Sam Belcher
Vice President-Nine Mile Point

P.O. Box 63
Lycoming, New York 13093
315.349.5200
315.349.1321 Fax

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Constellation Energy
eDF

NINE MILE POINT
NUCLEAR STATION

August 19, 2011

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Document Control Desk

SUBJECT: Nine Mile Point Nuclear Station
Unit No. 2; Docket No. 50-410

Response to Request for Additional Information Regarding Nine Mile Point Nuclear Station, Unit No. 2 – Re: The License Amendment Request for Extended Power Uprate Operation (TAC No. ME1476) – Anticipated Transient Without Scram Simulator Tests and Net Positive Suction Head for Emergency Core Cooling Systems

REFERENCES:

(a) Letter from K. J. Polson (NMPNS) to Document Control Desk (NRC), dated May 27, 2009, License Amendment Request (LAR) Pursuant to 10 CFR 50.90: Extended Power Uprate

(b) E-mail from R. Guzman (NRC) to J. J. Dosa (NMPNS), dated July 22, 2011, Follow-up Information Request Re: EPU ATWS Simulator Testing Plots and Data Tables

(c) E-mail from R. Guzman (NRC) to J. J. Dosa (NMPNS), dated July 27, 2011, NMP2 EPU-SBO Scenario Clarification

(d) E-mail from R. Guzman (NRC) to J. J. Dosa (NMPNS), dated August 4, 2011, Updated Information Request Re: NMP2 EPU – ATWS Simulator Testing Plots and SBO Scenario Clarification.

Nine Mile Point Nuclear Station, LLC (NMPNS) hereby transmits revised and supplemental information in support of a previously submitted request for amendment to Nine Mile Point Unit 2 (NMP2) Renewed Operating License (OL) NPF-69. The request, dated May 27, 2009 (Reference a), proposed an amendment to increase the power level authorized by OL Section 2.C.(1), Maximum Power Level, from 3467 megawatts-thermal (MWt) to 3988 MWt.

A134
NRR

By e-mails dated July 22, July 27, and August 4, 2011 (References b through d), the NRC staff requested supplemental information regarding the Anticipated Transient without Scram (ATWS) Simulator Tests and Net Positive Suction Head (NPSH) Requirements for Emergency Core Cooling Systems (ECCS). The Attachment to this letter provides the responses to the requests for additional information.

There are no regulatory commitments in this submittal.

Should you have any questions regarding the information in this submittal, please contact John J. Dosa, Director Licensing, at (315) 349-5219.

Very truly yours,

STATE OF NEW YORK :
: **TO WIT:**
COUNTY OF OSWEGO :

I, Sam Belcher, being duly sworn, state that I am Vice President-Nine Mile Point, and that I am duly authorized to execute and file these responses on behalf of Nine Mile Point Nuclear Station, LLC. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other Nine Mile Point employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Subscribed and sworn before me, a Notary Public in and for the State of New York and County of Oswego, this 19 day of August, 2011.

WITNESS my Hand and Notarial Seal: Lisa M. Doran
Notary Public

My Commission Expires:

9/12/2013
Date

Lisa M. Doran
Notary Public in the State of New York
Oswego County Reg. No. 01DO6029220
My Commission Expires 9/12/2013

SB/DEV

Attachment: Response to Request for Additional Information Regarding License Amendment Request for Extended Power Uprate Operation

cc: NRC Regional Administrator, Region I
NRC Resident Inspector
NRC Project Manager
A. L. Peterson, NYSERDA

ATTACHMENT

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE OPERATION

Nine Mile Point Nuclear Station, LLC
August 19, 2011

ATTACHMENT
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE OPERATION

By letter dated May 27, 2009, as supplemented on August 28, 2009, December 23, 2009, February 19, 2010, April 16, 2010, May 7, 2010, June 3, 2010, June 30, 2010, July 9, 2010, July 30, 2010, October 8, 2010, October 28, 2010, November 5, 2010, December 10, 2010, December 13, 2010, January 19, 2011, January 31, 2011, February 4, 2011, March 23, 2011, May 9, 2011, June 13, 2011, July 15, 2011, and August 5, 2011, Nine Mile Point Nuclear Station, LLC (NMPNS) submitted for Nuclear Regulatory Commission (NRC) review and approval, a proposed license amendment requesting an increase in the maximum steady-state power level from 3467 megawatts thermal (MWt) to 3988 MWt for Nine Mile Point Unit 2 (NMP2).

By e-mails dated July 22, July 27, and August 4, 2011, the NRC staff requested additional information regarding the Anticipated Transient Without Scram (ATWS) Simulator Tests and Net Positive Suction Head (NPSH) Requirements for Emergency Core Cooling Systems (ECCS). This attachment provides the responses to the requests for additional information (RAI).

The NRC request is repeated (in italics), followed by the NMPNS response.

RAI from NRC E-mail dated July 22, 2011, as updated in NRC E-mail dated August 4, 2011

ATWS Simulator Exercises

As we discussed, while the data provided by NMPNS in February 2011 supports the NRC staff's review of the proposed EPU with respect to thermal and hydraulic design, the staff has determined that clarifying information is necessary to support its completion of the draft safety evaluation (SE) for [Advisory Committee on Reactor Safeguards] ACRS' review. Specifically, for the [Main Steam Isolation Valve] MSIV closure and turbine trip EPU ATWS events, the staff notes that the licensee has provided the appropriate data for both ATWS events via CD copy dated February 2011; however, the staff requests the following information to conclude its review on thermal and hydraulic design.

1) Provide the sequence of both events with the transient response(s) corresponding to ATWS emergency operating procedure actions (e.g., turbine trips, recirculation pump trips, turbine bypass valves open, power increases, water level reduction, standby liquid control system injection, to steady state/oscillation under control, etc.)

2) For clarity of the data tables for both the MSIV closure and turbine trip ATWS EPU events, provide the full name/nomenclature with description or definition of each column field (e.g., rrpdome, nmapmfx_z, fwslal01, etc.).

3) In addition to the [Reactor Pressure Vessel] RPV Pressure vs. Time plots in both events, please include an overlay plot of Power versus Time (i.e., show power oscillations/response corresponding to the RPV pressure response).

NMPNS Response to 1) above

Note: The Simulator model used for this evaluation is not an engineering simulation and the model is not the final EPU simulator upgrade. The results have been compared to the EPU design ATWS results and the response is reasonable. These figures should be used on a qualitative basis to judge operator response only.

Simulator Scenario 1 - Maximum Extended Load Line Limit Analysis (MELLLA) Isolated Anticipated Transient Without Scram (ATWS) with Main Steam Isolation Valve (MSIV) Closure

Scenario Description

The plant is operating at Extended Power Uprate (EPU) conditions on a limiting control rod pattern for MELLLA. A spurious MSIV isolation occurs and the reactor fails to scram with no control rod motion. In addition, the Alternate Rod Insertion (ARI) function of the Redundant Reactivity Control System (RRCS) fails to effect control rod motion. All other features of RRCS function as designed. The crew performs actions per:

- N2-EOP-RPV, RPV Control
- N2-EOP-PC, Primary Containment Control
- N2-EOP-C5, Failure to Scram

For the purpose of the ATWS transient with MSIV closure, operator action was not taken to insert control rods.

Initial Conditions

Reactor power at 100% of rated, 3988 MWth
Core flow at 99% of rated (107.4 Mlbm/hr)
Suppression Pool Temperature 90°F
Suppression Pool Level 199.5 feet
Service Water Supply temperature 84°F
All equipment OPERABLE

Significant Event Sequence – Time (T) in Seconds

T = 0 All MSIVs close. Closure time is four seconds
T = 3.6 High reactor pressure initiates RRCS. Reactor Recirculation pumps transfer to slow speed
T = 5.1 Peak neutron flux of 225%
T = 8.6 Peak Reactor Pressure Vessel (RPV) pressure of 1350 psig
T = 28.6 Automatic action – Reactor Recirculation pumps trip to OFF, feedwater runback terminates feedwater injection
T = 60.6 Suppression Pool temperature reaches Boron Injection Initiation Temperature (BIIT) of 110°F
T = 113 Automatic action – Boron injection initiated
T = 116 Operator action – injection sources other than Reactor Core Isolation Cooling (RCIC), Control Rod Drive (CRD) and boron are terminated and prevented
T = 151 Operator action – pressure band of 800 – 1000 psig established using Safety Relief Valves (SRVs)
T = 199 Operator action – commence RPV level recovery following feedwater runback. Directed level band is from Minimum Steam Cooling Water Level (MSCWL) to Top of Active Fuel (TAF)

Reactor Water Level	TAF	MSCWL
Actual	-14"	-39"
Fuel Zone Indicated	-55"	-70"

T = 251 Average Power Range Monitor (APRM) neutron flux is downscale, less than 4%
T = 273 Operator action – First loop of Residual Heat Removal (RHR) is in Suppression Pool cooling at rated flow of 7450 gpm
T = 275 Operator action – RPV water level restored and maintained within directed band
T = 339 Suppression Pool temperature reaches maximum value of 134.9°F
T = 404 Operator action – second loop of RHR is in Suppression Pool cooling at rated flow of 7450 gpm
T = 406 Reactor is in hot shutdown as indicated by neutron flux <0.1% on APRMs

Figures 1 through 27 depict the plant response for a number of parameters.

Simulator Scenario 2 - MELLLA ATWS with Turbine Trip

Scenario Description

The plant is operating at EPU conditions on a limiting control rod pattern for MELLLA. A spurious turbine trip occurs and the reactor fails to scram with no control rod motion. In addition, the Alternate Rod Insertion (ARI) function of the Redundant Reactivity Control System (RRCS) fails to effect control rod motion. All other features of RRCS function as designed. The crew performs actions per:

- N2-EOP-RPV, RPV Control
- N2-EOP-PC, Primary Containment Control
- N2-EOP-C5, Failure to Scram

For the purpose of the ATWS transient turbine trip with bypass, operator action was not taken to insert control rods.

Initial Conditions

Reactor power at 100% of rated, 3988 MWth
Core flow at 99% of rated (107.4 Mlbm/hr)
Suppression Pool Temperature 90°F
Suppression Pool Level 199.5 feet
Service Water Supply temperature 84°F
All equipment OPERABLE

Significant Event Sequence – Time (T) in Seconds

T = 0	Main turbine trips.
T = 0.5	All five turbine bypass valves are full open
T = 1	High reactor pressure initiates RRCS. Reactor Recirculation pumps transfer to slow speed
T = 2	Peak neutron flux of 185%
T = 2.8	Peak Reactor Pressure Vessel (RPV) pressure of 1187 psig
T = 26	Automatic action – Reactor Recirculation pumps trip to OFF, feedwater runback terminates feedwater injection
T = 104	Operator action – RPV water level stabilized following feedwater runback in a band of 50 to 80 inches on wide range level indication.
T = 110.6	Automatic action – Boron injection initiated
T = 153.6	Suppression Pool temperature reaches Boron Injection Initiation Temperature (BIIT) of 110°F
T = 191	Operator action – pressure band of 800 – 1000 psig established using Safety Relief Valves (SRVs)
T = 216	Operator action – injection sources other than Reactor Core Isolation Cooling (RCIC), Control Rod Drive (CRD) and boron are terminated and prevented
T = 256	Operation action – RPV level is in desired band from Minimum Steam Cooling Water Level (MSCWL) to Top of Active Fuel (TAF)

Reactor Water Level	TAF	MSCWL
Actual	-14”	-39”
Fuel Zone Indicated	-55”	-70”

T = 269 Suppression Pool temperature reaches maximum value of 120.7°F

T = 338 Operator action – First loop of Residual Heat Removal (RHR) is in Suppression Pool cooling at rated flow of 7450 gpm

T = 373 Average Power Range Monitor (APRM) neutron flux is downscale, less than 4%

T = 425 Operator action – second loop of RHR is in Suppression Pool cooling at rated flow of 7450 gpm

T = 465 Reactor is in hot shutdown as indicated by neutron flux <0.1% on APRMs

Figures 28 through 54 depict the plant response for a number of parameters.

Figure 1
Transient Test EPU Isolated ATWS MELLLA
RPV Dome Pressure (rrpdome)

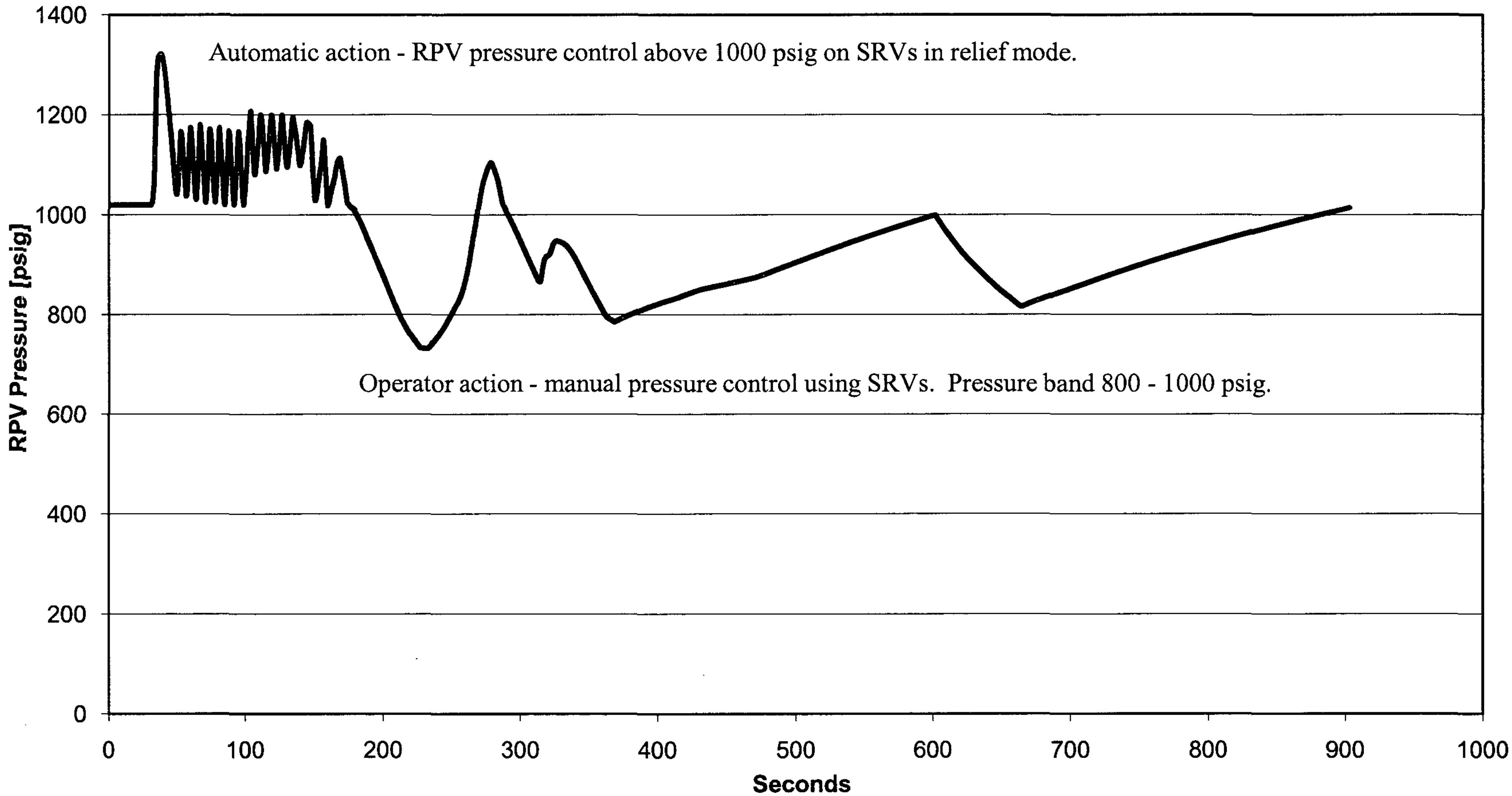


Figure 2
Transient Test EPU Isolated ATWS MELLLA
Neutron Flux (nmapmfx_z)

