Enclosure 1 is to be withheld from public disclosure under 10 CFR 2.390.
When Enclosure 1 is separated, this letter is decontrolled.

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

April 1, 2011

10 CFR 50.4
10 CFR 2.390(b)(4)

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

Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

Subject: **WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 - RESPONSE TO LARGE BREAK LOSS OF COOLANT ACCIDENT (LBLOCA) AND OVER-PRESSURIZATION REQUEST FOR ADDITIONAL INFORMATION**

Reference: TVA letter dated February 11, 2011, "Watts Bar Nuclear Plant (WBN) Unit 2 – Final Safety Analysis Report (FSAR) – Response to Requests for Additional Information"

The purpose of this letter is to provide responses to requests for additional information (RAIs) regarding (1) LBLOCA and (2) results of an over-pressurization analysis. These RAIs were received during the recent NRC Audit at the Westinghouse Electric Company LLC offices in Rockville, Maryland, held during the week of March 14, 2011.

Enclosure 1 to this letter provides the first part of the request by providing Westinghouse document WBT-D-3039 P-Attachment, "Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) - BE LOCA Data for Transmittal to NRC" (Proprietary). This document contains information proprietary to Westinghouse. Accordingly, TVA respectfully requests that this proprietary information be withheld from public disclosure in accordance with 10 CFR 2.390.

Enclosure 2 provides the supporting 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 Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390.

D030
NRR

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CA W-II-3090 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Enclosure 3 provides Westinghouse document WBT-D-3039 NP-Attachment, "Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) - BE LOCA Data for Transmittal to NRC" (Non-Proprietary), containing non-proprietary version of the information provided in Enclosure 1.

To address the second part of the request, Enclosure 4 provides the results of an over-pressurization analysis by providing a Westinghouse paper entitled, "Watts Bar Unit 2 Loss of Load Results with no Credit for the First Safety Grade Trip." In the reference, TVA has previously provided part of this information in the response to question 5.2.2 - 2.a (1) including Figures 1 through 5. The figures provided in Enclosure 4 start numbering at Figure 6. This enclosure does not contain proprietary information.

There are no new commitments made in this submittal. If you have any questions, please contact Bill Crouch at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 1st day of April, 2011.

Respectfully,

David Stinson
Watts Bar Unit 2 Vice President

Enclosures:

1. Westinghouse document WBT-D-3039 P-Attachment, "Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) - BE LOCA Data for Transmittal to NRC" (Proprietary)
2. Affidavit for Withholding Proprietary Information from Public Disclosure
3. Westinghouse document WBT-D-3039 NP-Attachment, "Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) - BE LOCA Data for Transmittal to NRC" (Non-Proprietary)
4. Watts Bar Unit 2 Loss of Load Results with no Credit for the First Safety Grade Trip

cc (Enclosures):

U. S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Resident Inspector Unit 2
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNIT 2
AFFIDAVIT FOR WITHHOLDING
PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Westinghouse Electric Company
Nuclear Services
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) 720-0754
e-mail: greshaja@westinghouse.com
Proj letter ref WBT-D-3039

CAW-11-3090

March 28, 2011

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: "Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) – BE LOCA Data for Transmittal to NRC" (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-11-3090 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. 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 Tennessee Valley Authority.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-11-3090 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

BTMarsh /for

J. A. Gresham, Manager
Regulatory Compliance

Enclosures

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared B. F. Maurer, 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:

B. F. Maurer Manager
ABWR Licensing

Sworn to and subscribed before me
this 28th day of March 2011

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Cynthia Olesky, Notary Public
Manor Boro, Westmoreland County
My Commission Expires July 16, 2014
Member, Pennsylvania Association of Notaries

(1) I am Manager, ABWR Licensing, in Nuclear Services, 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.

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.

(iii) 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.

(iv) 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.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) – BE LOCA Data for Transmittal to NRC" (Proprietary), for submittal to the Commission, being transmitted by Tennessee Valley Authority letter 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 the NRC review of the Watts Bar Unit 2 license application.

This information is part of that which will enable Westinghouse to:

(a) Assist the customer in obtaining NRC review of the Watts Bar Unit 2 license.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of this information to its customers for purposes of plant specific LOCA analysis for licensing basis applications

(b) Its use by a competitor would improve their competitive position in the design and licensing of a similar product for LBLOCA analyses.

(c) 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 calculations 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

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT UNIT 2
WESTINGHOUSE DOCUMENT WBT-D-3039 NP-ATTACHMENT, "WATTS BAR UNIT 2 (WBT) RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION (RAI) - BE LOCA DATA FOR TRANSMITTAL TO NRC" (NON-PROPRIETARY)

Watts Bar Unit 2 (WBT) Responses to Request for Additional Information (RAI) – BE LOCA Data for Transmittal to NRC

Westinghouse Electric Company
1000 Westinghouse Drive
Cranberry, Pennsylvania 16066

RAI 1: What is the decay heat model and uncertainty?

The decay heat model as described in Reference 1, Section 8 follows ANSI/ANS 5.1 1979 psuedo nuclide method as described in Section 8 , Reference1 and equations 8-1 throuh 8-3. Decay heat uncertainty is considered in the overall uncertainty (In the discusion of Regulatory Postion 4.3.3, in Section 13-2-4 of Reference 1). The decay heat uncertainties from the American National Standards Institute/American Nuclear Society (ANSI/ANS) 5.1-1979 standard are applied as described in Section 8-7. [

]^{a,c} (Section 11-4-1, Reference 1). The decay heat uncertainty is

[

]^{a,c}.

RAI 2: **Provide WCOBRA/TRAC noding diagram.**

Noding diagram provided in Figures 1 and 2.

RAI 3: **Does model include heat transfer from core barrel to downcomer?**

Model does include heat transfer from core barrel to downcomer and barrel/baffel regions. Note that Watts Bar Nuclear 2 does not have a thermal shield, rather it has neutron pads that are modeled with the core barrel.

RAI 4: Provide the following data:

Downcomer level
RCS pressure
Fluid temperatures in downcomer
Containment Pressure
ECCS flow
Peak clad temperature (PCT)
Fluid temperatures at the PCT location
Heat transfer coefficients at the PCT location
Core level

Requested data are provided in Figures 3 through 16. Note that PCT plot is from the hot rod (HOTSPOT) calculation. The PCT location is at elevation 2926 mm (115.2 in) above bottom of fuel. Other plots are from the WCOBRA/TRAC calculation.

References:

1. WCAP-16009-P-A & WCAP-16009-NP-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM)," January 2005.

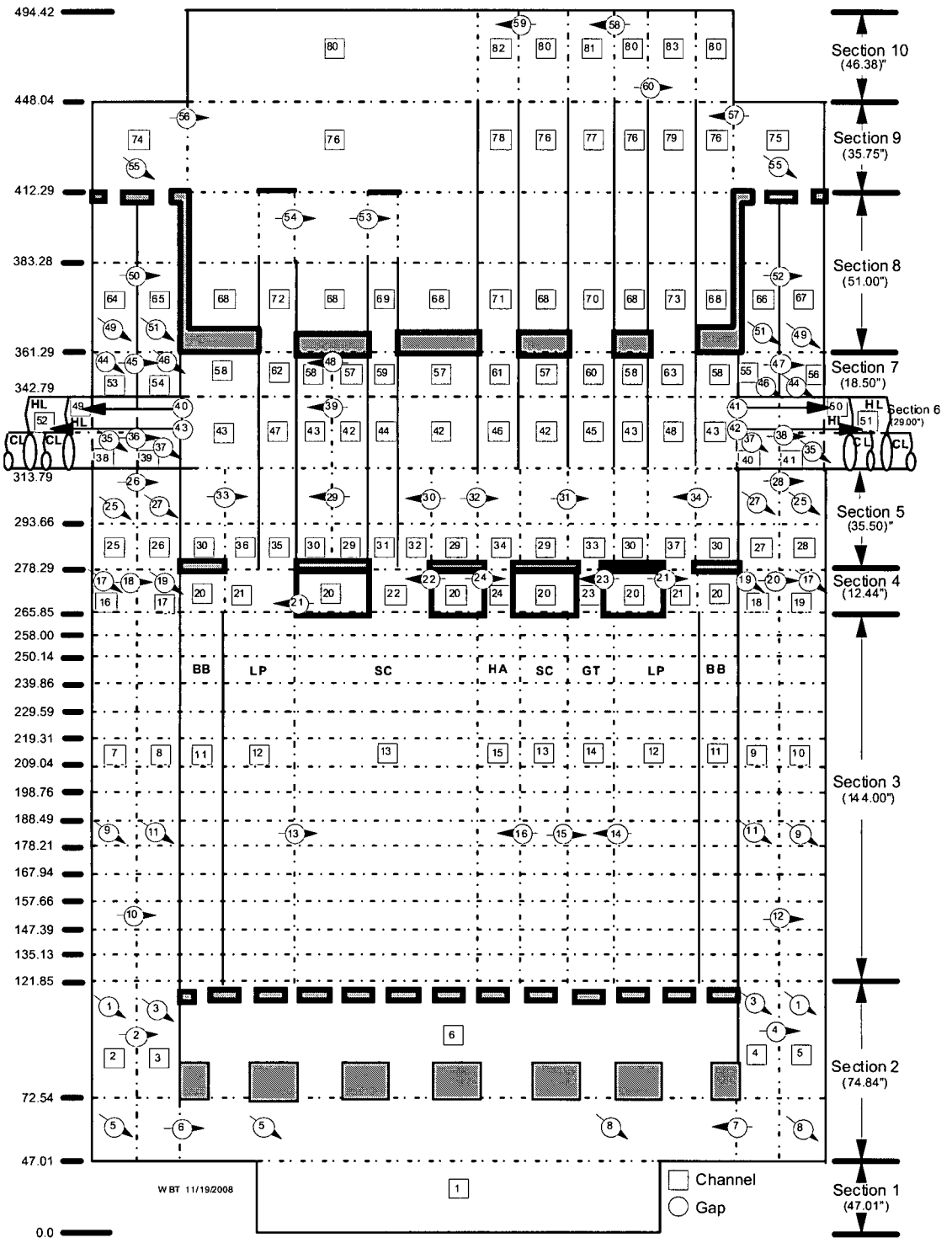

Figure 1. Watts Bar Nuclear 2: WCOBRA/TRAC Reactor Vessel noding diagram.

