG and PANTHERS Heat Transfer for Test 12 (Figure 4.2-7, Ref. 4)

Figure E-4. TRACG Suppression Pool Nodalization (Suppression Pool Stratification Tests)

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Figure E-5. Final Pool Temperature Comparison, TRACG04 Version 53, TRACG04 Version 5711 Level 2.
(Suppression Pool Stratification Tests)

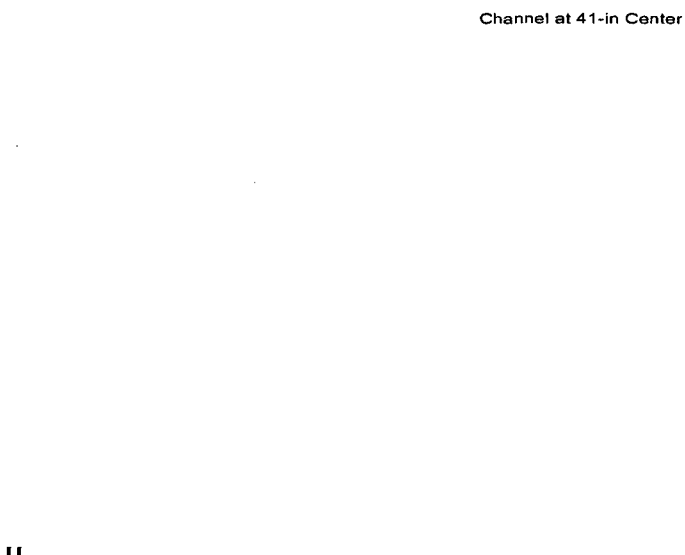

Figure E-6. Channel at 41-in. Center: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-3, Ref. 4)

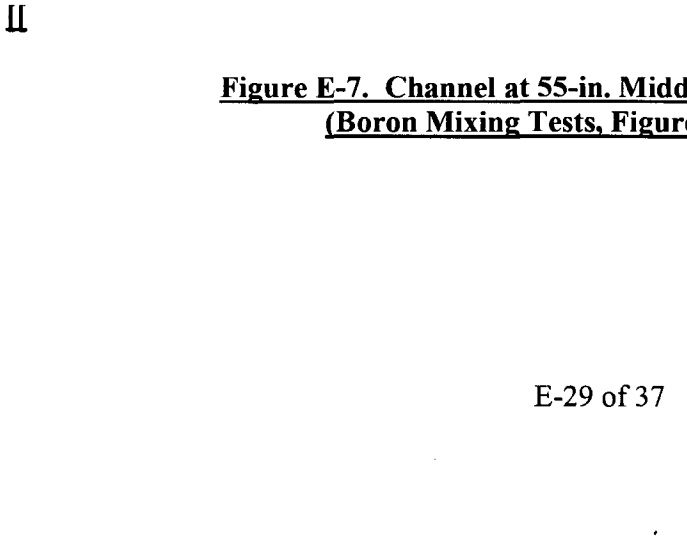

Figure E-7. Channel at 55-in. Middle: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-4, Ref. 4)

II

II

Figure E-8. Channel at 41-in. Periphery: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-5, Ref. 4)

II

II

Figure E-9. Bypass at 41-in. Center: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-6, Ref. 4)

II

II

Figure E-10. Bypass at 55-in. Middle: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-7, Ref. 4)

II

II

Figure E-11. Bypass at 41-in. Periphery: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-8, Ref. 4)

II

II

Figure E-12. Lower Plenum at 14-in. Middle: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-9, Ref. 4)

II

II

Figure E-13. Lower Plenum Center: Well-Mixed Model (Boron Mixing Tests, Figure 5.4-10, Ref. 4)

II

II

Figure E-14. DW Pressure Response
(PSTF Mark III Test 5703-01, Figure 5.5-5, Ref. 4)

II

II

Figure E-15 DW Pressure Response
(4T/Mark II Test 5101-34, Figure 5.6-5, Ref. 4)

II

II

Figure E-16. WW Pressure Response
(4T/Mark II Test 5101-34, Figure 5.6-6, Ref. 4)

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Figure E-17. Steam Flow to PCC3 for Test E2 - Power Reduced 50% (PANDA Exploratory Tests, Figure 6.4-18, Ref. 4)

Note: Case TE1CE2 and Case TE1CE2_70 in PANDA Exploratory Test for Natural Circulation and Flow Oscillation Tests are eliminated from V5711 level 2 code assessment.

II II

**Figure E-18. Steam Flow to PCC3 for Test E2 -
Power Reduced 70%
(PANDA Exploratory Tests, Figure 6.4-18, Ref. 4)**

Note: Case TE1CE2 and Case TE1CE2 70 in PANDA Exploratory Test for Natural Circulation and Flow Oscillation Tests are eliminated from V5711 level 2 code assessment.