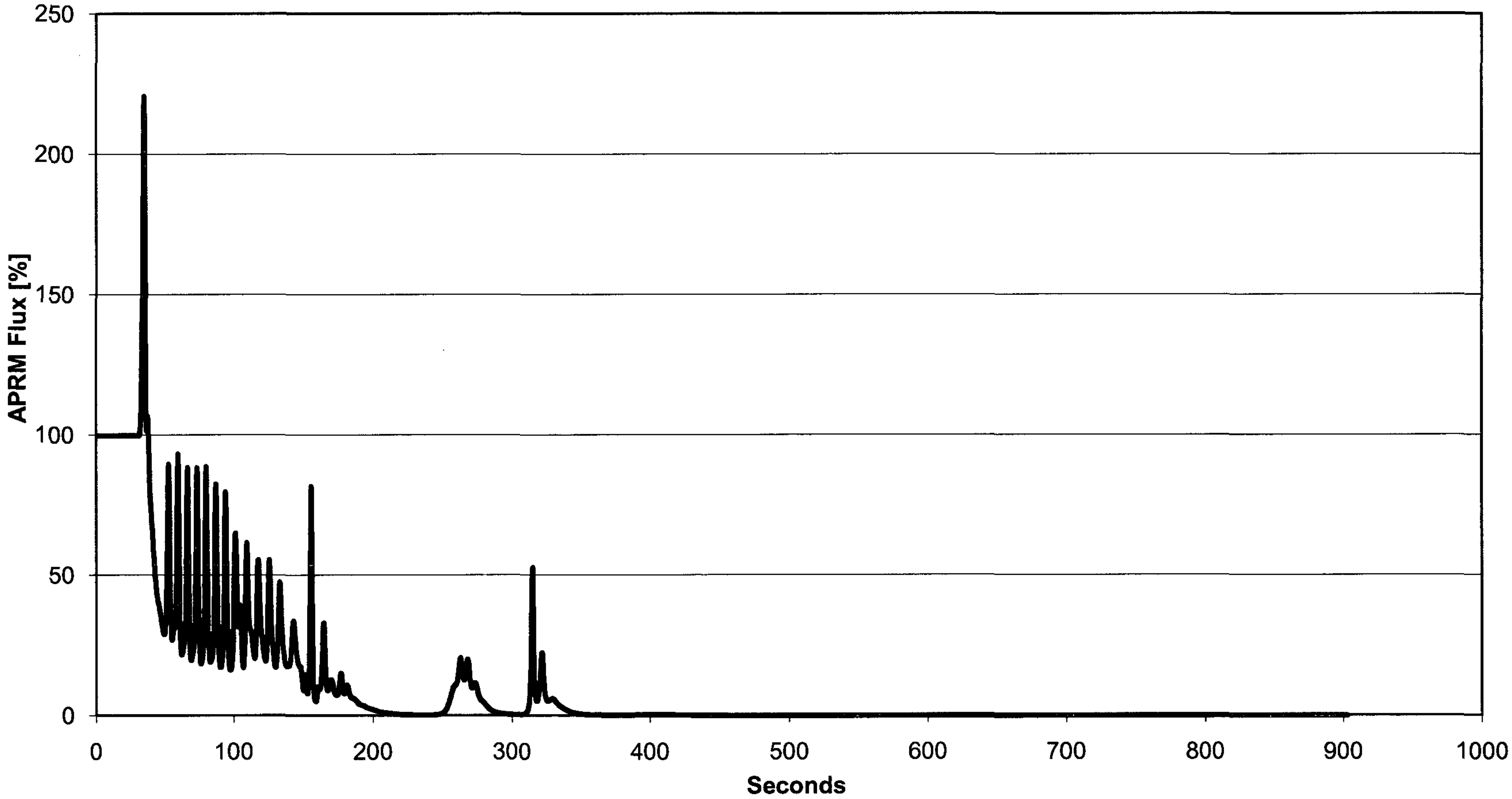


Figure 3
Transient Test EPU Isolated ATWS MELLLA
Narrow Range RPV Level (fwsla101)

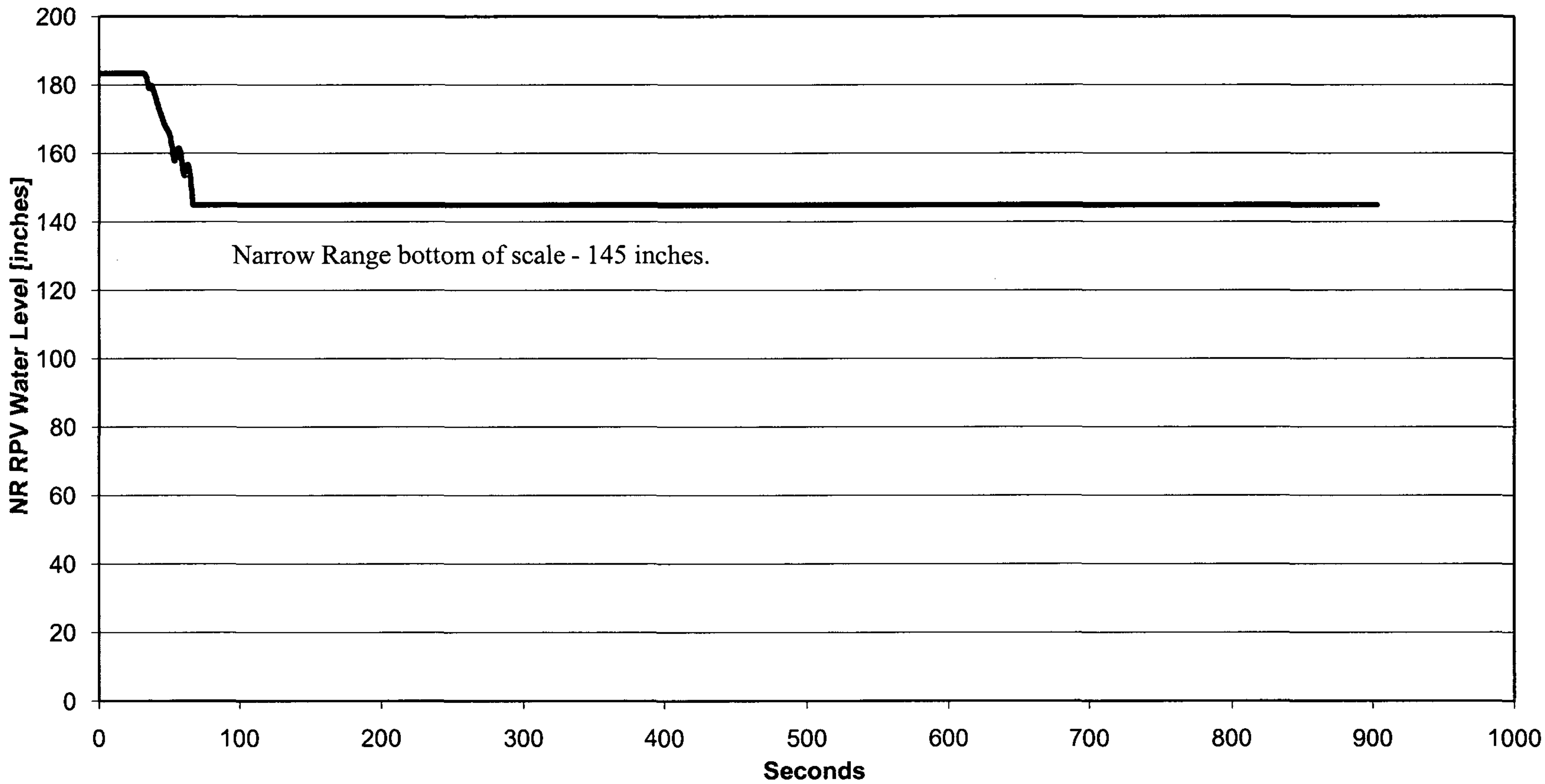


Figure 4
Transient Test EPU Isolated ATWS MELLLA
Wide Range RPV Level (rrlwrn1420)

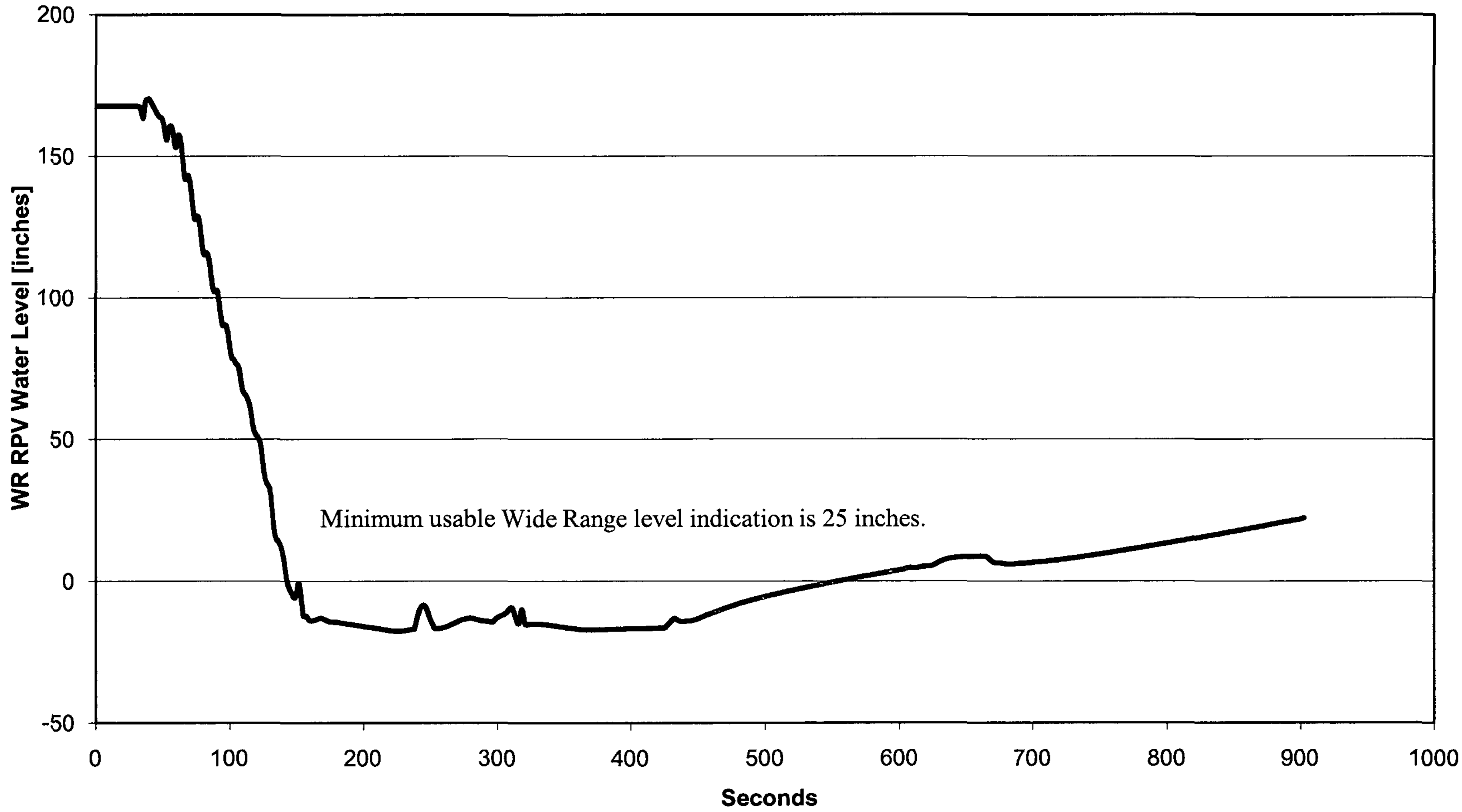


Figure 5
Transient Test EPU Isolated ATWS MELLLA
Feedwater Flow (fwfwtot_z)

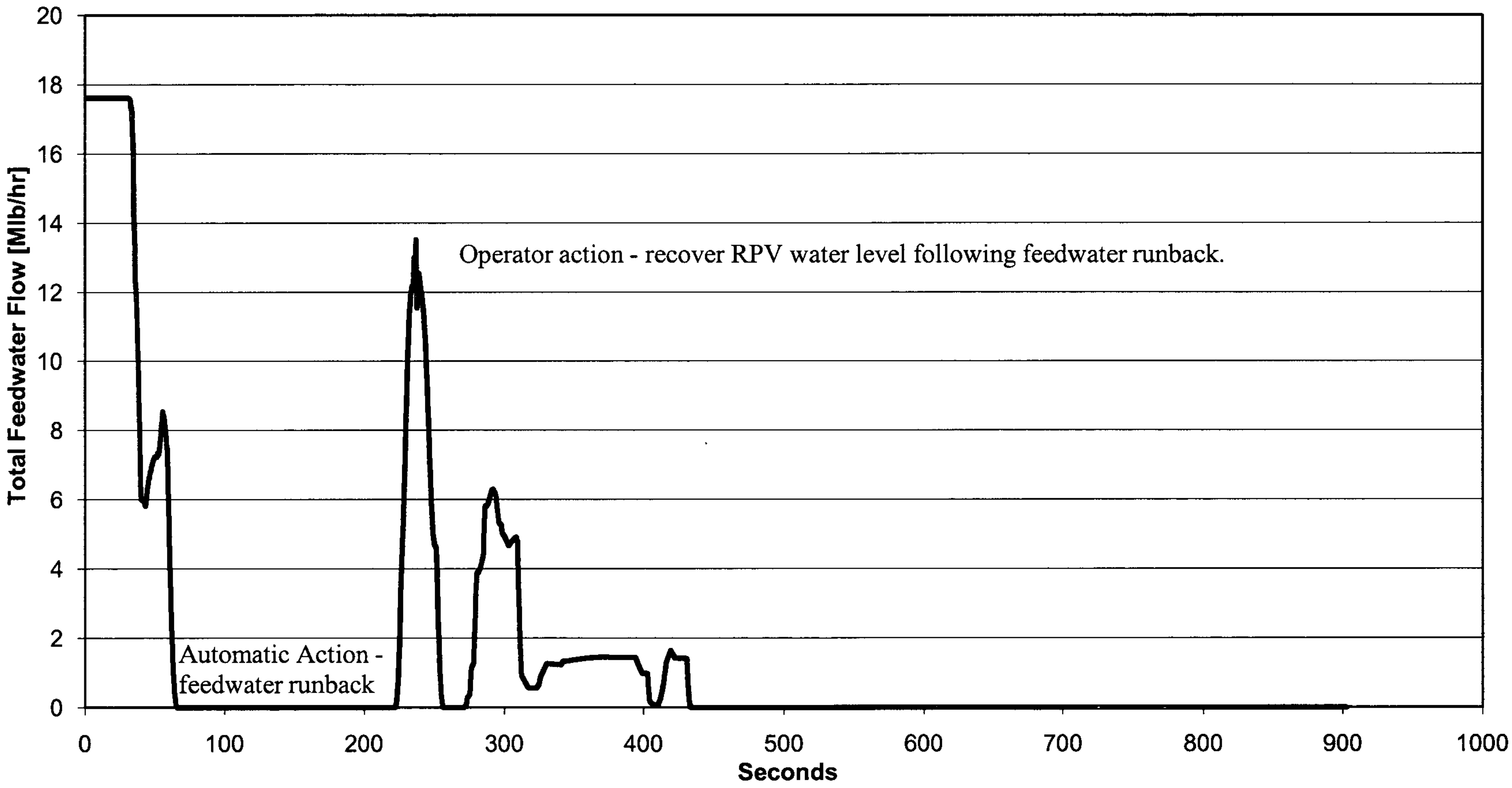


Figure 6
Transient Test EPU Isolated ATWS MELLLA
Main Steam Flow (msfmslt_z)