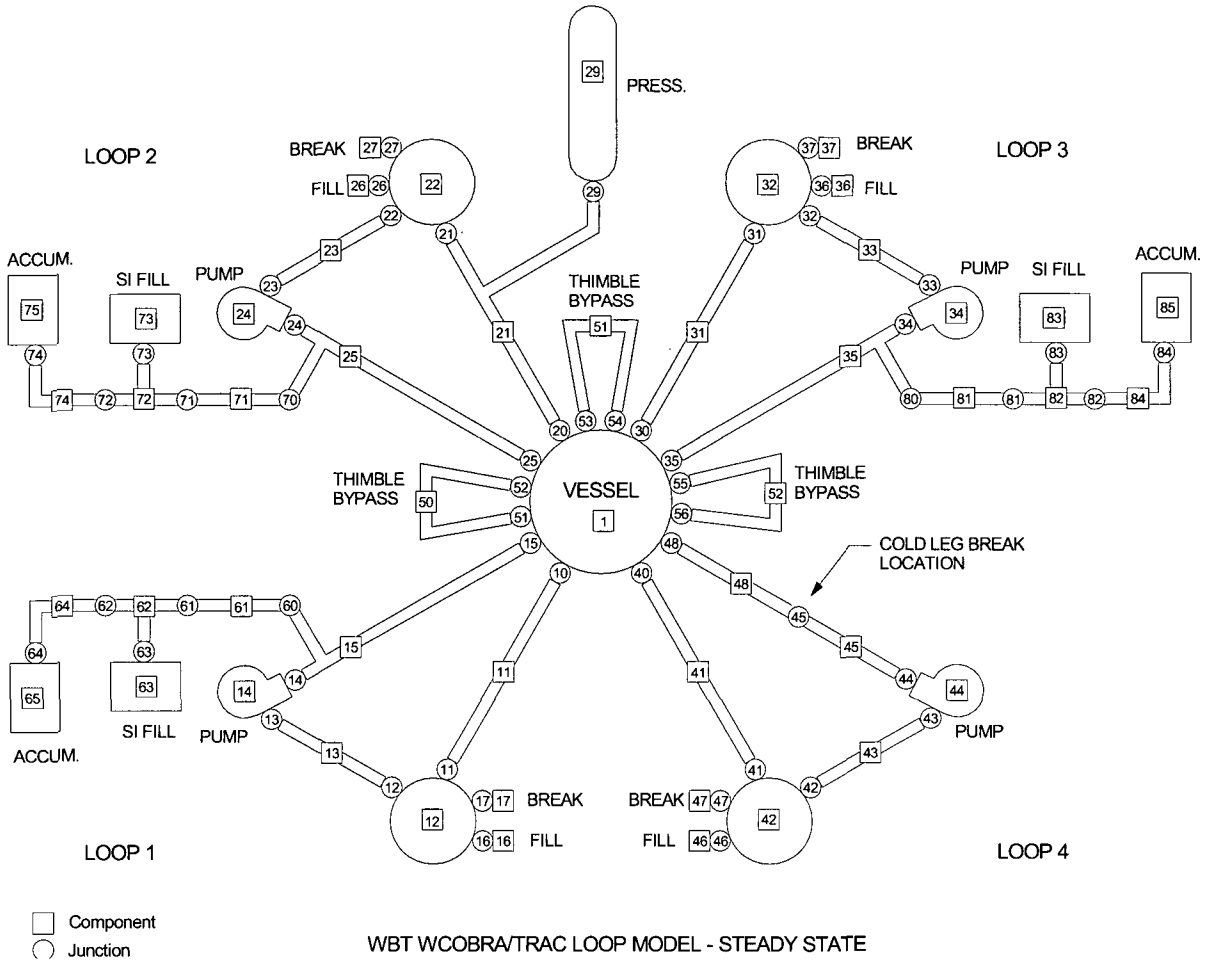

Figure 2. Watts Bar Nuclear 2: WCOBRA/TRAC Loop noding diagram.

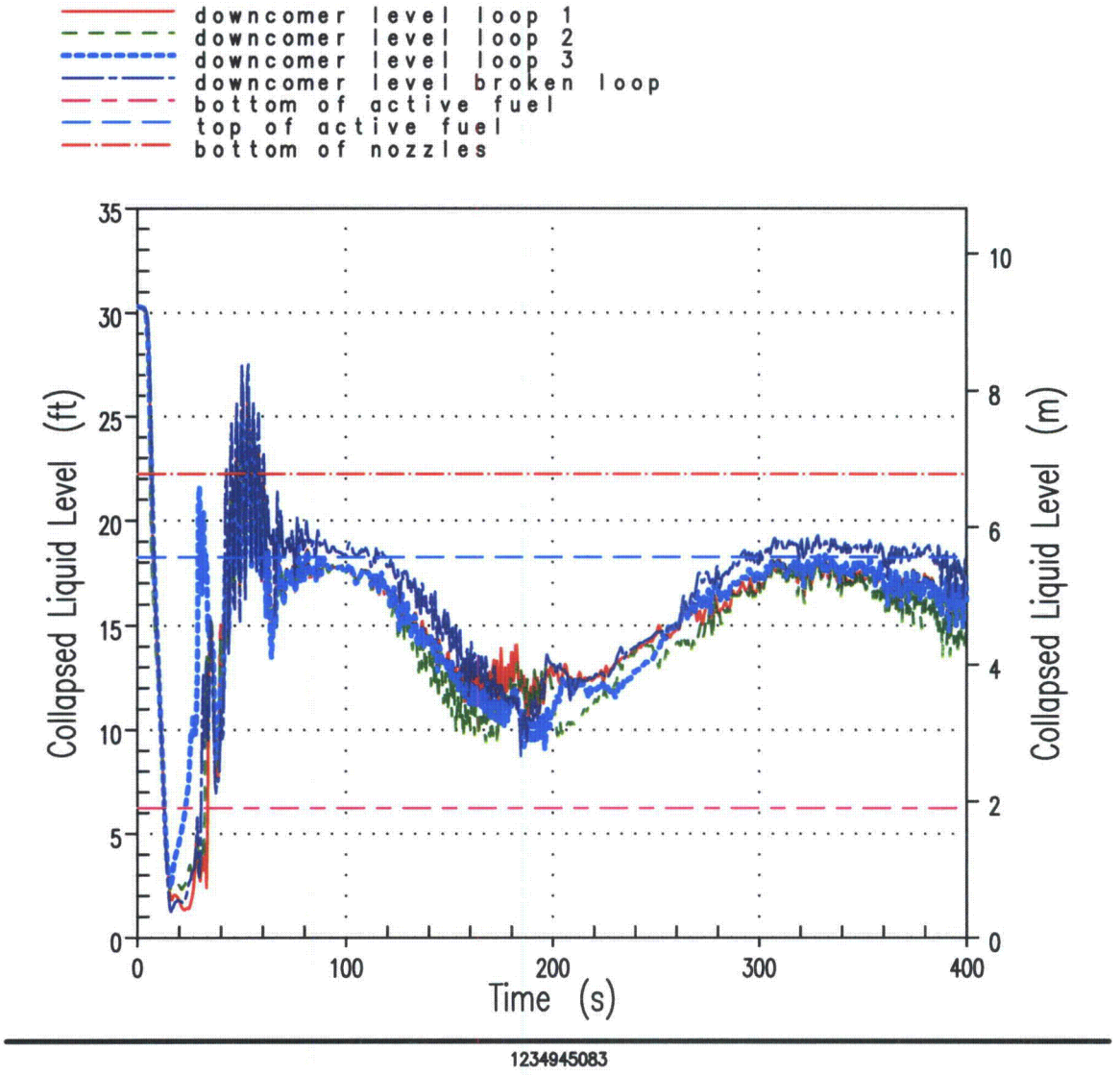

Figure 3. Watts Bar Nuclear 2: Predicted downcomer collapsed liquid levels (Note: reference is to bottom of downcomer not bottom of vessel).

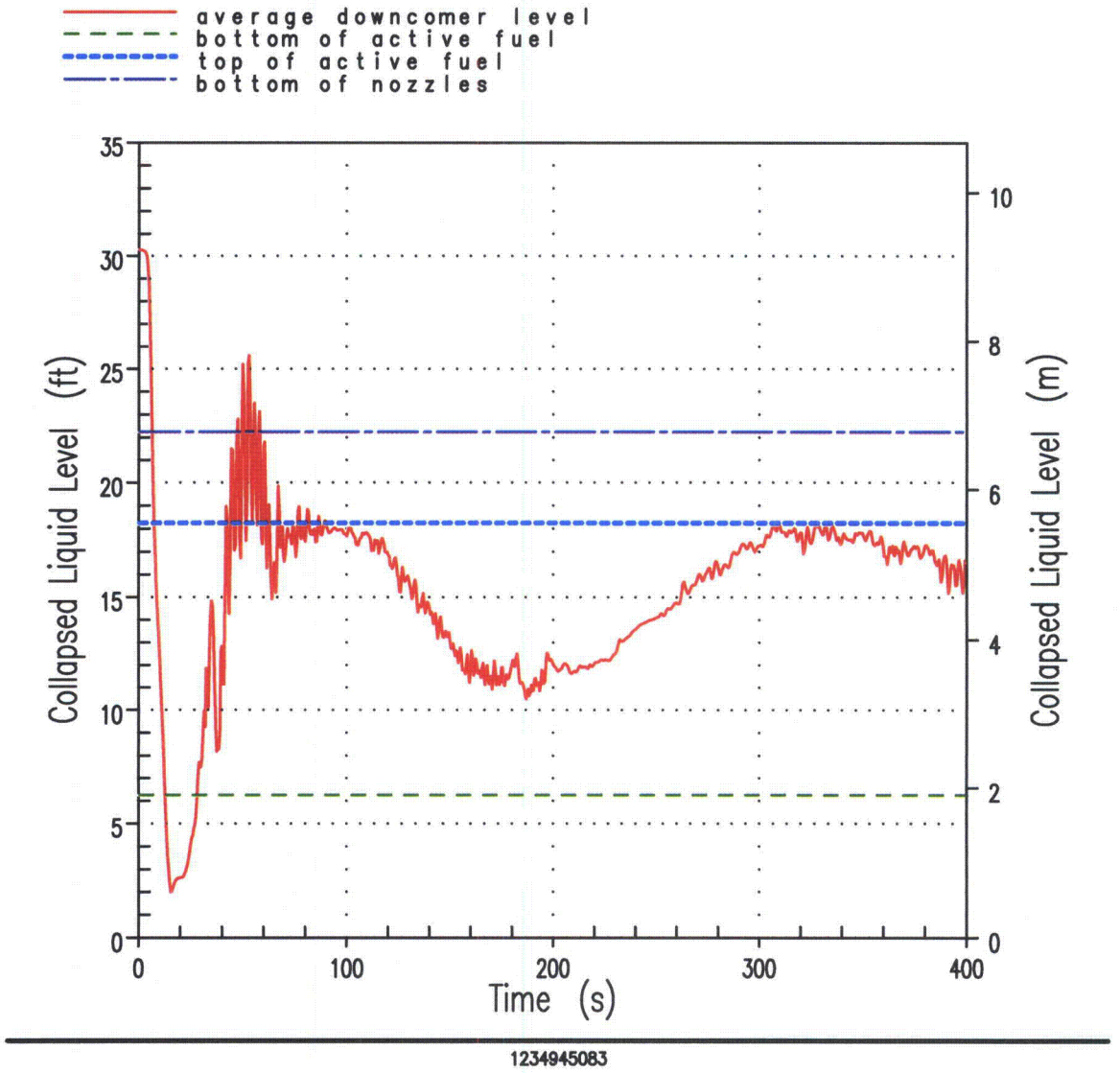

Figure 4. Watts Bar Nuclear 2: Predicted downcomer average collapsed liquid level (Note: referece is to bottom of downcomer not bottom of vessel).