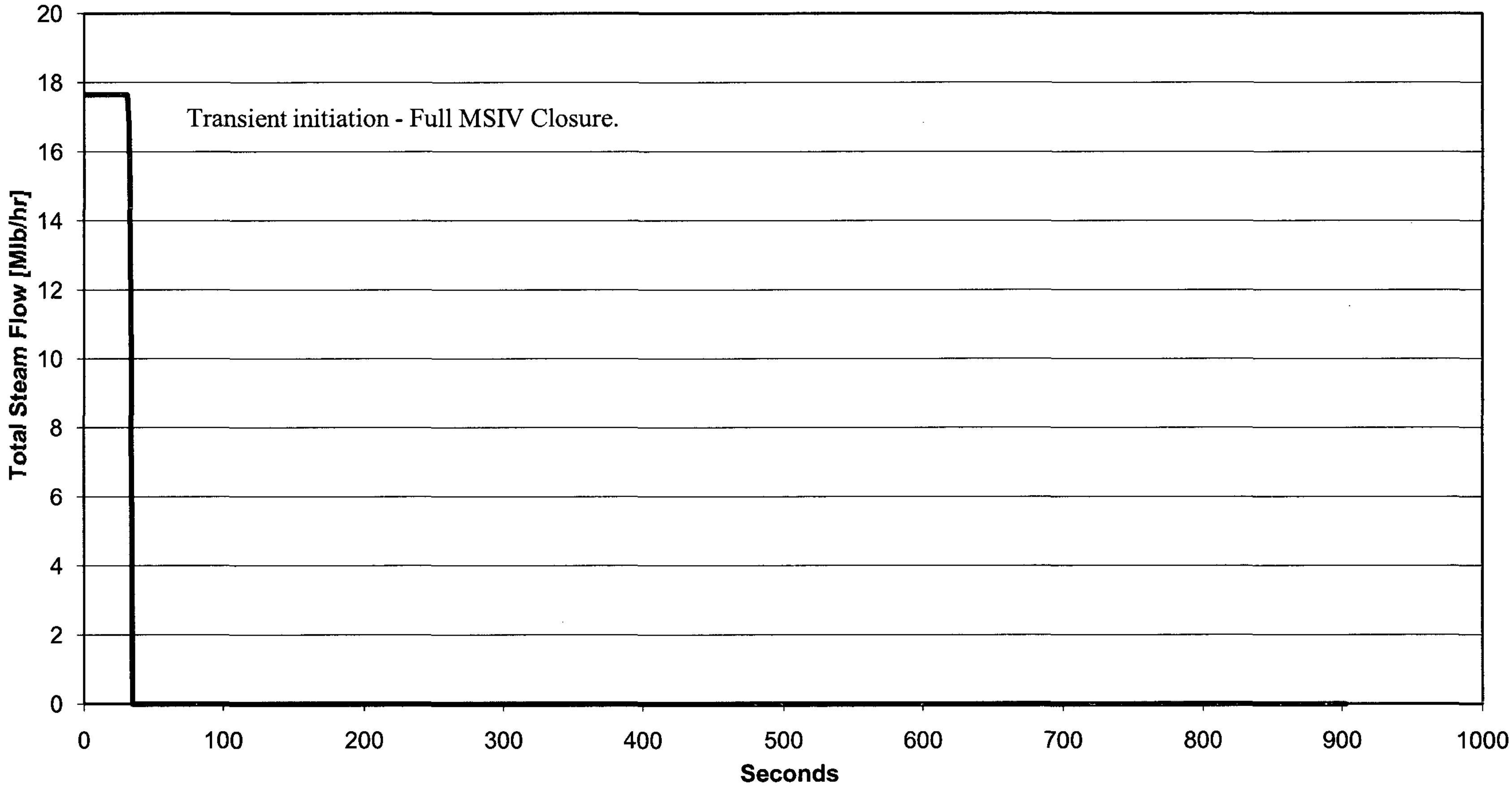


Figure 7
Transient Test EPU Isolated ATWS MELLLA
Total Core Flow (rrffcr_z)

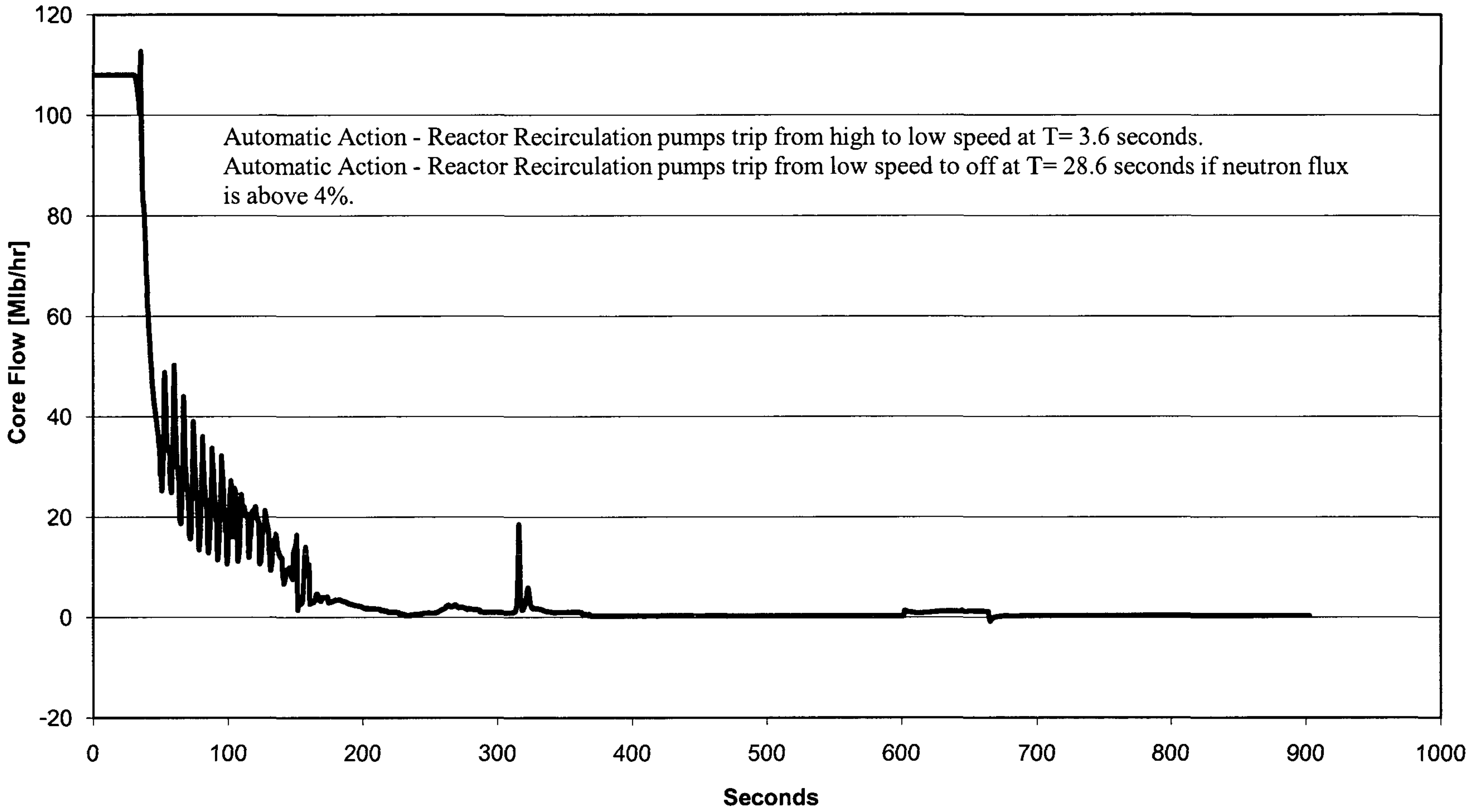


Figure 8
Transient Test EPU Isolated ATWS MELLLA
Final Feedwater Temperature (fwtrxt)

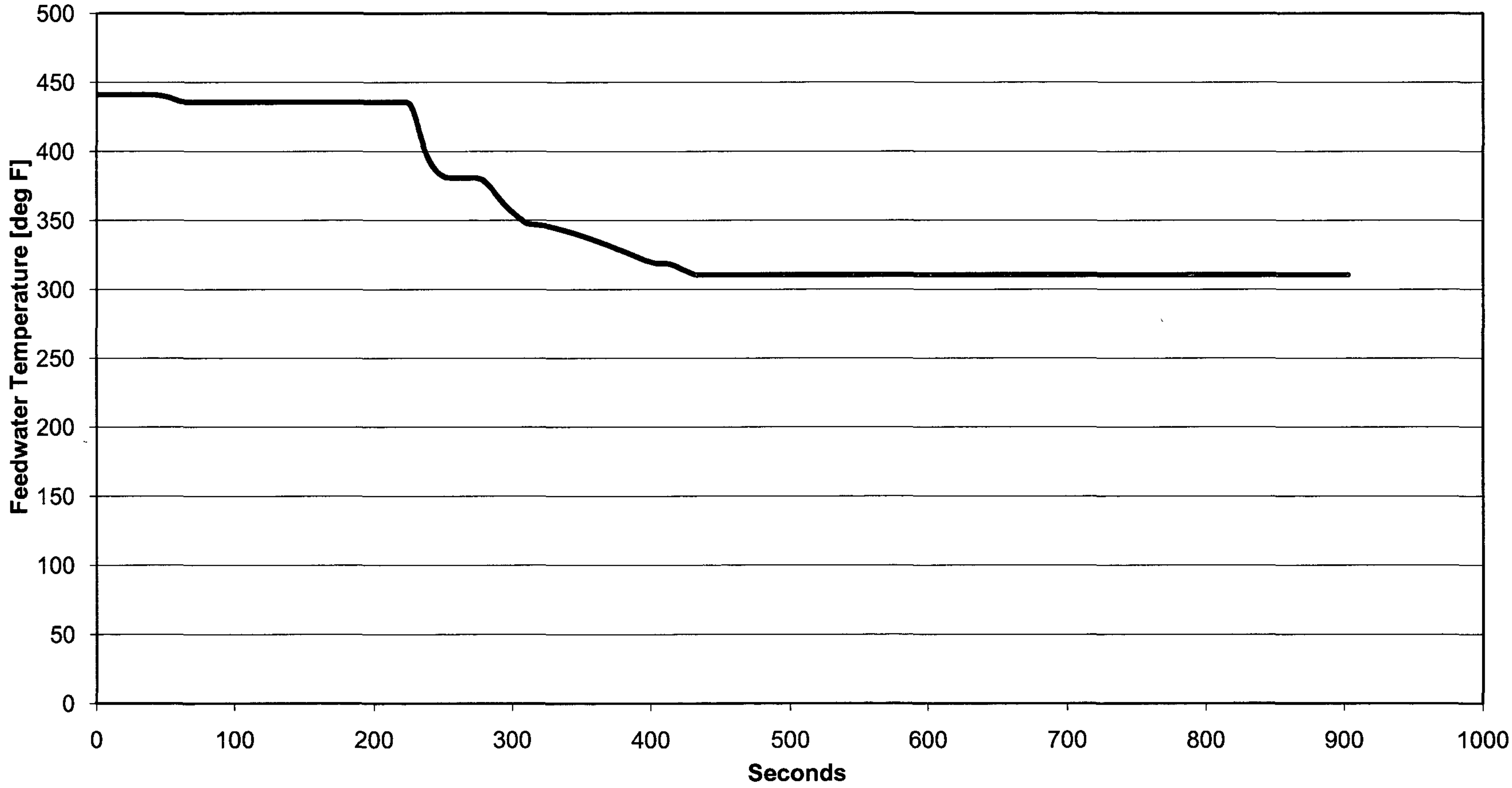


Figure 9
Transient Test EPU Isolated ATWS MELLLA
Main Condenser Vacuum (mxvacb)

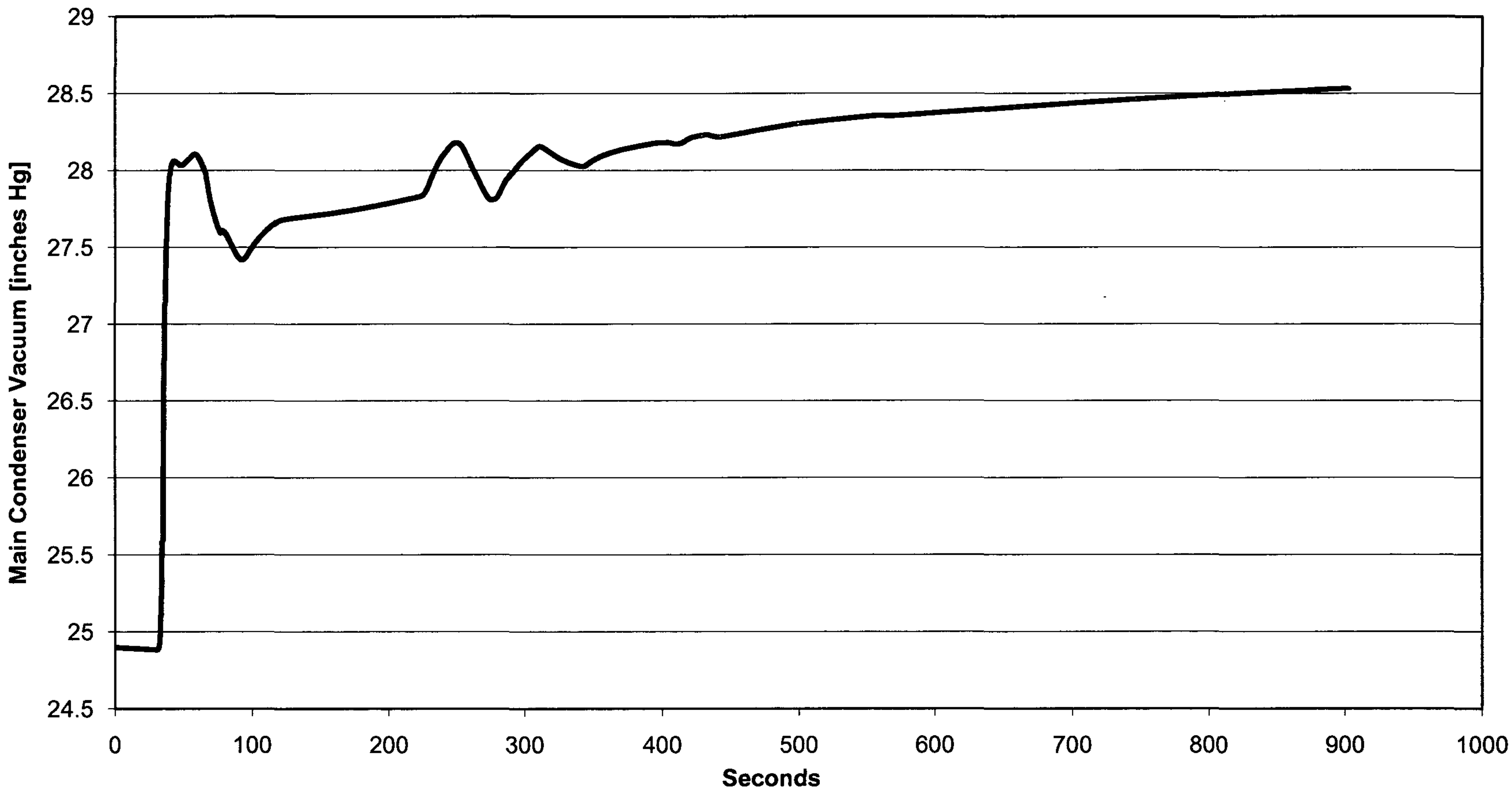


Figure 10
Transient Test EPU Isolated ATWS MELLLA
Turbine Bypass Valve Position (tcvbpvav)