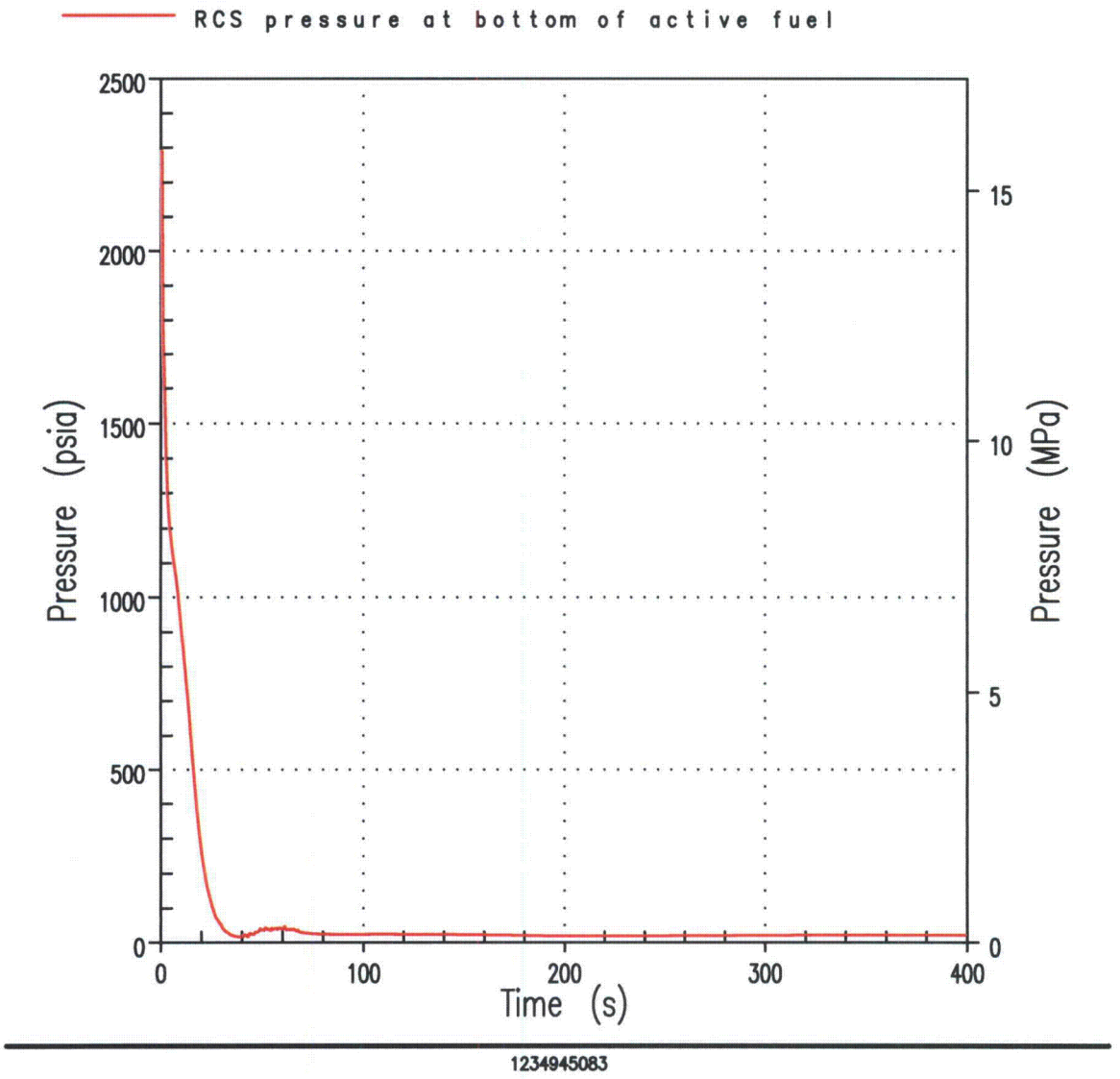

Figure 5. Watts Bar Nuclear 2: Predicted RCS Pressure at bottom of active fuel.

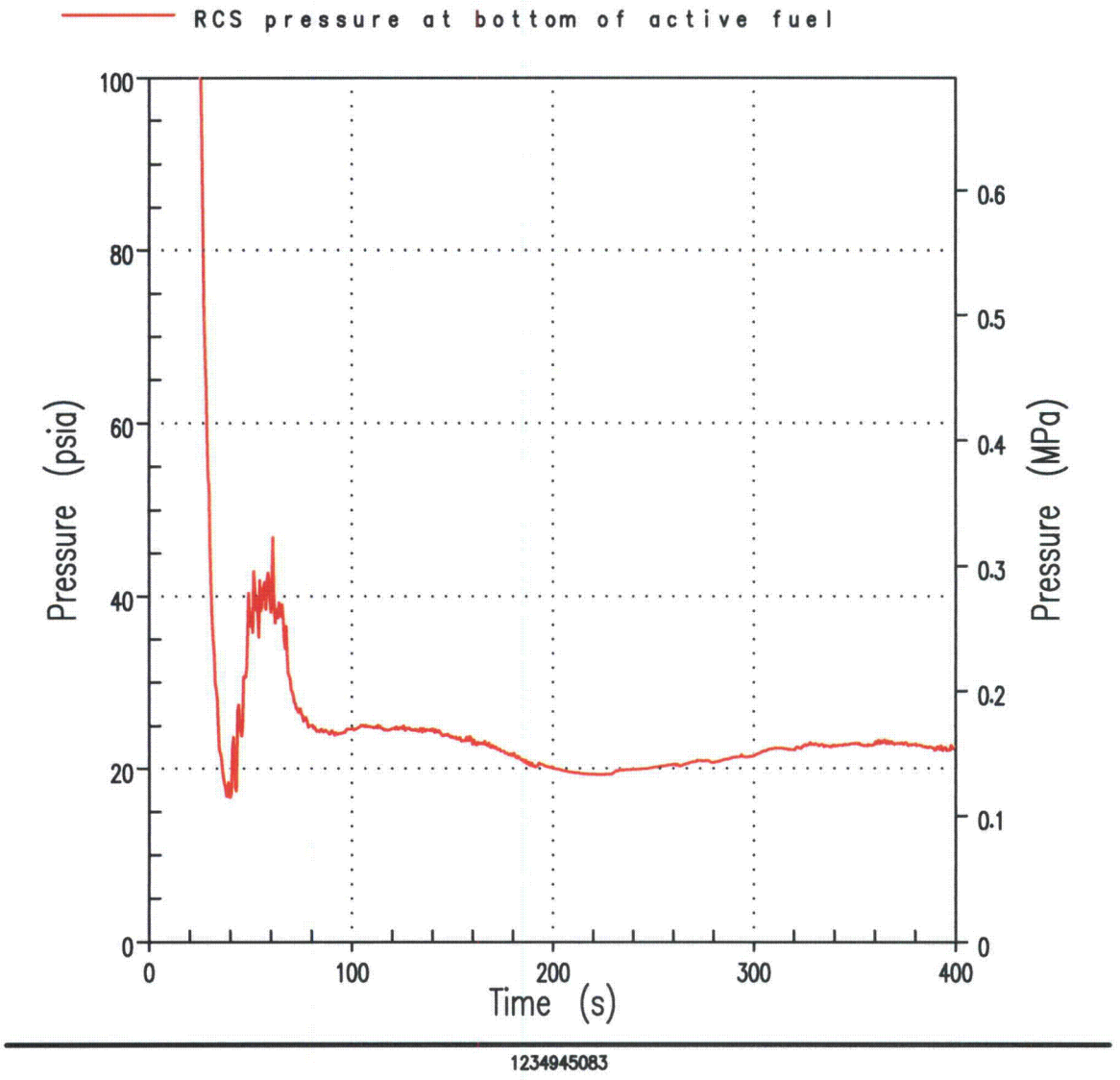

Figure 6. Watts Bar Nuclear 2: Predicted RCS pressure at bottom of active fuel maximum pressure rescaled.