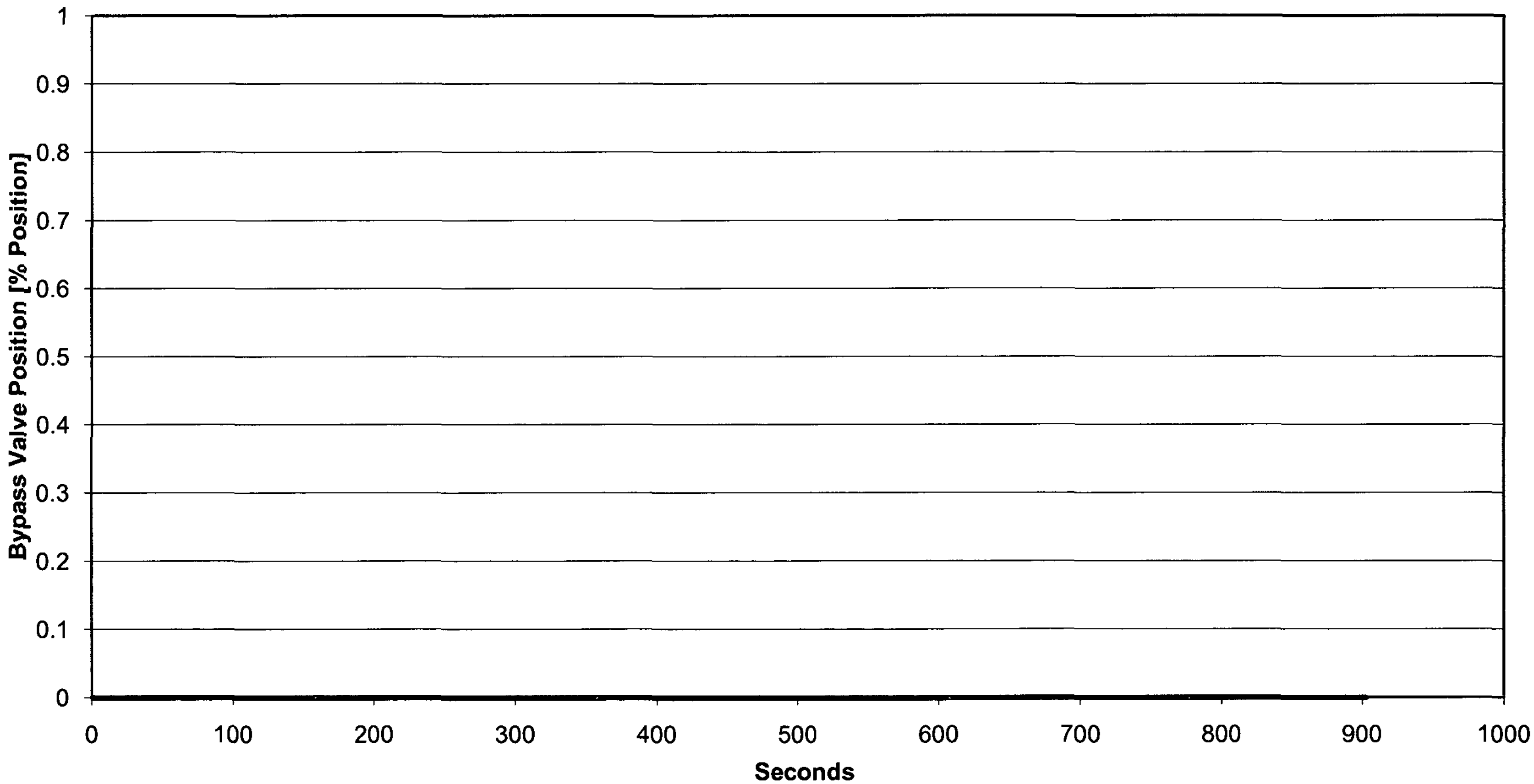


Figure 11
Transient Test EPU Isolated ATWS MELLLA
Turbine Control Valve Position (msvtmcv)

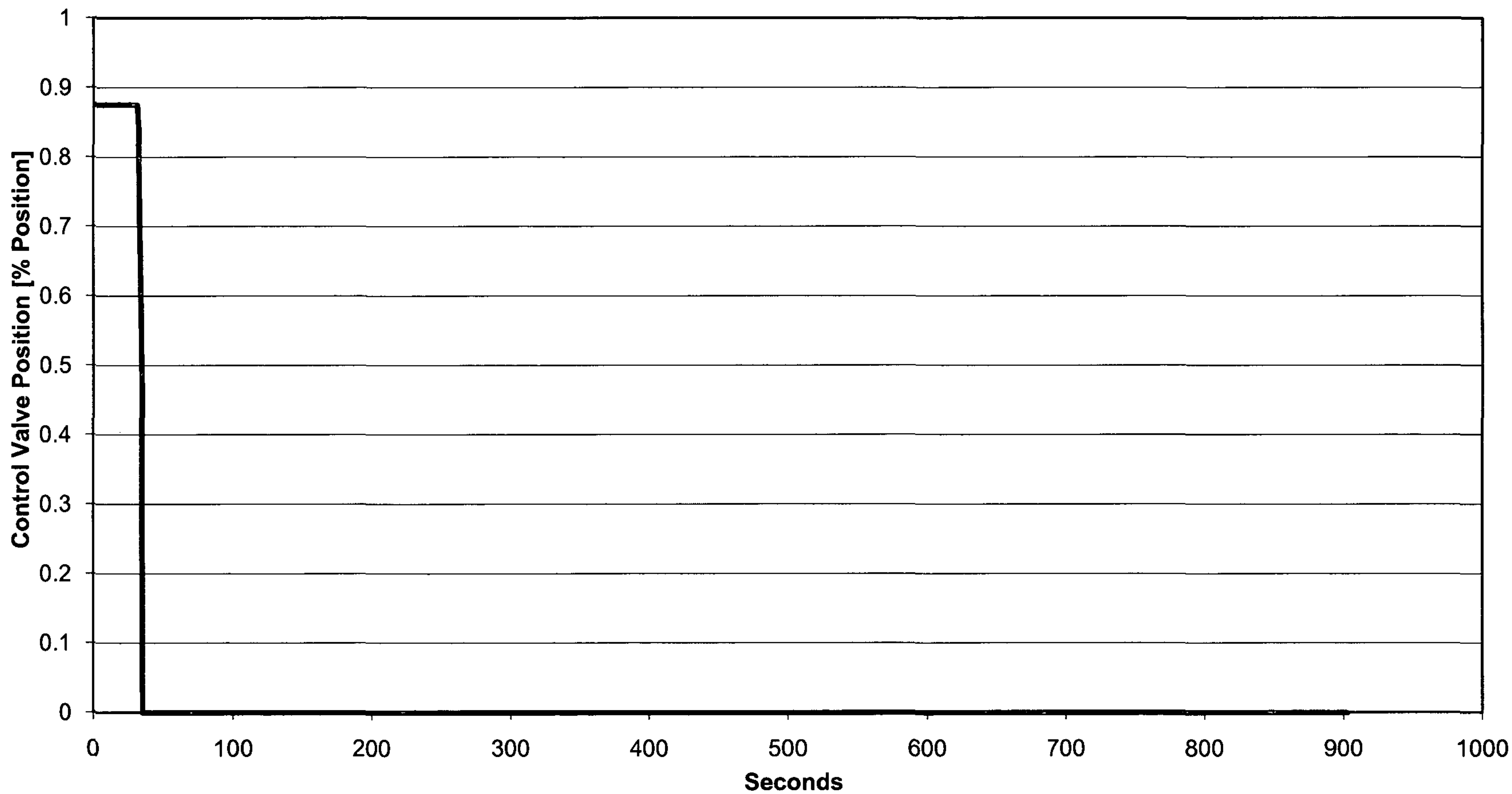


Figure 12
Transient Test EPU Isolated ATWS MELLLA
Fuel Zone RPV Level (ZAR2R610_Z)

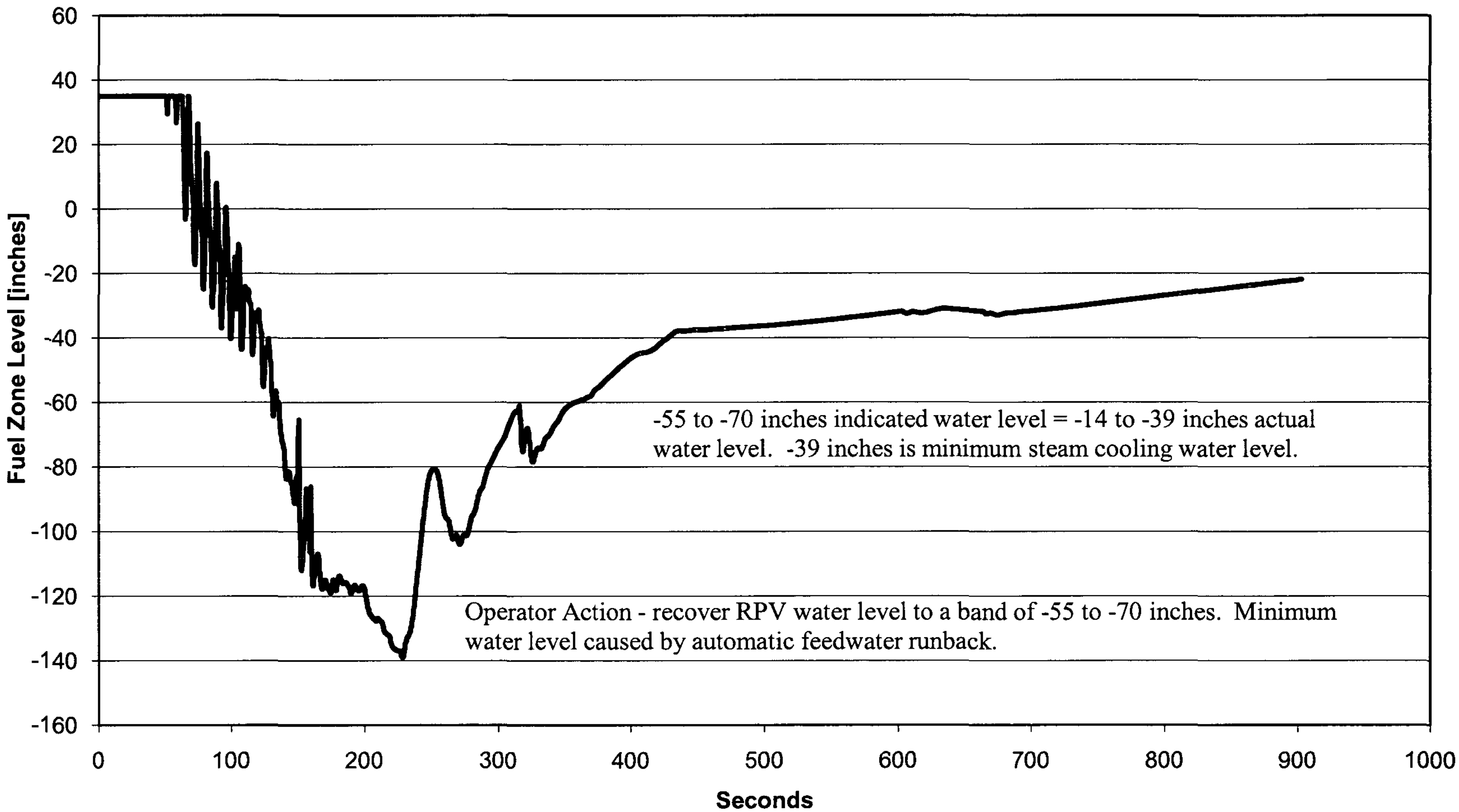


Figure 13
Transient Test EPU Isolated ATWS MELLLA
Drywell Pressure (PCPDWCMS)

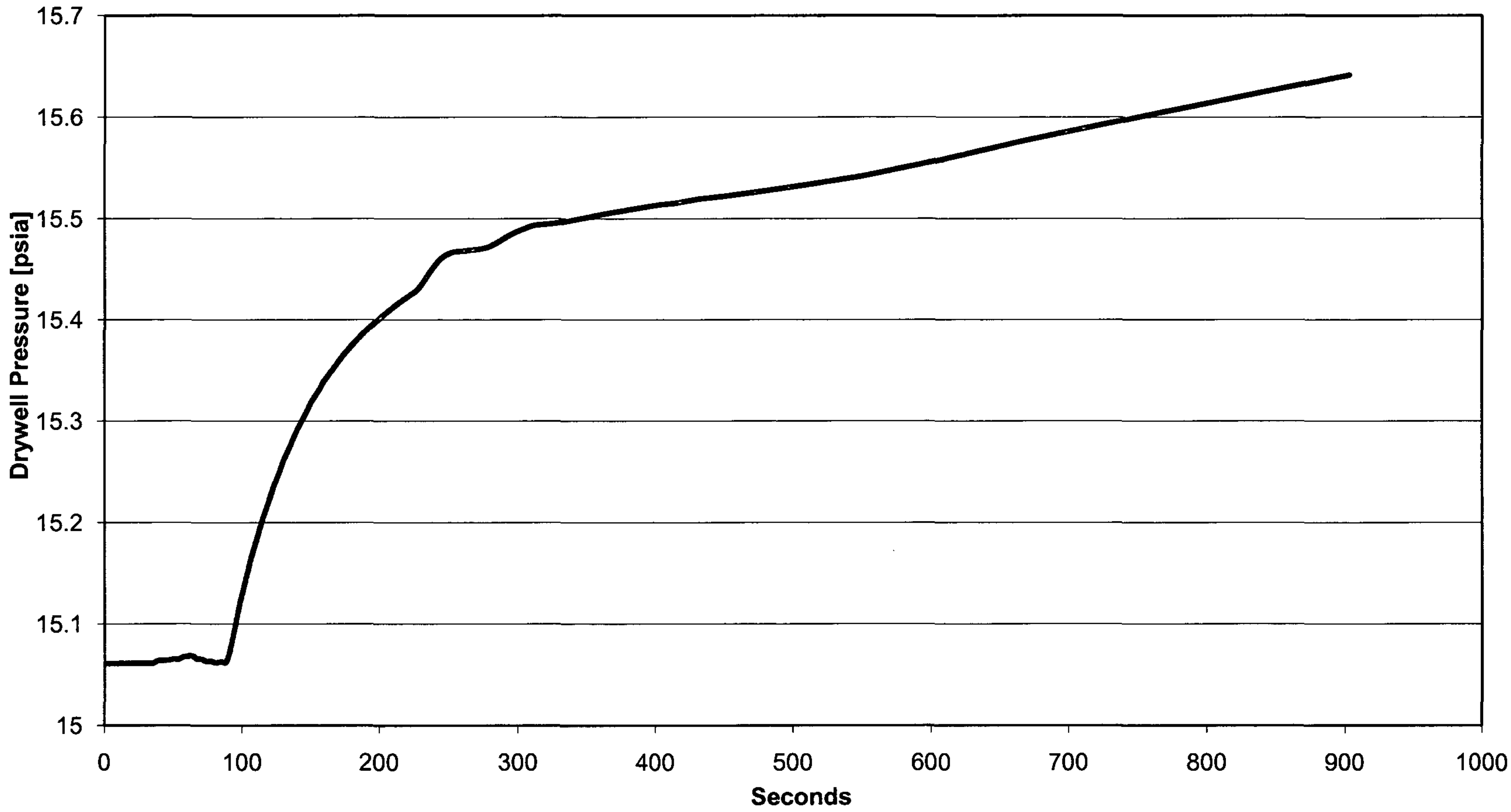


Figure 14
Transient Test EPU Isolated ATWS MELLLA
Suppression Chamber Pressure (PCPCHMB)

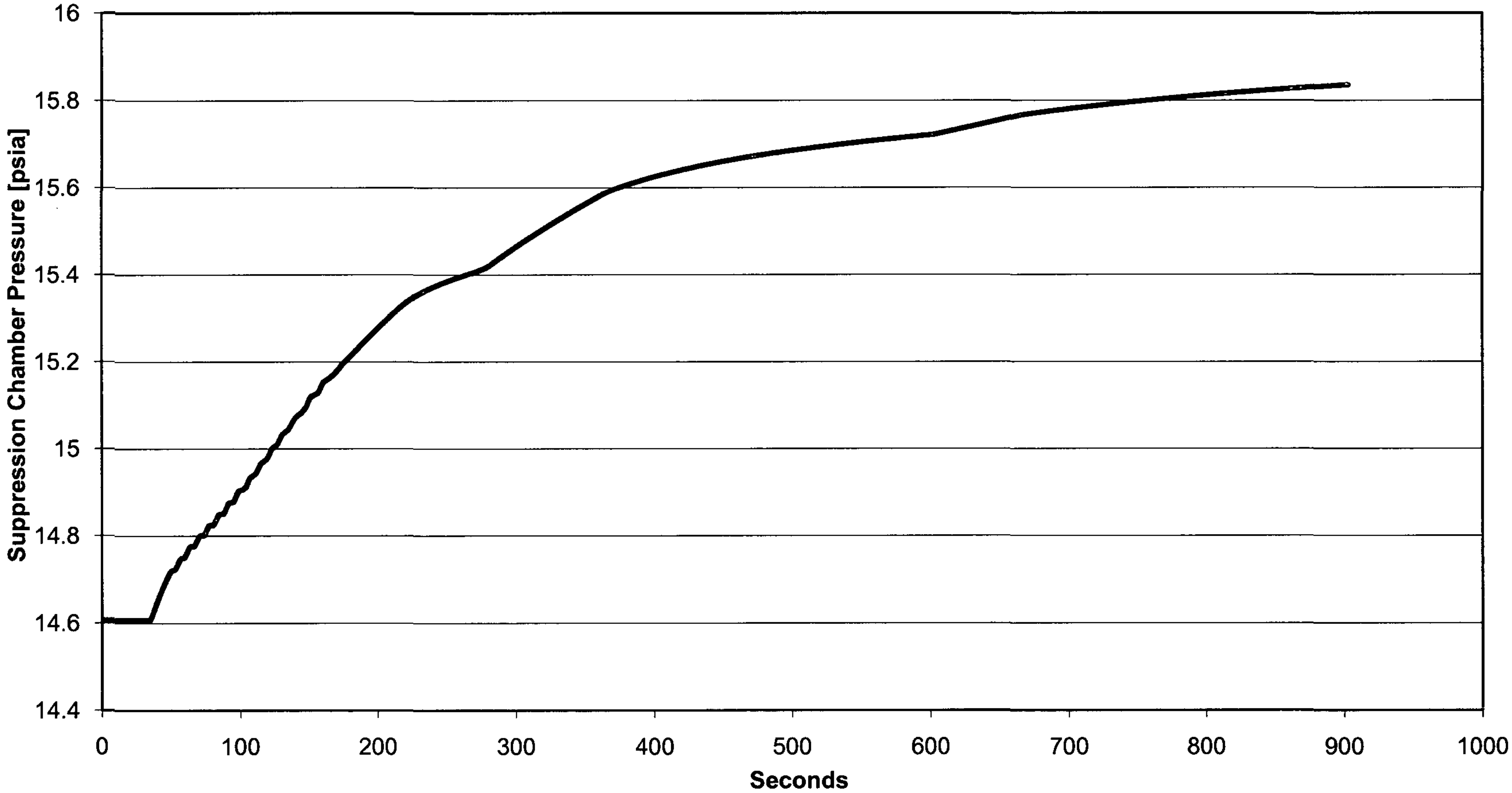


Figure 15
Transient Test EPU Isolated ATWS MELLLA
Drywell Temperature (PCTDRYWL)

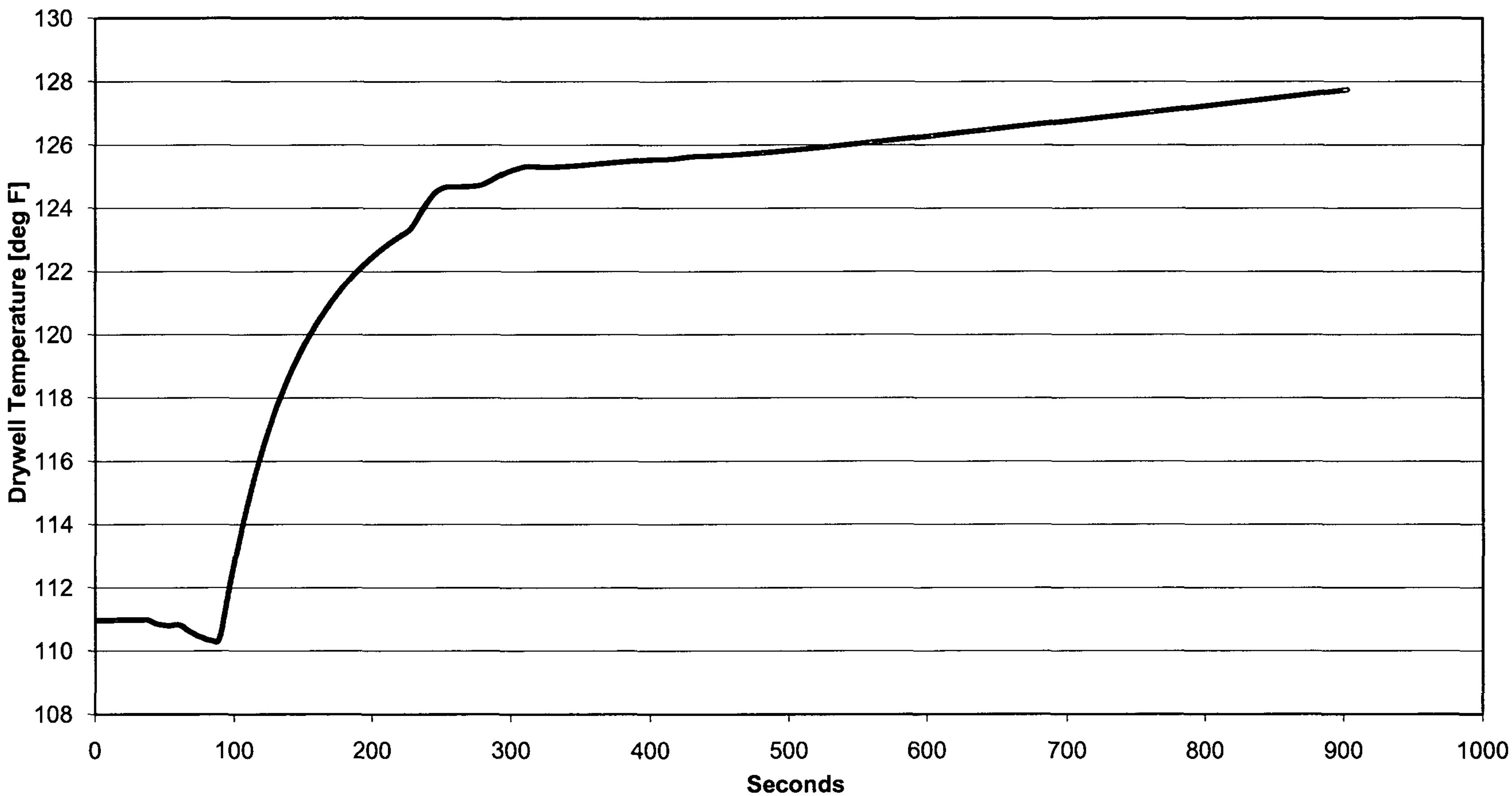


Figure 16
Transient Test EPU Isolated ATWS MELLLA
(Suppression Chamber Air Temperature (PCTSPAIR)

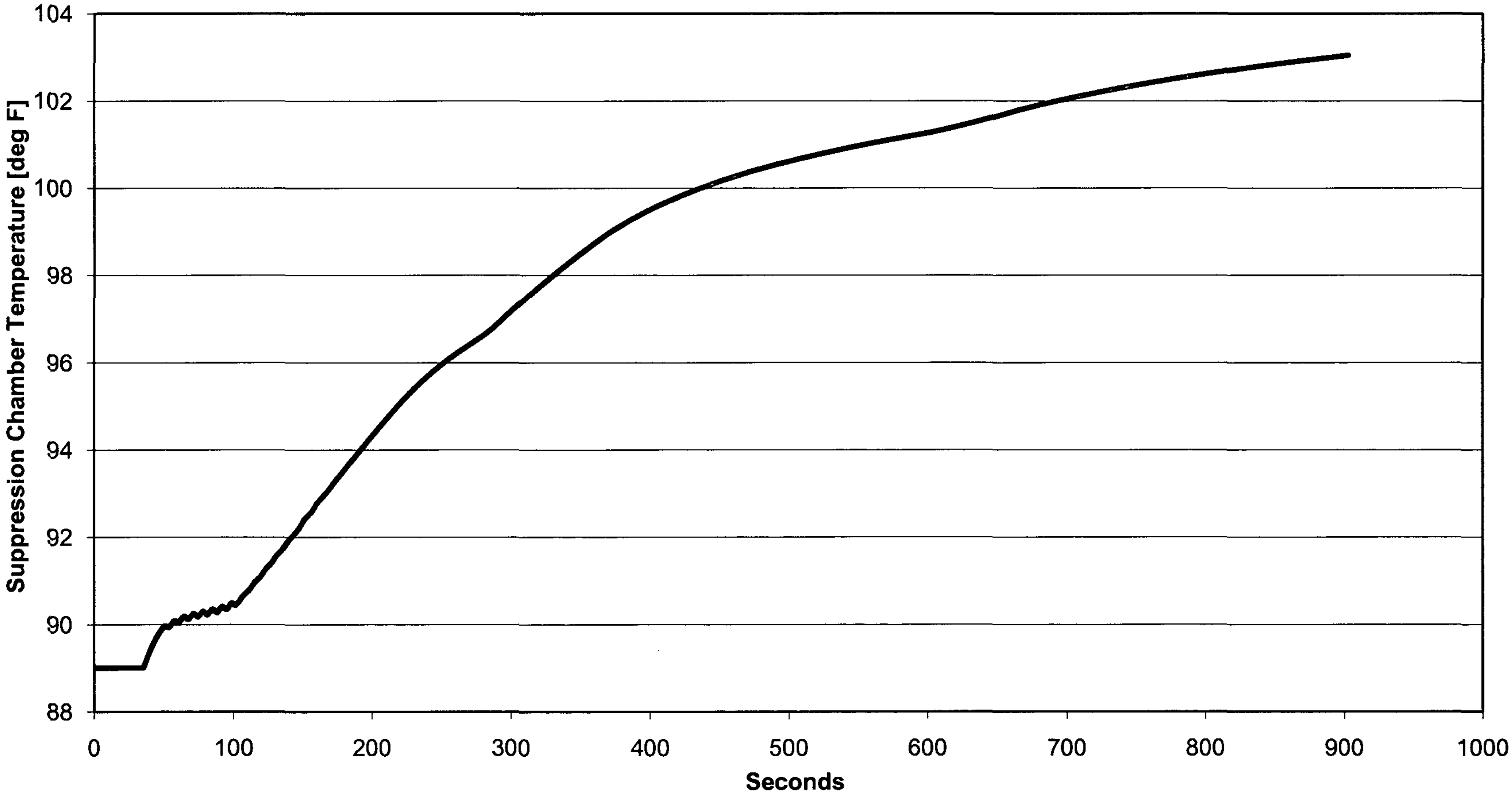


Figure 17
Transient Test EPU Isolated ATWS MELLLA
Suppression Pool Temperature (PCTSP)