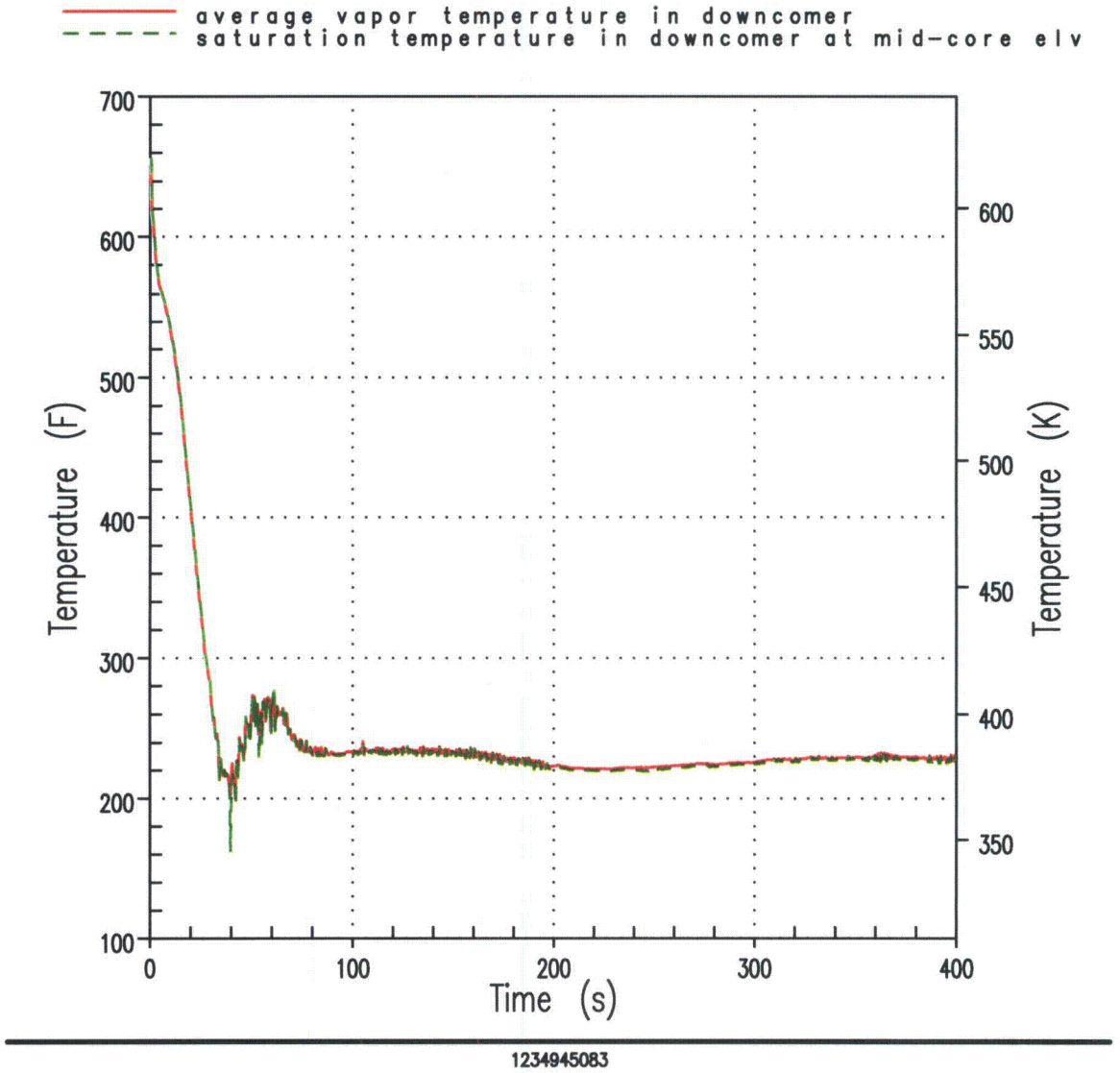

Figure 7. Watts Bar Nuclear 2: Predicted average vapor temperature vs. saturation temperature in the downcomer (temperature averaged from bottom of downcomer to bottom of nozzles).

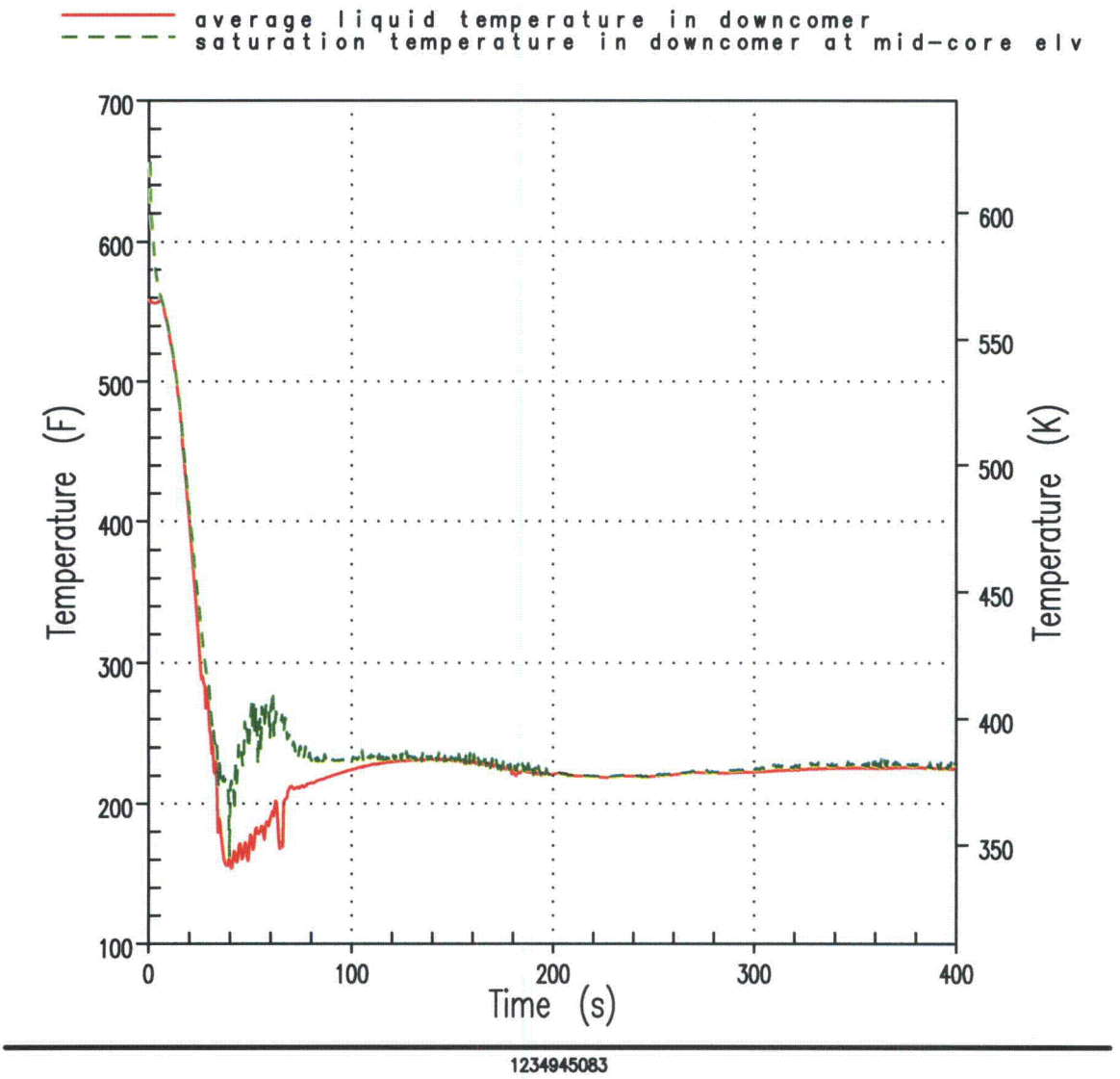

Figure 8. Watts Bar Nuclear 2: Predicted average liquid temperature in downcomer vs. saturation temperature.

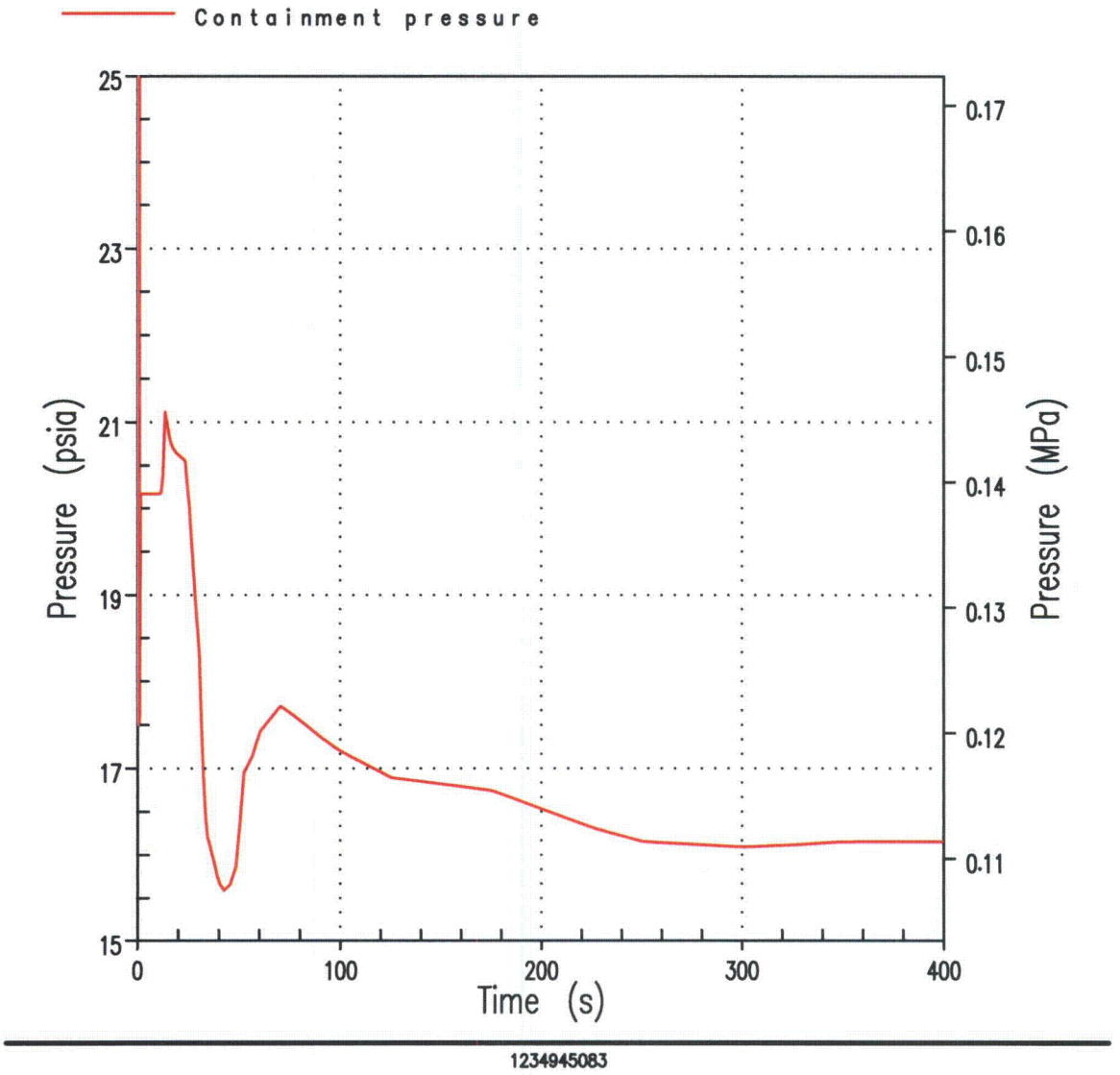

Figure 9. Watts Bar Nuclear 2: Predicted containment pressure.