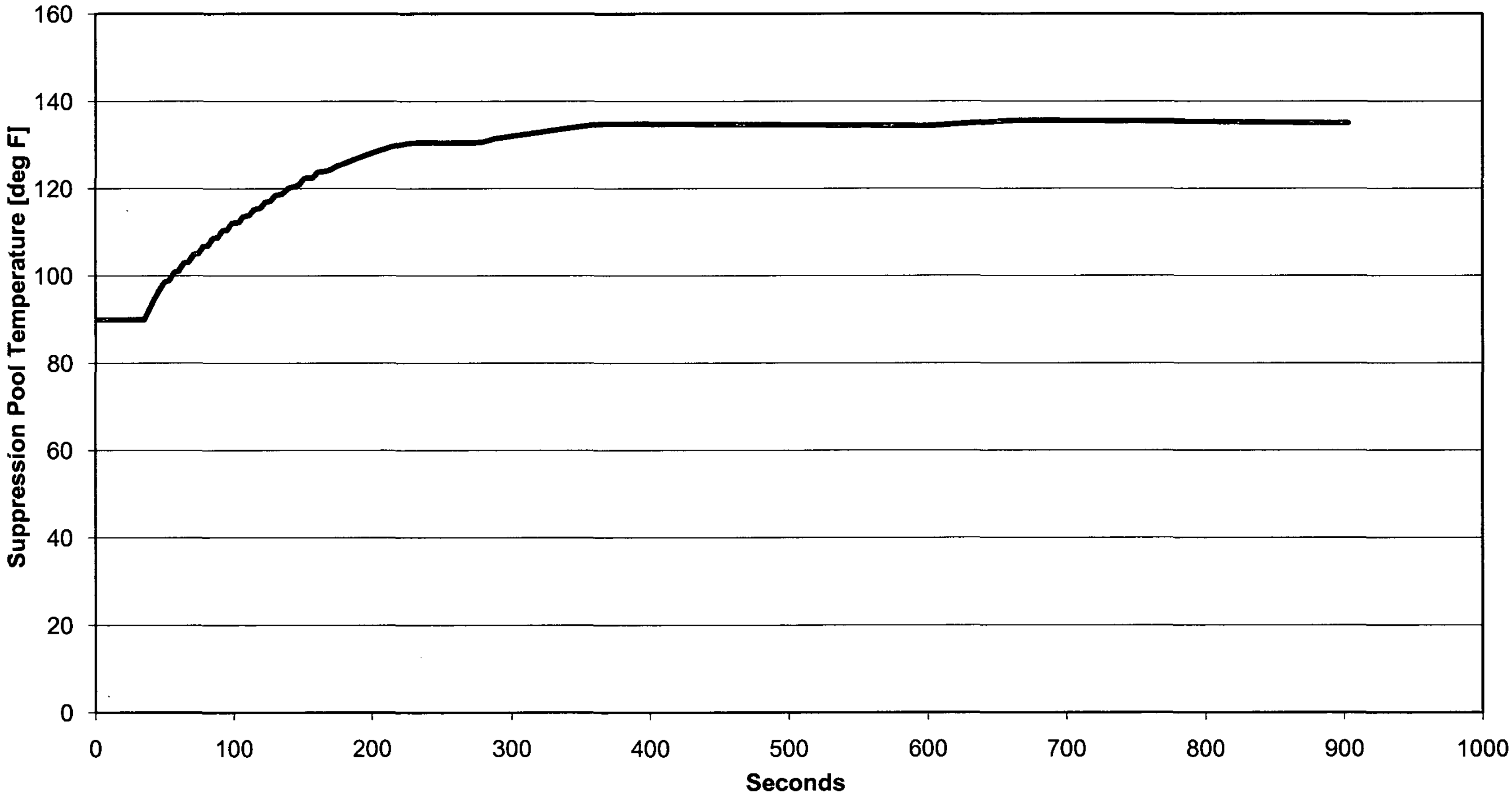


Figure 18
Transient Test EPU Isolated ATWS MELLLA
Boron Injection Flow Rate (SLFTOTALSYSTEM)

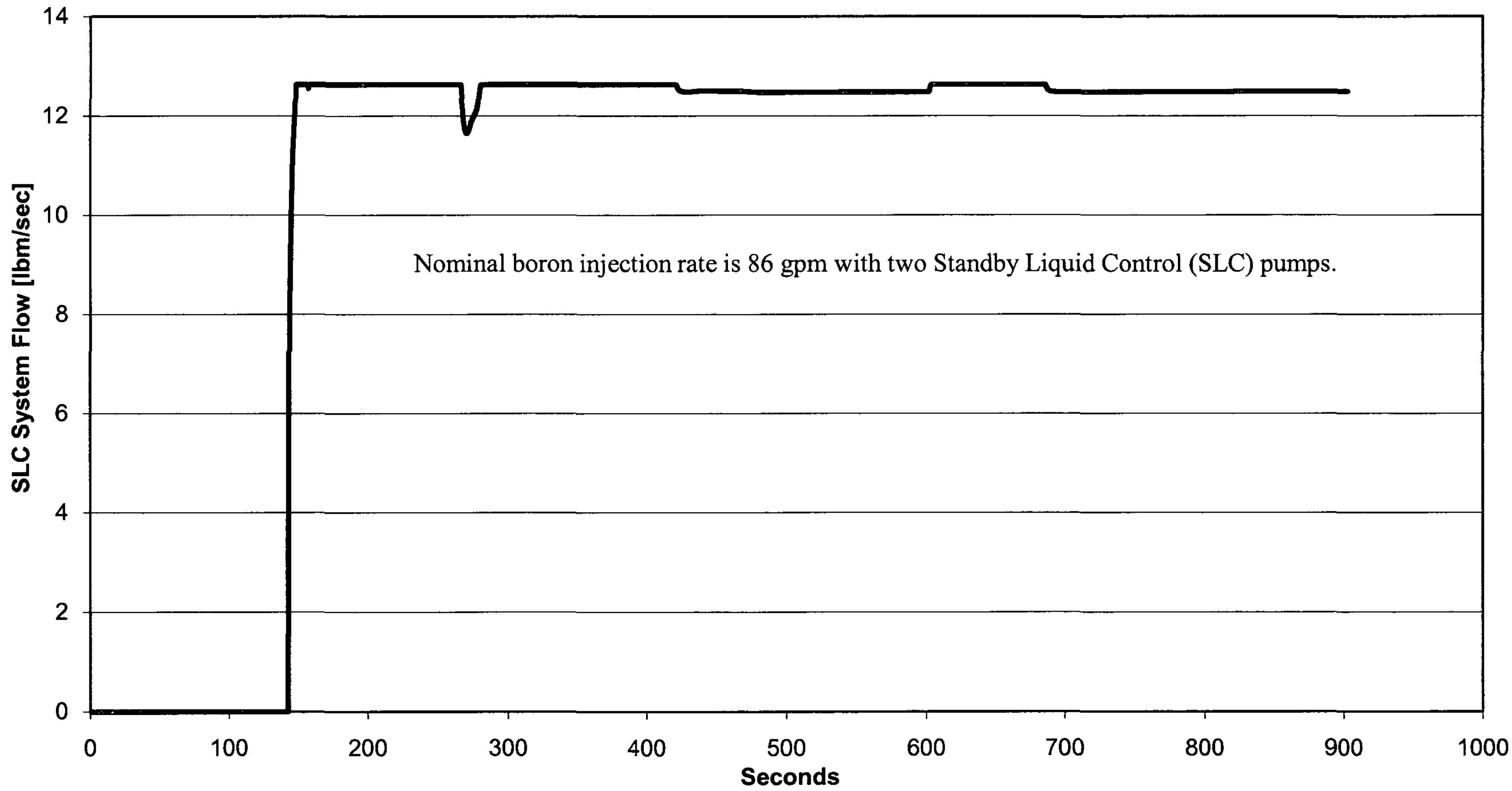


Figure 19
Transient Test EPU Isolated ATWS MELLLA
RPV Boron Concentration (RRCBORON)

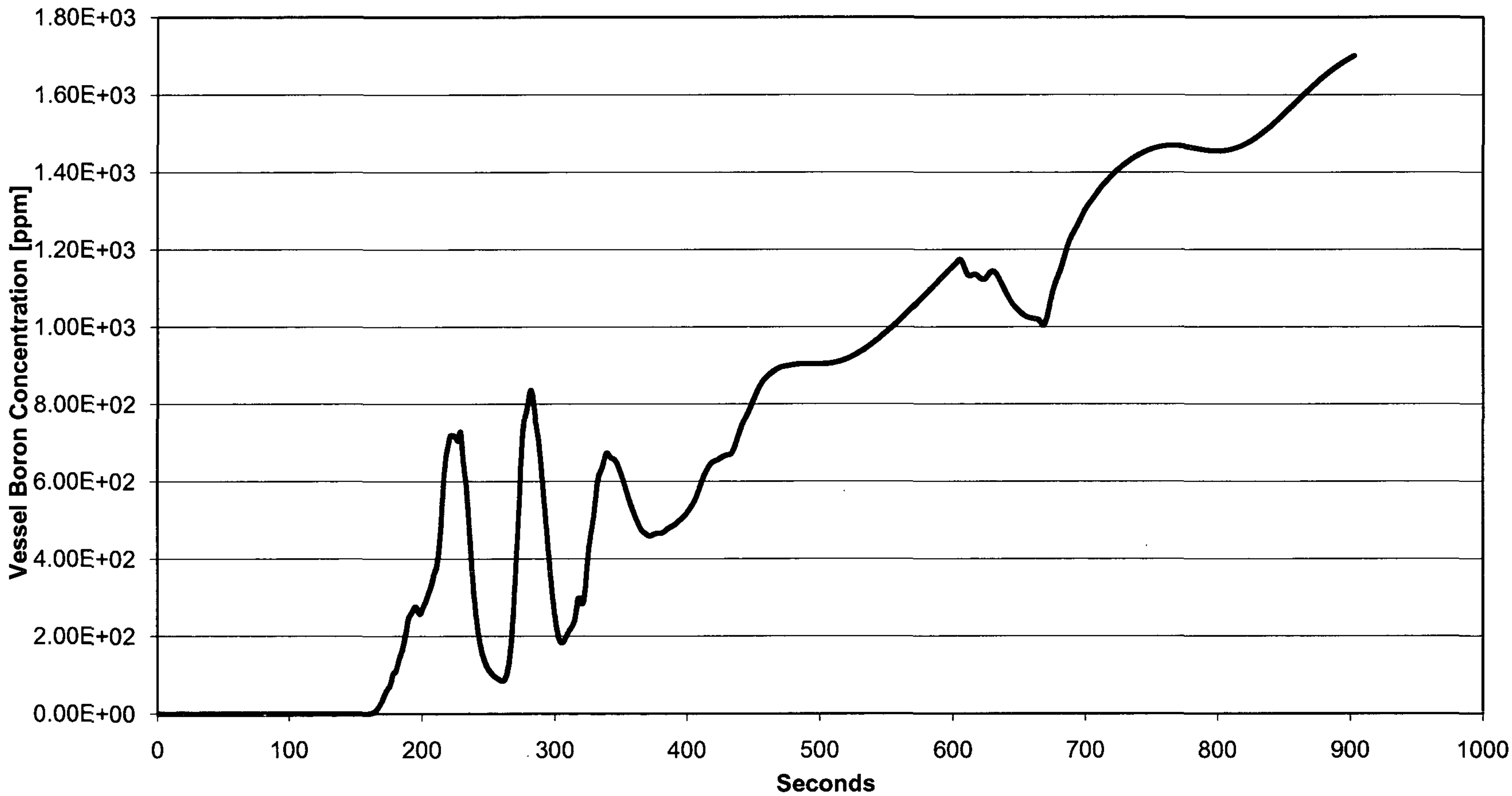


Figure 20
Transient Test EPU Isolated ATWS MELLLA
Core Reactivity (CRXREAC)

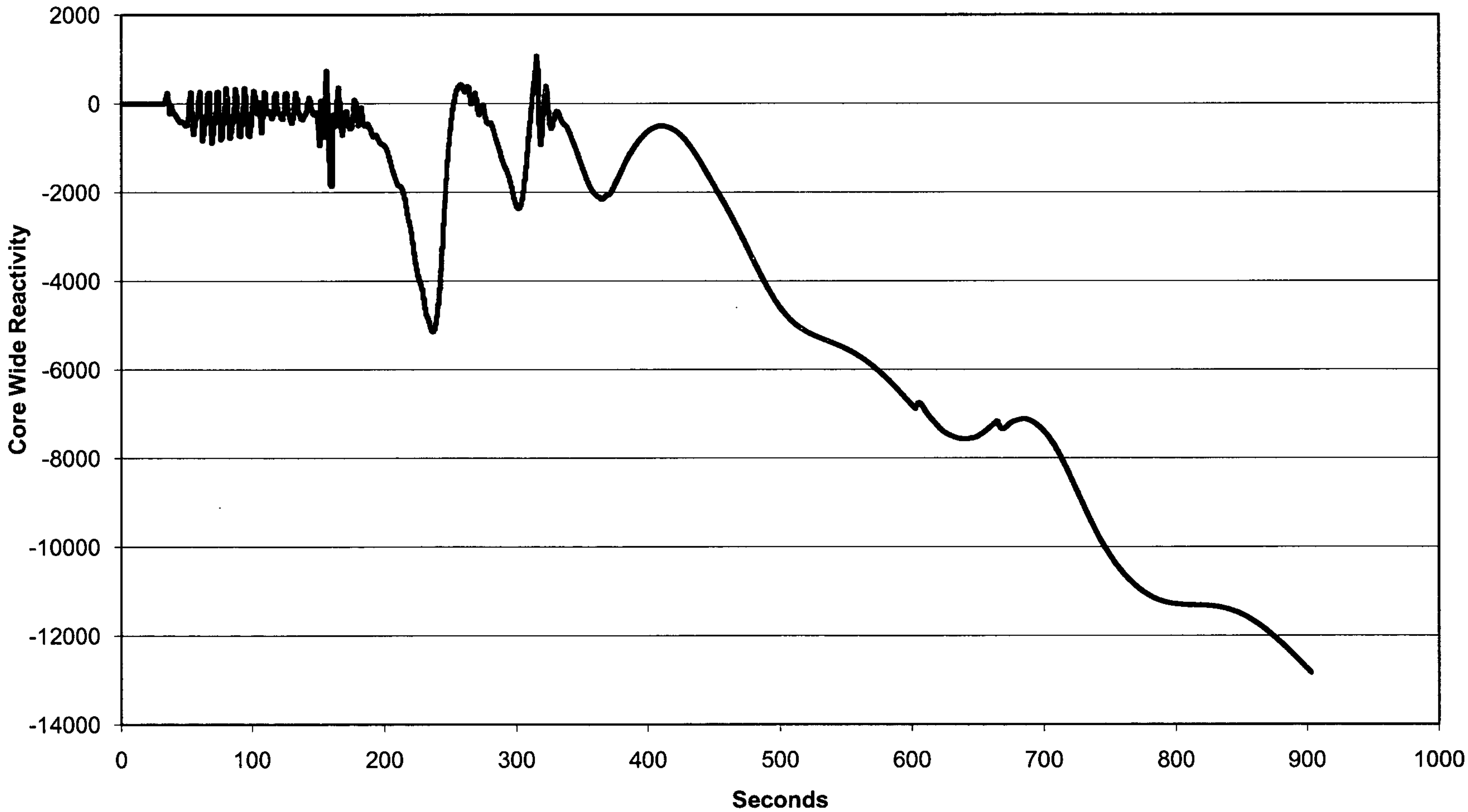


Figure 21
Transient Test EPU Isolated ATWS MELLLA
HCTL Limit (SPDSA118)

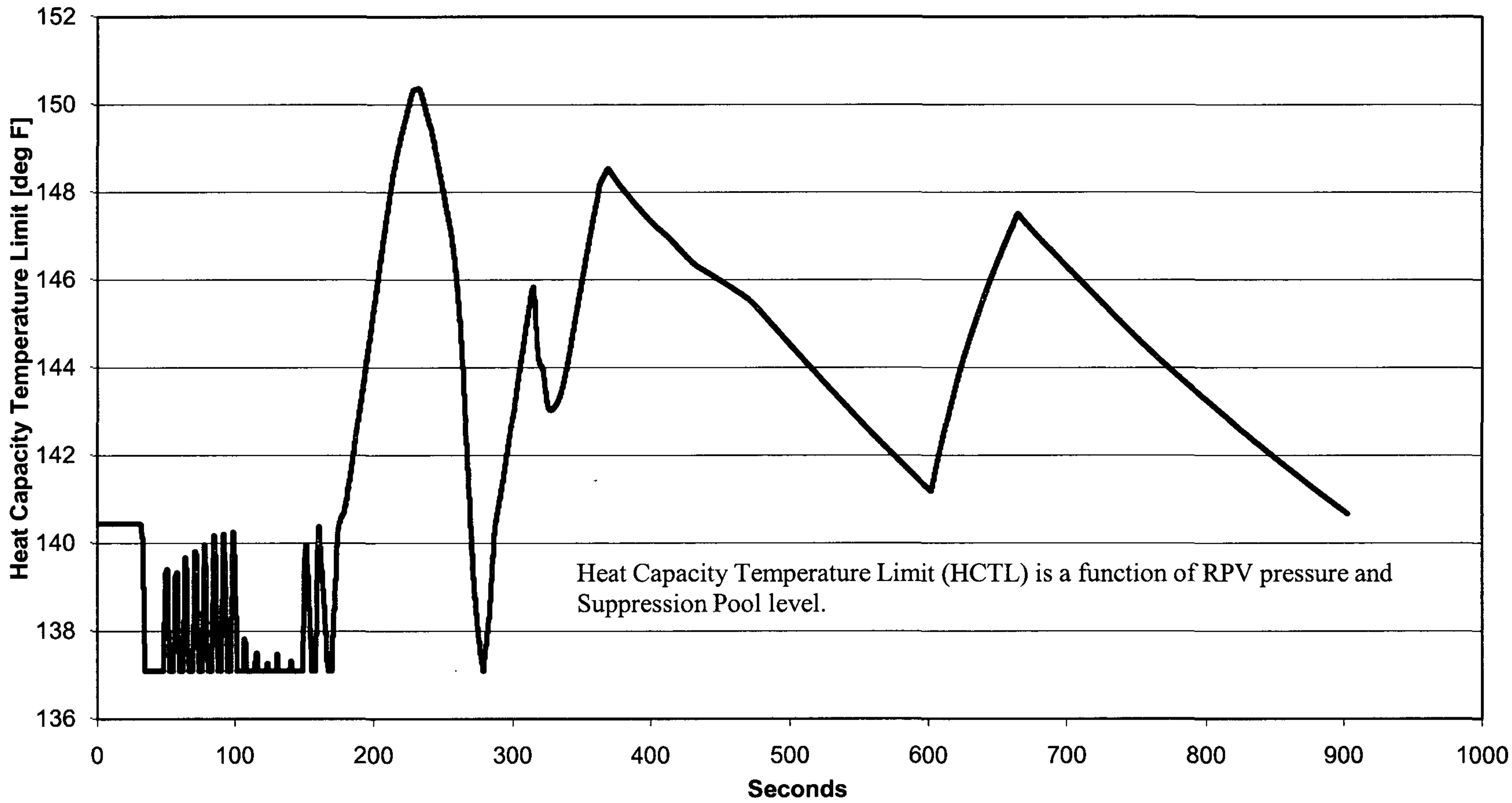


Figure 22
Transient Test EPU Isolated ATWS MELLLA
HCTL Margin (SPDSA119)

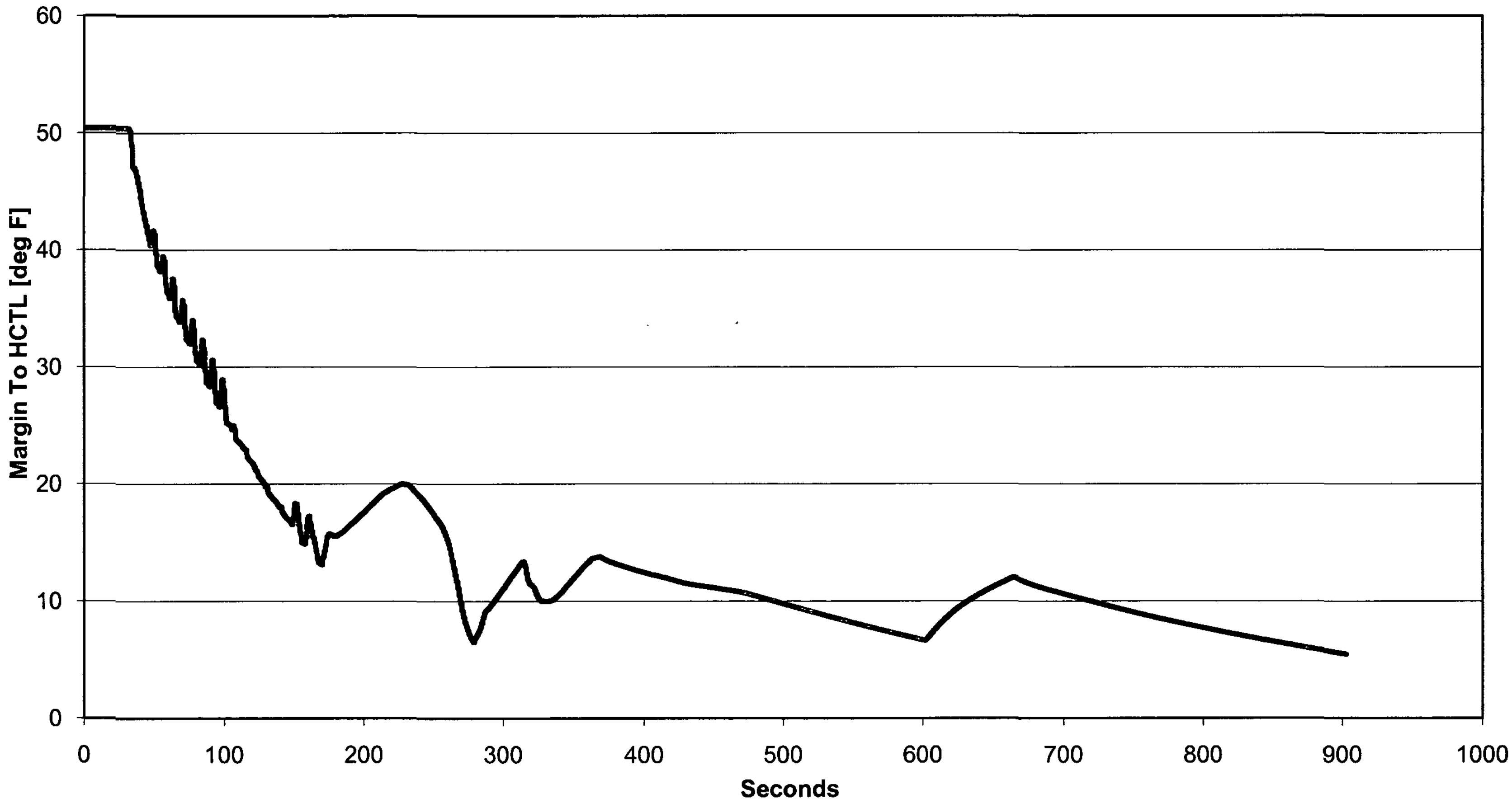


Figure 23
Transient Test EPU Isolated ATWS MELLLA
RHR "A" Pump Flow (RHFPMP1A)

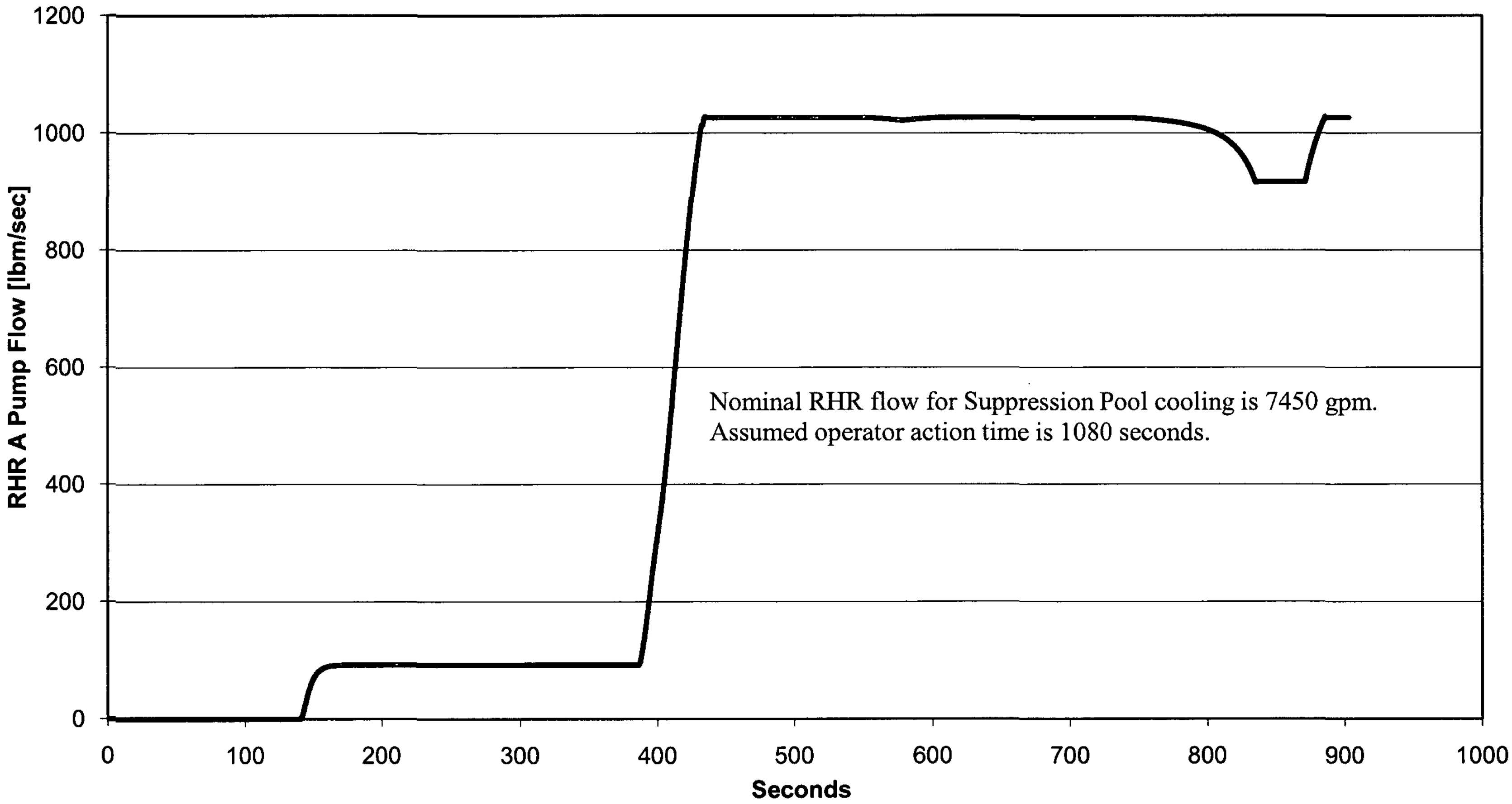


Figure 24
Transient Test EPU Isolated ATWS MELLLA
RHR "B" Pump Flow (RHFPMP1B)

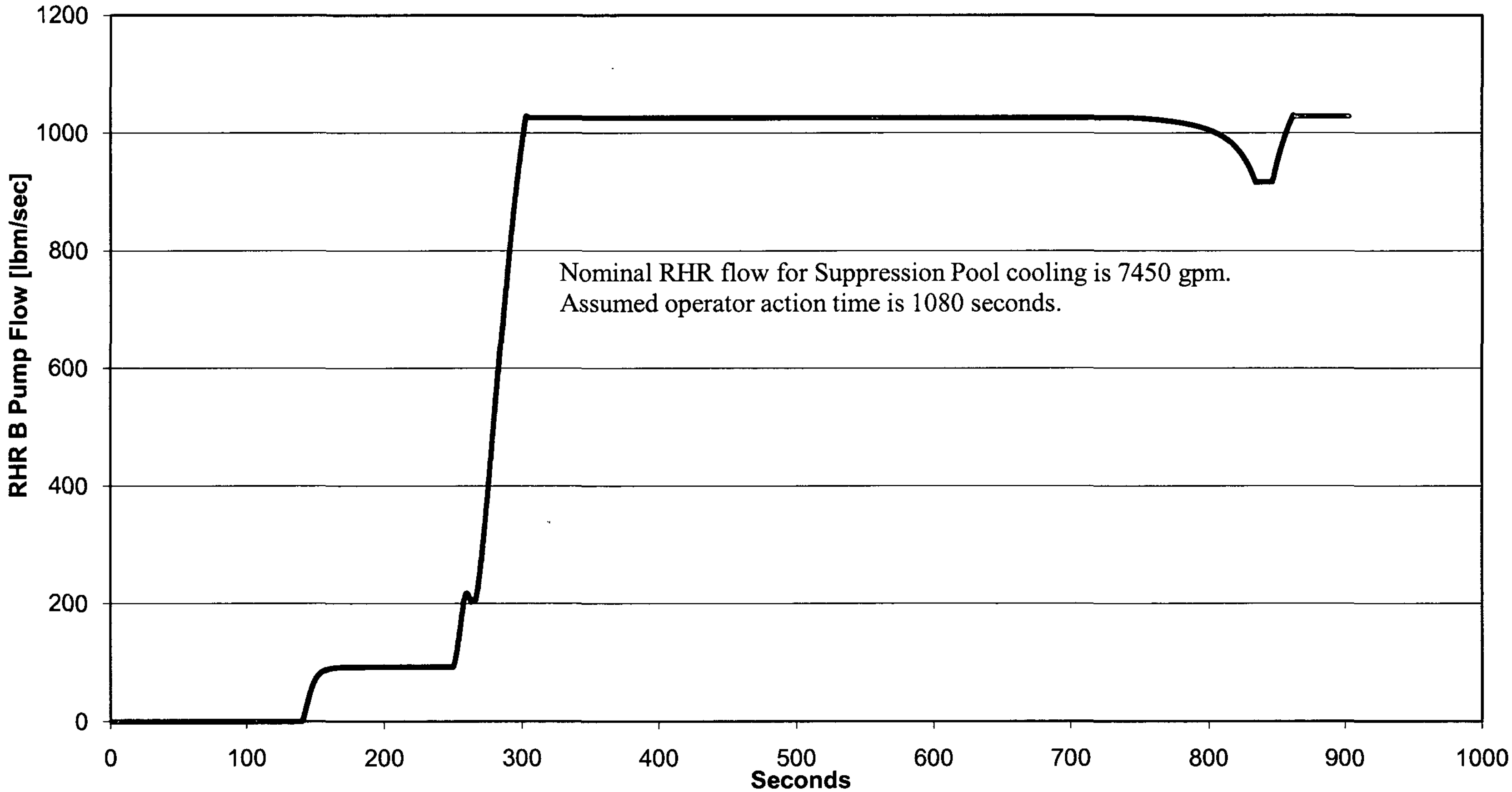


Figure 25
Transient Test EPU Isolated ATWS MELLLA
RHR "C" Pump Flow (RHFPMP1C)