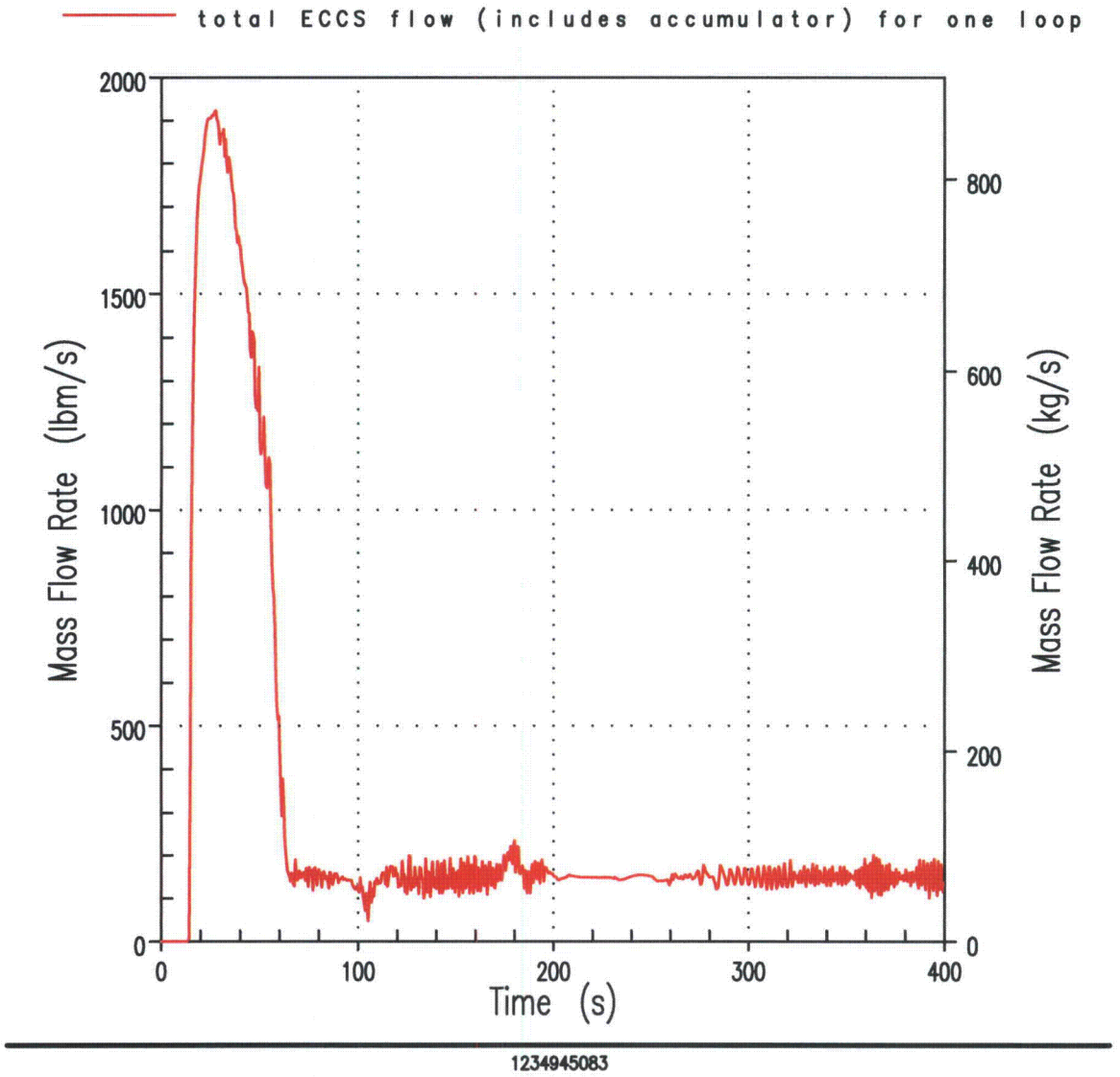

Figure 10. Watts Bar Nuclear 2: Predicted ECCS flow for one of 3 loops injecting (includes accumulator injection).

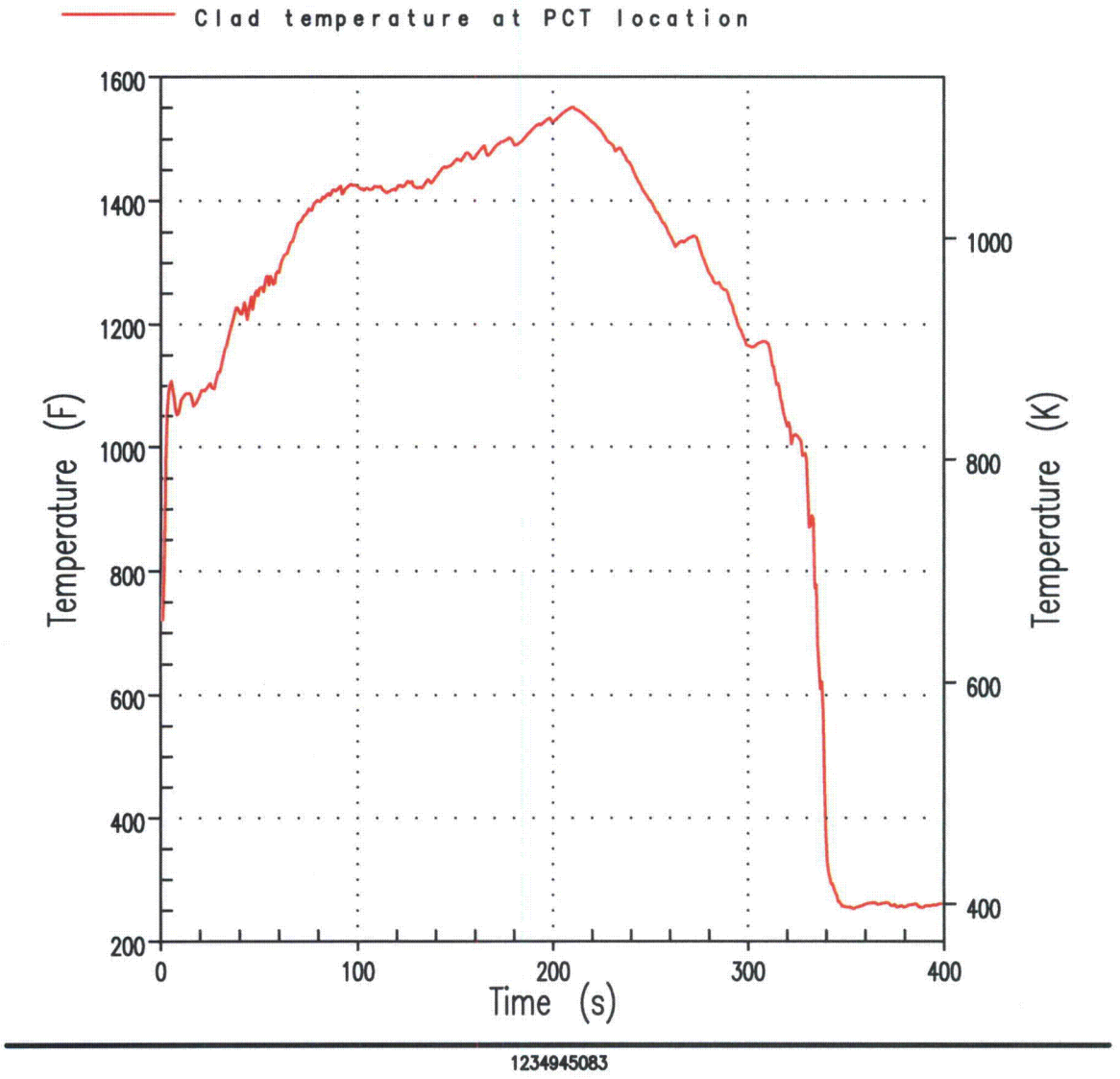

Figure 11. Watts Bar Nuclear 2: Predicted peak cladding temperature (PCT).

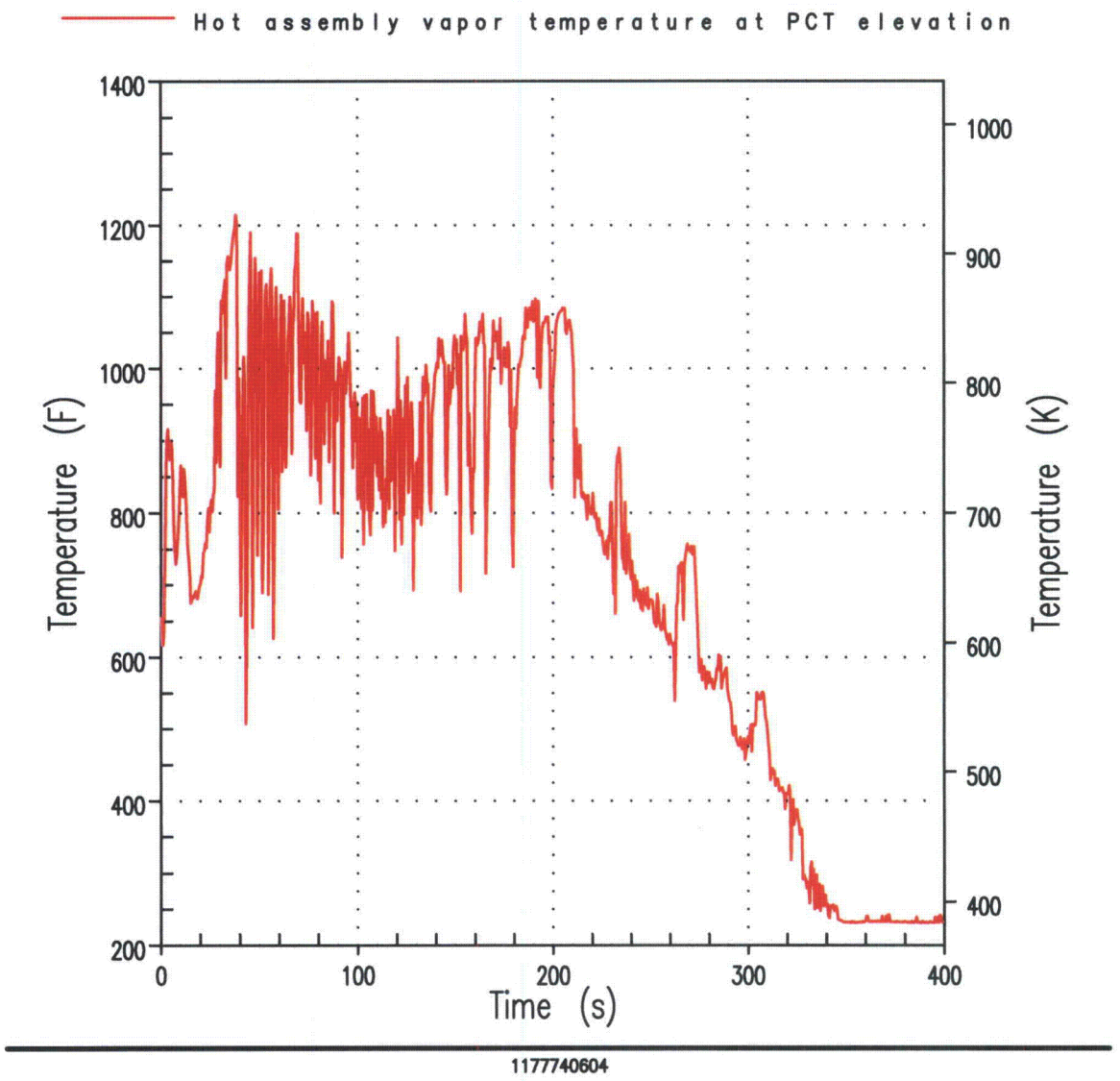

Figure 12. Watts Bar Nuclear 2: Predicted hot assembly vapor temperature at PCT elevation.

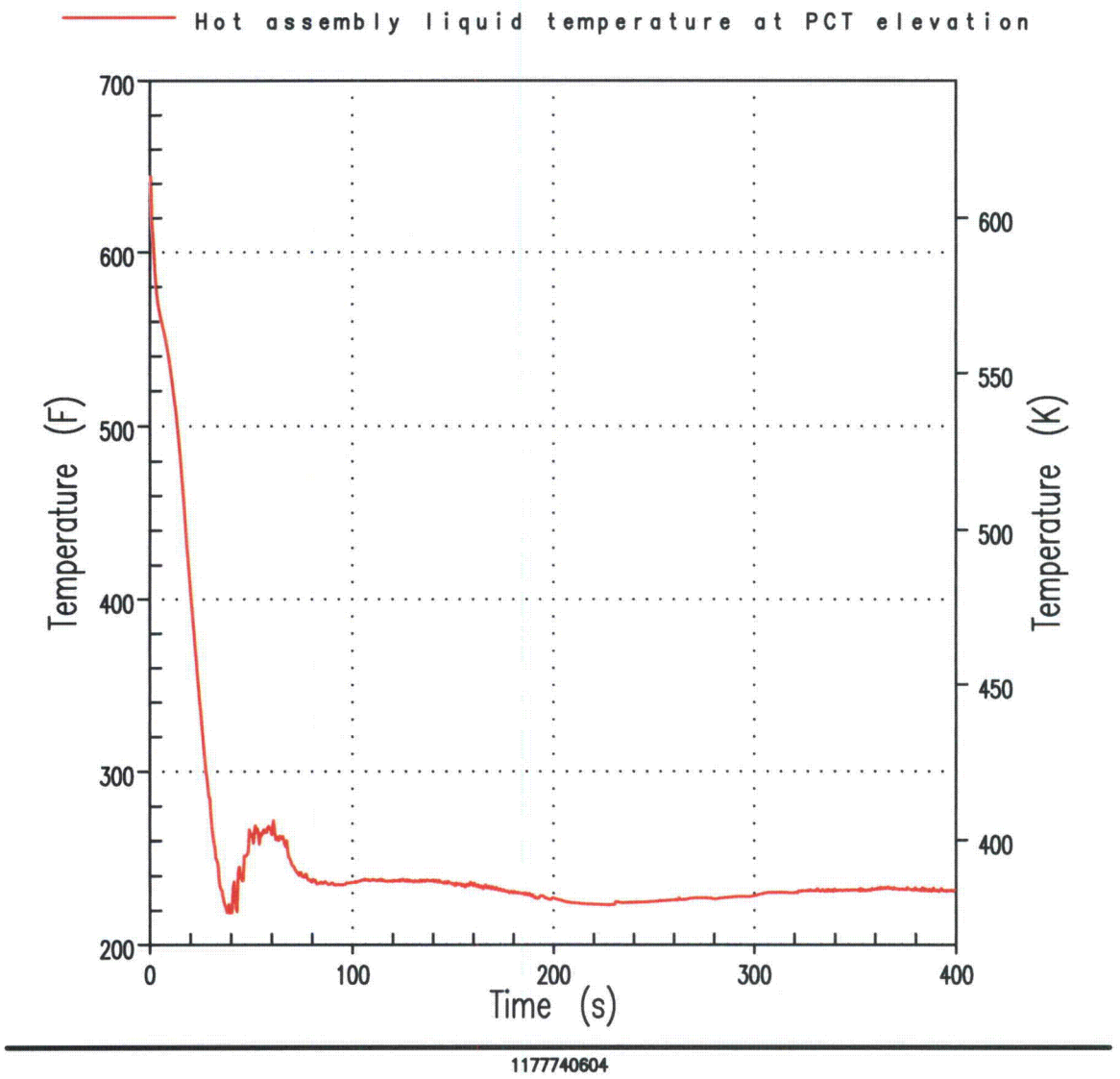

Figure 13. Watts Bar Nuclear 2: Predicted hot assembly liquid temperature at PCT elevation.

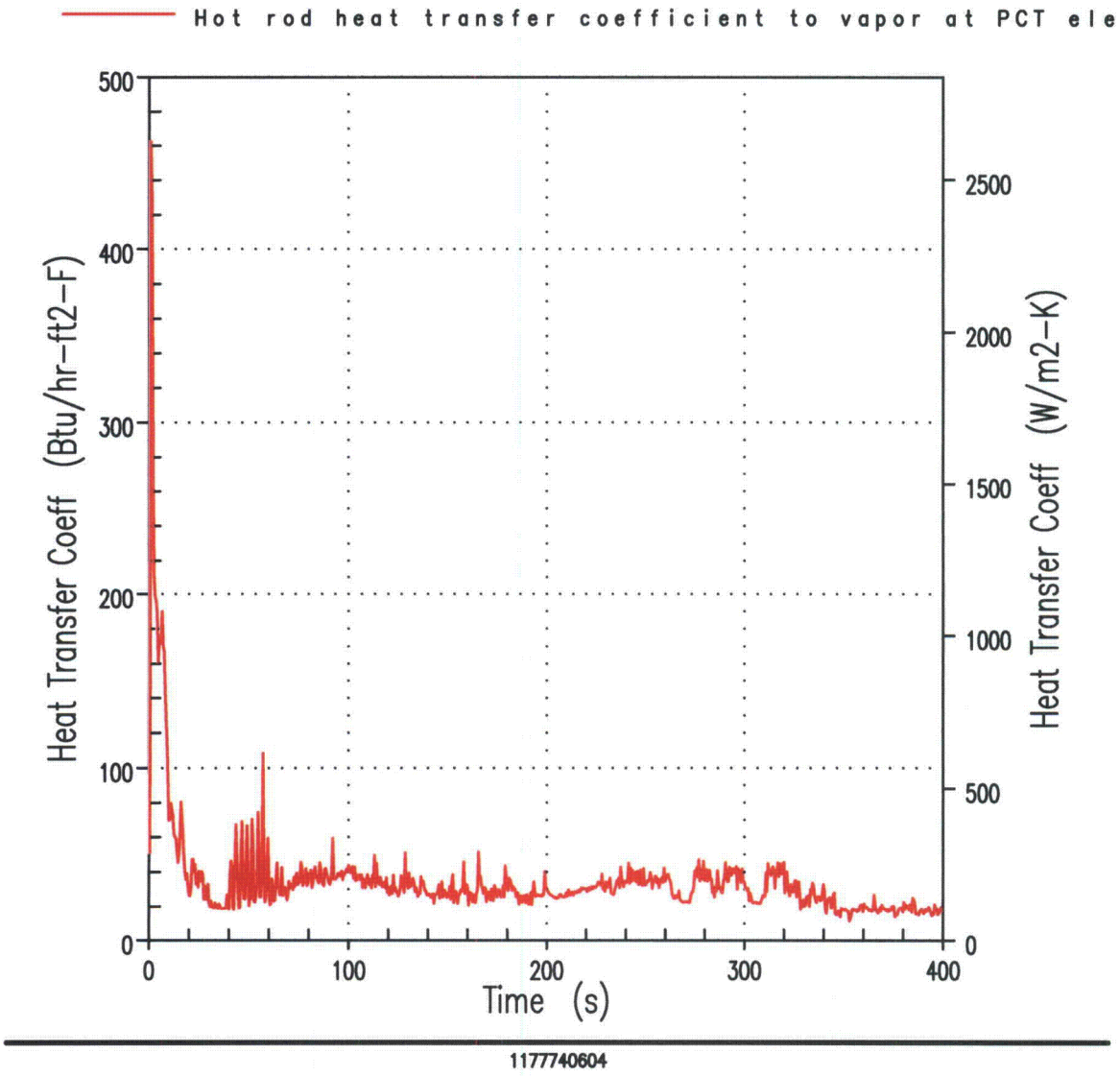

Figure 14. Watts Bar Nuclear 2: Predicted hot rod heat transfer coefficient to vapor at the PCT elevation.

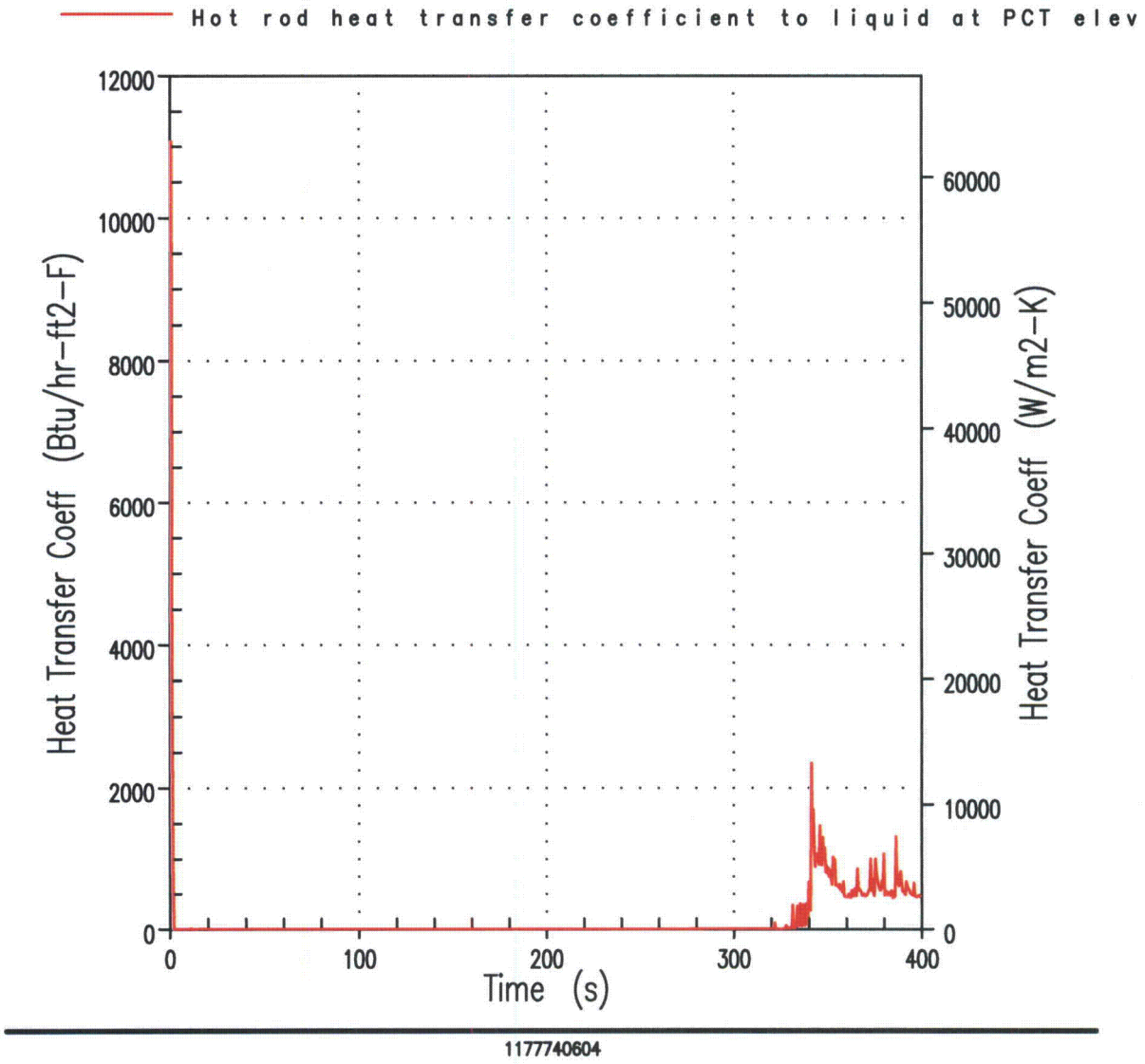

Figure 15. Watts Bar Nuclear 2: Predicted hot rod heat transfer coefficient to liquid at PCT elevation.

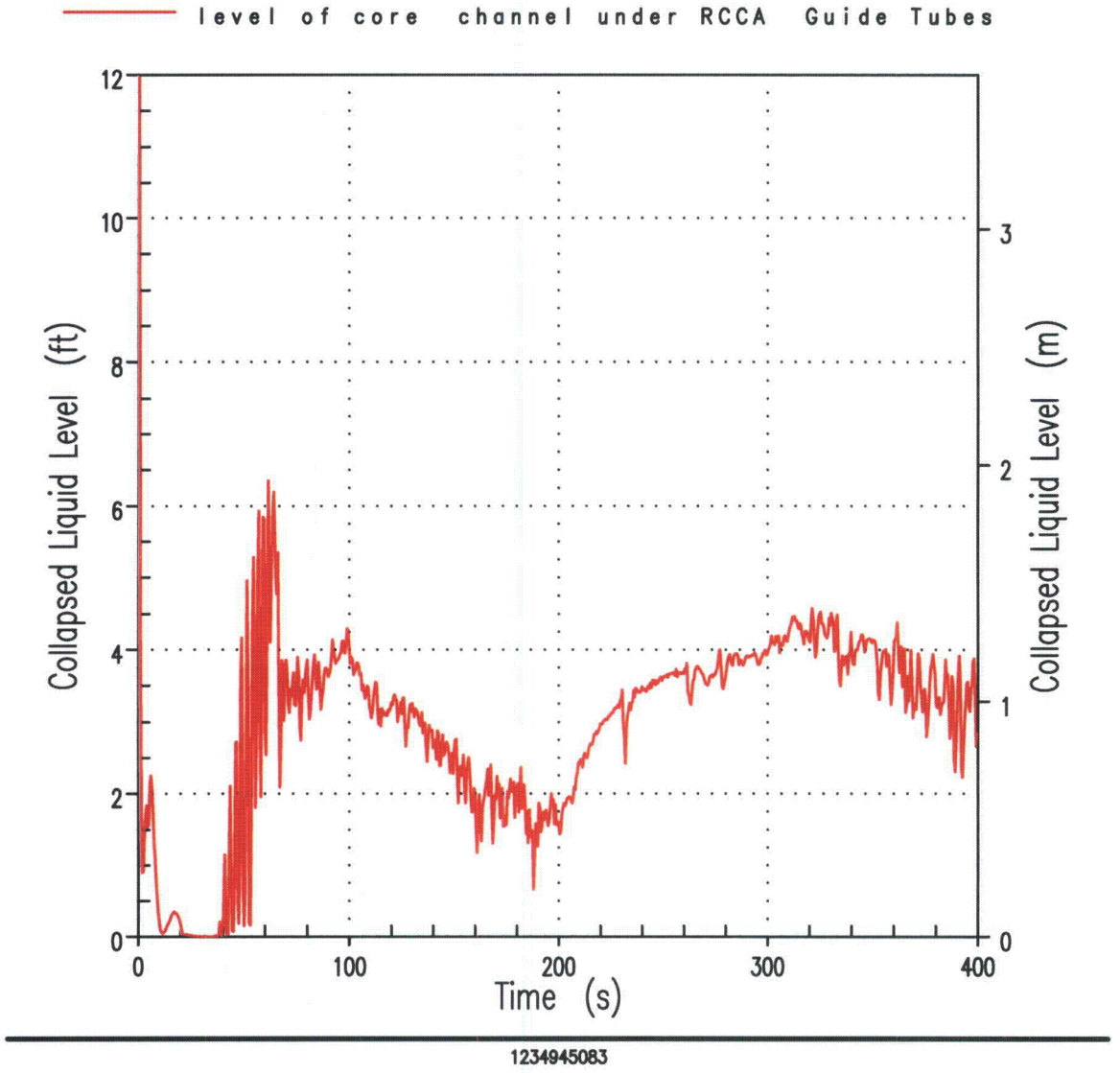

Figure 16. Watts Bar Nuclear 2: Predicted average core assemblies collapsed liquid level.

ENCLOSURE 4

WATTS BAR NUCLEAR PLANT UNIT 2
WATTS BAR UNIT 2 LOSS OF LOAD RESULTS
WITH NO CREDIT FOR THE FIRST SAFETY GRADE TRIP

Watts Bar Unit 2 Loss of Load Results With no Credit for the First Safety Grade Trip

The Watts Bar Unit 2 overpressure analyses is consistent with the requirements of SRP 5.2.2. SRP 5.2.2 requires that the second safety grade reactor trip signal be credited for safety valve sizing calculations. This is consistent with the safety valve sizing procedure discussed in Section 2 of WCAP-7769, Revision 1. WCAP-7769 states, "For the sizing, main feedwater flow is maintained and no credit for reactor trip is taken." This analysis is typically performed prior to construction of the plant to provide a basis for the capacity requirements for the safety valves and the requirement of SRP 5.2.2 provides a conservative basis for the number and design of the valves.

However, WCAP-7769 goes on to say, "After determining the required safety valve relief capacities, as described above, the loss of load transient is again analyzed for the case where main feedwater flow is lost when steam flow to the turbine is lost...For this case, the bases for analysis are the same as described above except that credit is taken for Doppler feedback and appropriate reactor trip, other than direct reactor trip on turbine trip." This describes the analysis performed in Chapter 15 of the UFSAR, which verifies that the overpressure limits are satisfied with the current/latest design.

The analyses documented in the Watts Bar UFSAR are not safety valve sizing calculations - no changes are being made to the safety valves as a result of the Unit 2 completion program. The Loss of External Electrical Load / Turbine Trip analysis presented previously demonstrates that the safety valves have adequate capacity to maintain peak primary pressure below 110% of design, which satisfies the requirements of GDC-15. GDC-15 applies to "any condition of normal operation, including anticipated operational occurrences" which does not include a common mode failure of the first safety grade reactor trip signal.

The Loss of External Load / Turbine Trip RCS overpressure analysis is performed to demonstrate that, in the event of a sudden loss of the secondary heat sink, the associated increase in reactor coolant system temperature does not result in overpressurization of the RCS system.

The Nuclear Regulatory Commission (NRC) has requested the results of an additional Loss of Load analysis with no credit taken for the first safety grade trip reached. In the licensing basis Loss of Load analysis for Watts Bar Unit 2, the first safety grade trip reached is the High Pressurizer Pressure trip. A new analysis with no credit taken for reactor trip via High Pressurizer Pressure has been run. This new analysis contains all the same conservative assumptions as the FSAR analysis. No best-estimate or better-estimate assumptions were made. Sequence of events for the two cases are provided below:

Event	Case with Credit for High Pressurizer Pressure
Loss of load occurs	0.0
High pressurizer pressure setpoint reached	4.76
Rod motion starts	6.76
Peak primary pressure (2691.8 psia) reached	8.50
Secondary safety valves open	9.58
Peak pressurizer water volume (1475.2 ft^3)	11.60

Event	Case with No Credit for High Pressurizer Pressure
Loss of load occurs	0.0
High pressurizer pressure setpoint reached	4.76
Secondary safety valves open	9.57
Overtemperature ΔT setpoint reached	9.79
Peak primary pressure (2714.7 psia) reached	11.10
Rod motion starts	11.29
Peak pressurizer water volume (1677.7 ft^3)	15.60

With credit for the first reactor trip function (high pressurizer pressure), the peak primary system pressure reached is 2691.8 psia with rod motion via high pressurizer pressure reactor trip function occurring at 6.76 seconds. Reactor trip on overtemperature ΔT occurs 4.5 seconds later than the high pressurizer pressure trip occurs in the FSAR case and the new peak primary system pressure is 2714.7 psia. Thus, even with no credit for the first trip and all other analysis assumptions unchanged, the peak primary pressure does not exceed 110% of the design pressure.

The following transient plots show the key parameters for the two cases analyzed. The solid red lines represent the analysis with credit for the high pressurizer pressure trip and the green dashed lines represent the case without credit for the high pressurizer pressure reactor trip function.

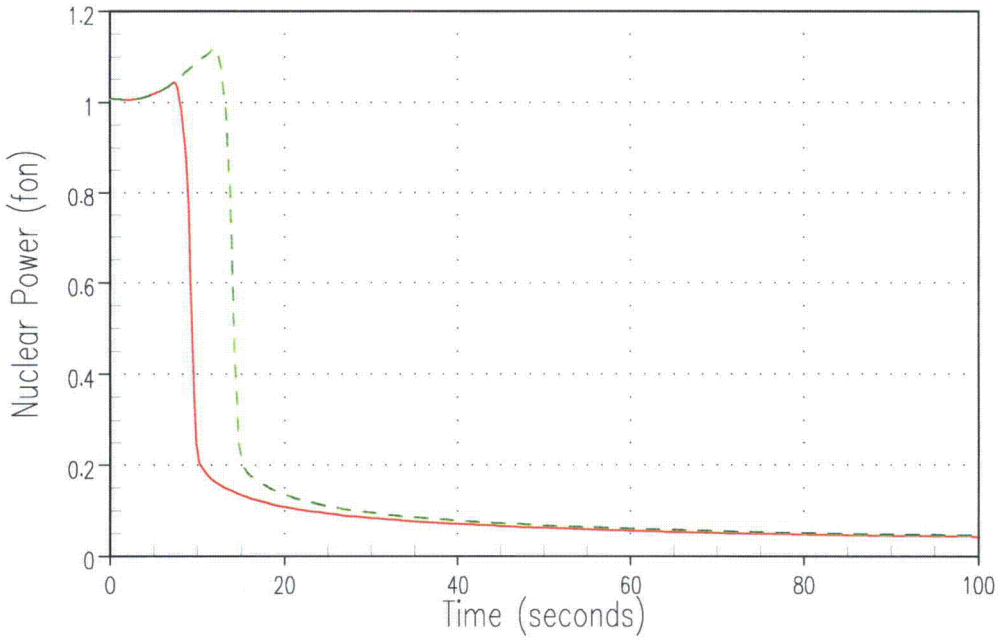

Figure 6 – Nuclear Power vs. Time

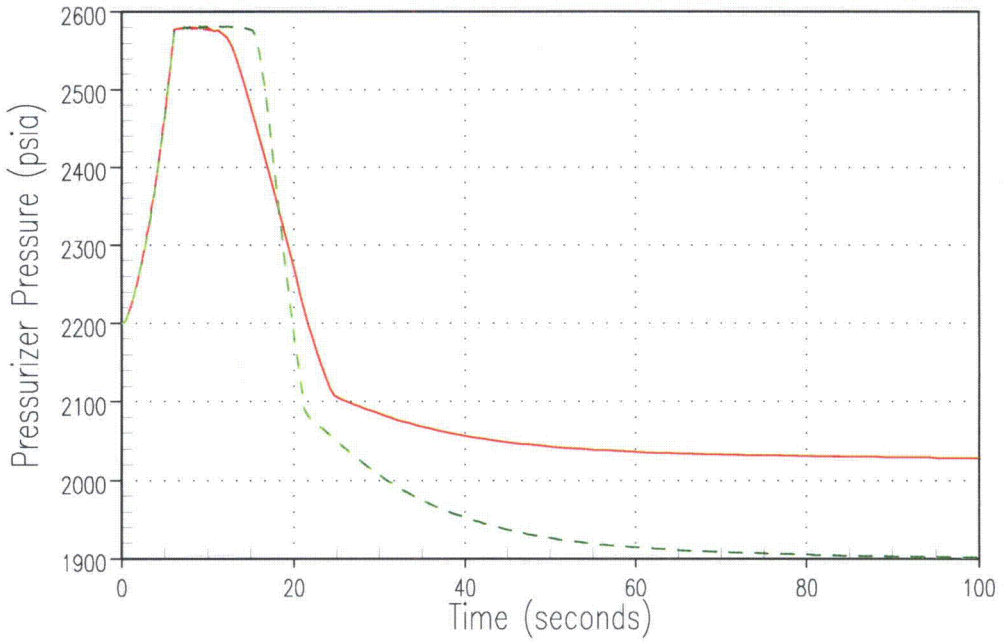

Figure 7 – Pressurizer Pressure vs. Time

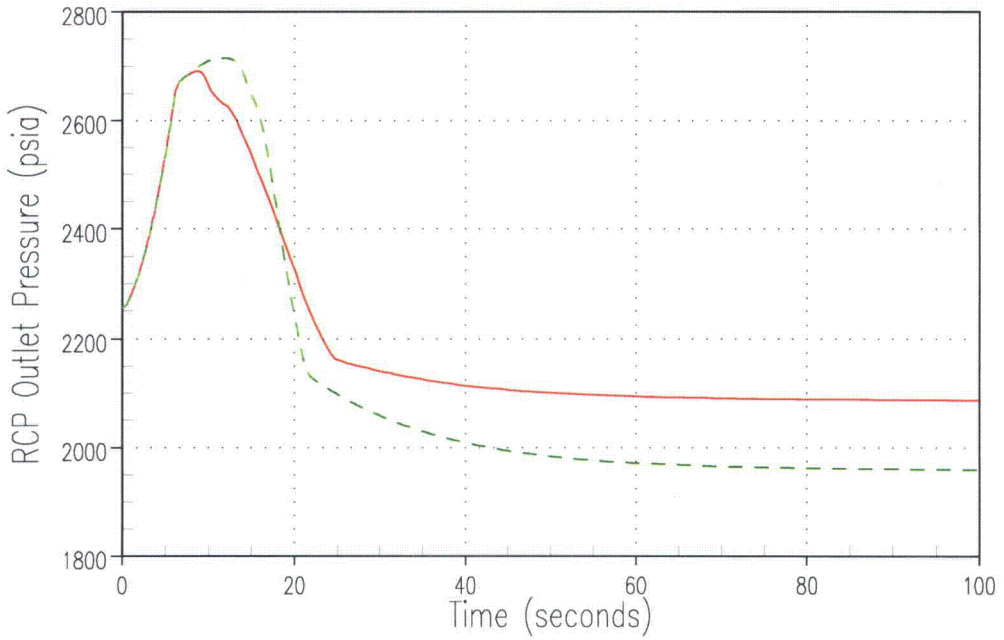

Figure 8 – RCP Outlet Pressure vs. Time

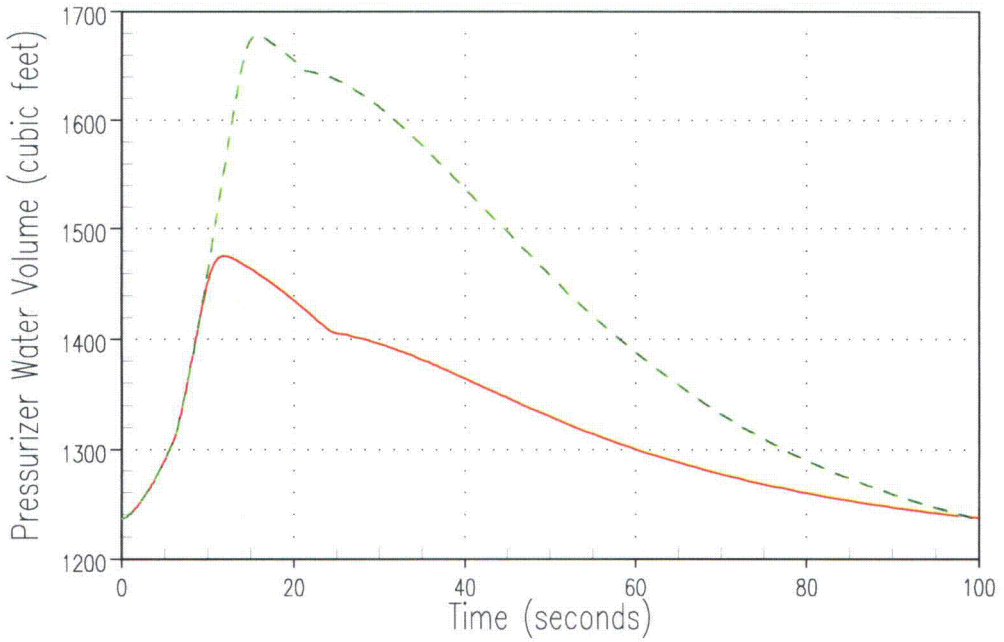

Figure 9 – Pressurizer Water Volume vs. Time

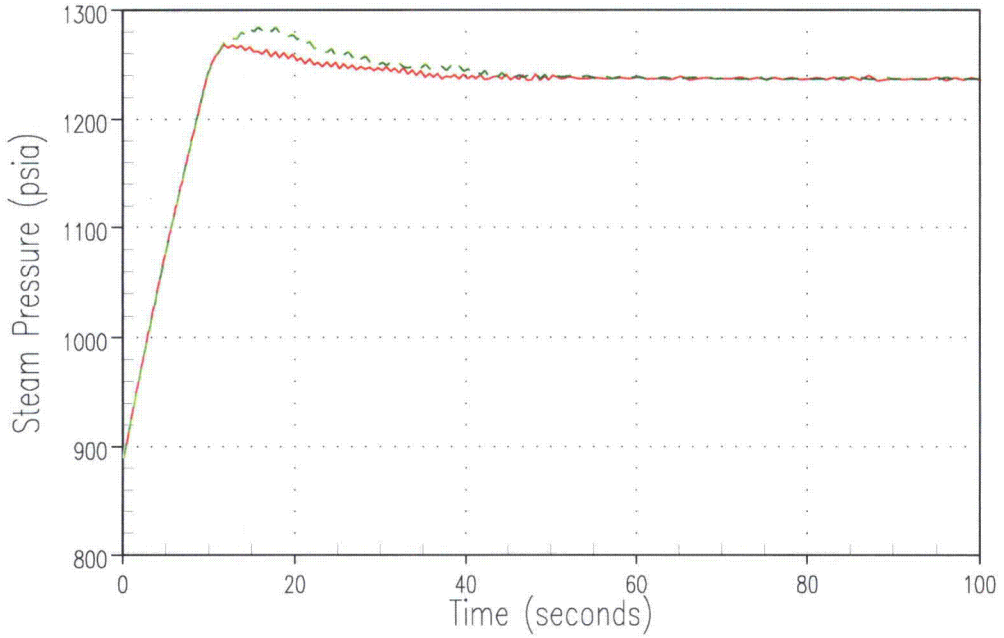

Figure 10 – Steam Generator Pressure vs. Time

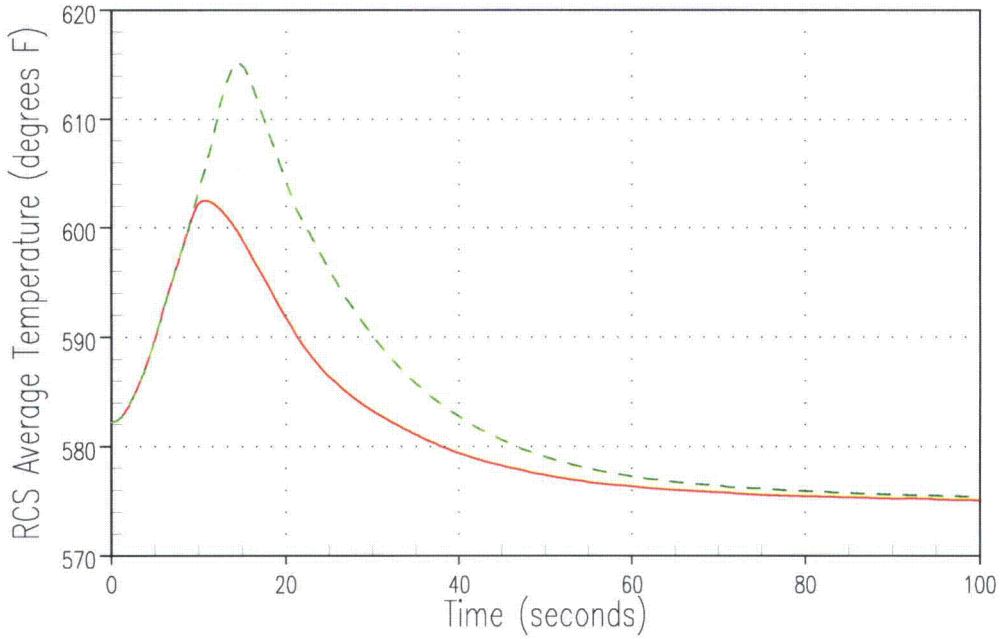

Figure 11 – Average Temperature vs. Time