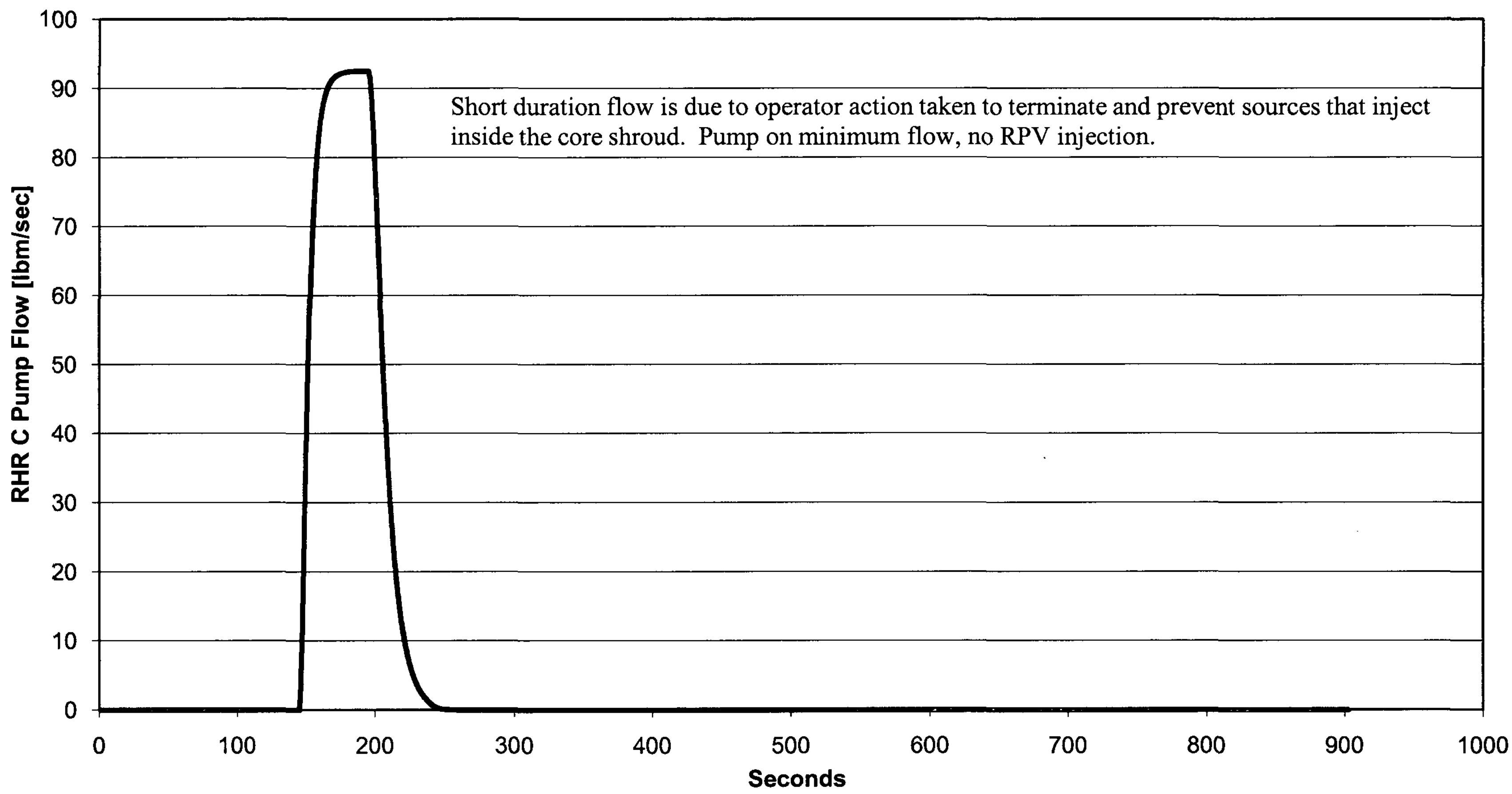


Figure 26
Transient Test EPU Isolated ATWS MELLLA
Total SRV Flow (MSFSRVWTRSC)

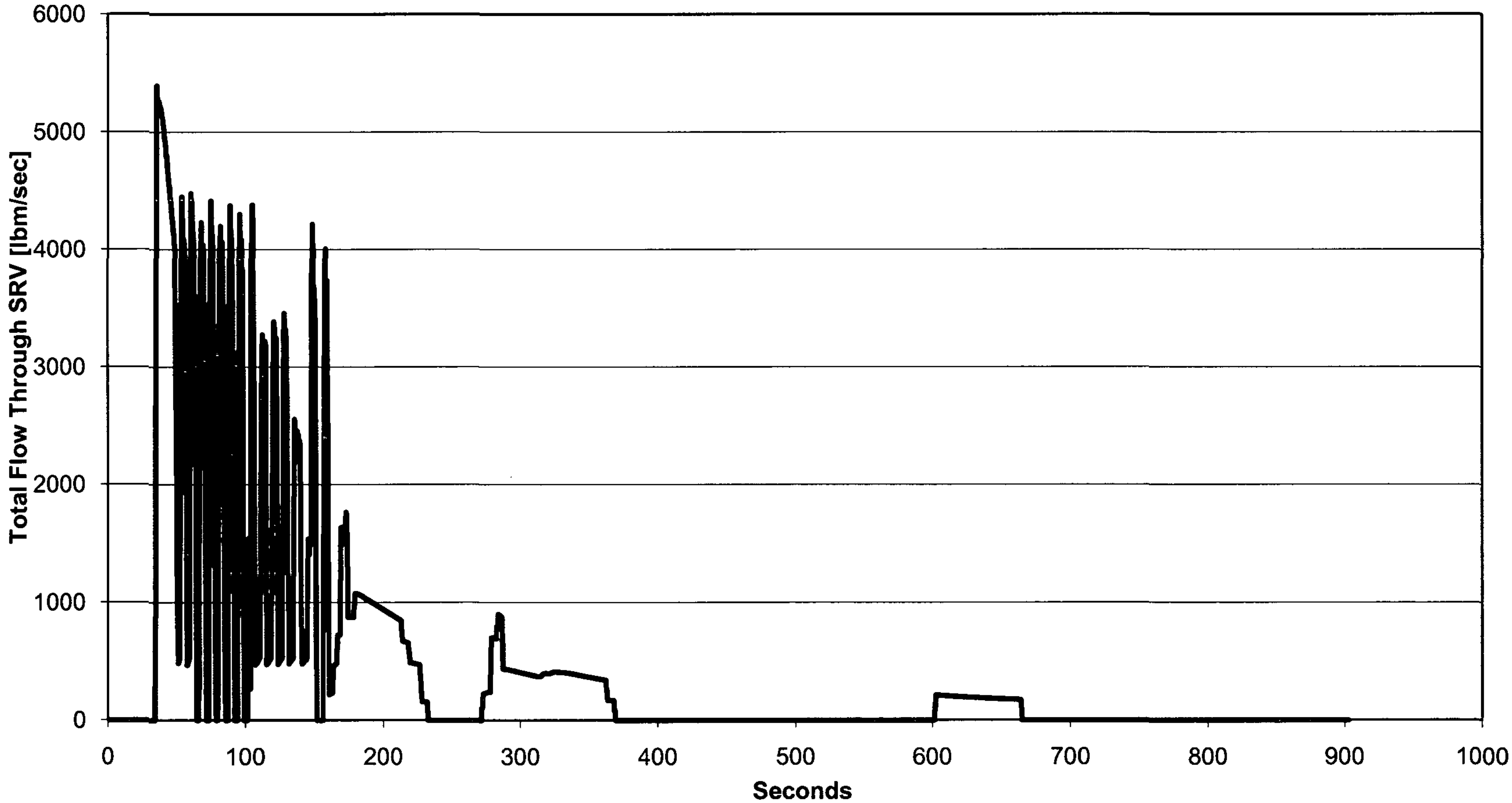


Figure 27
Transient Test EPU Isolated ATWS MELLLA
Suppression Pool Level (SPDSA117)

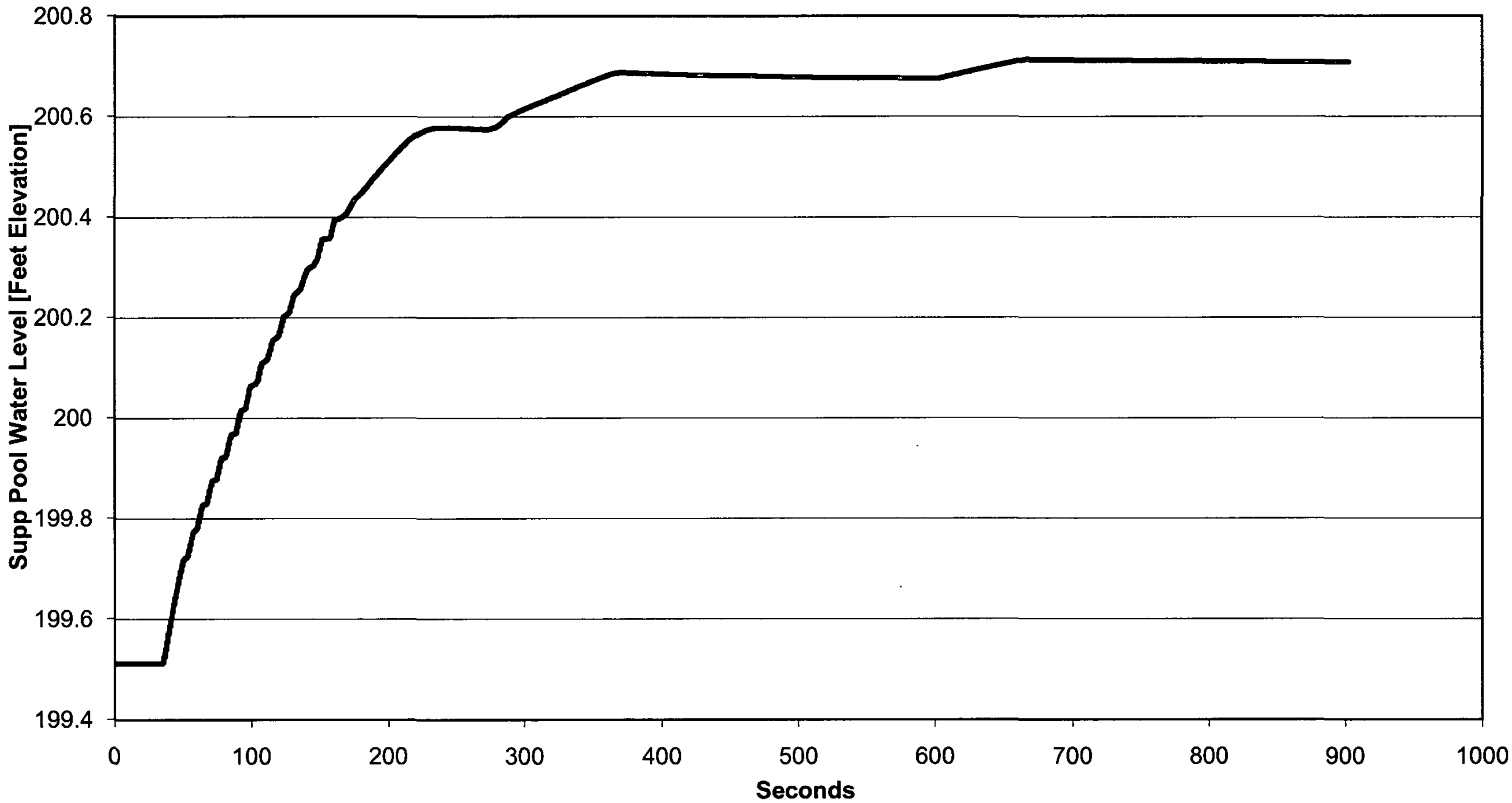


Figure 28
Transient Test EPU Turbine Trip ATWS MELLLA
RPV Dome Pressure (rrpdome)

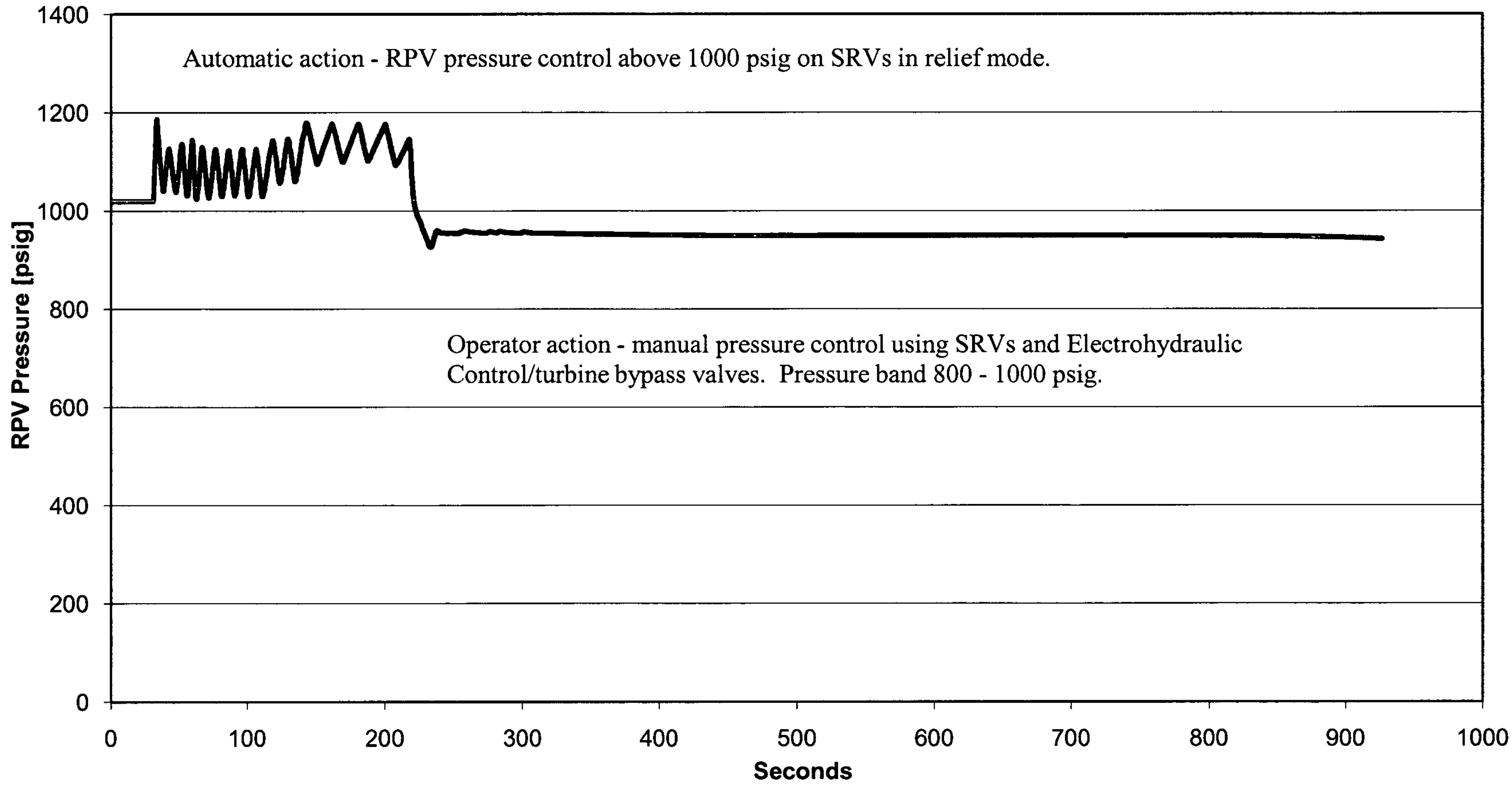


Figure 29
Transient Test EPU Turbine Trip ATWS MELLLA
Neutron Flux (nmapmfx_z)

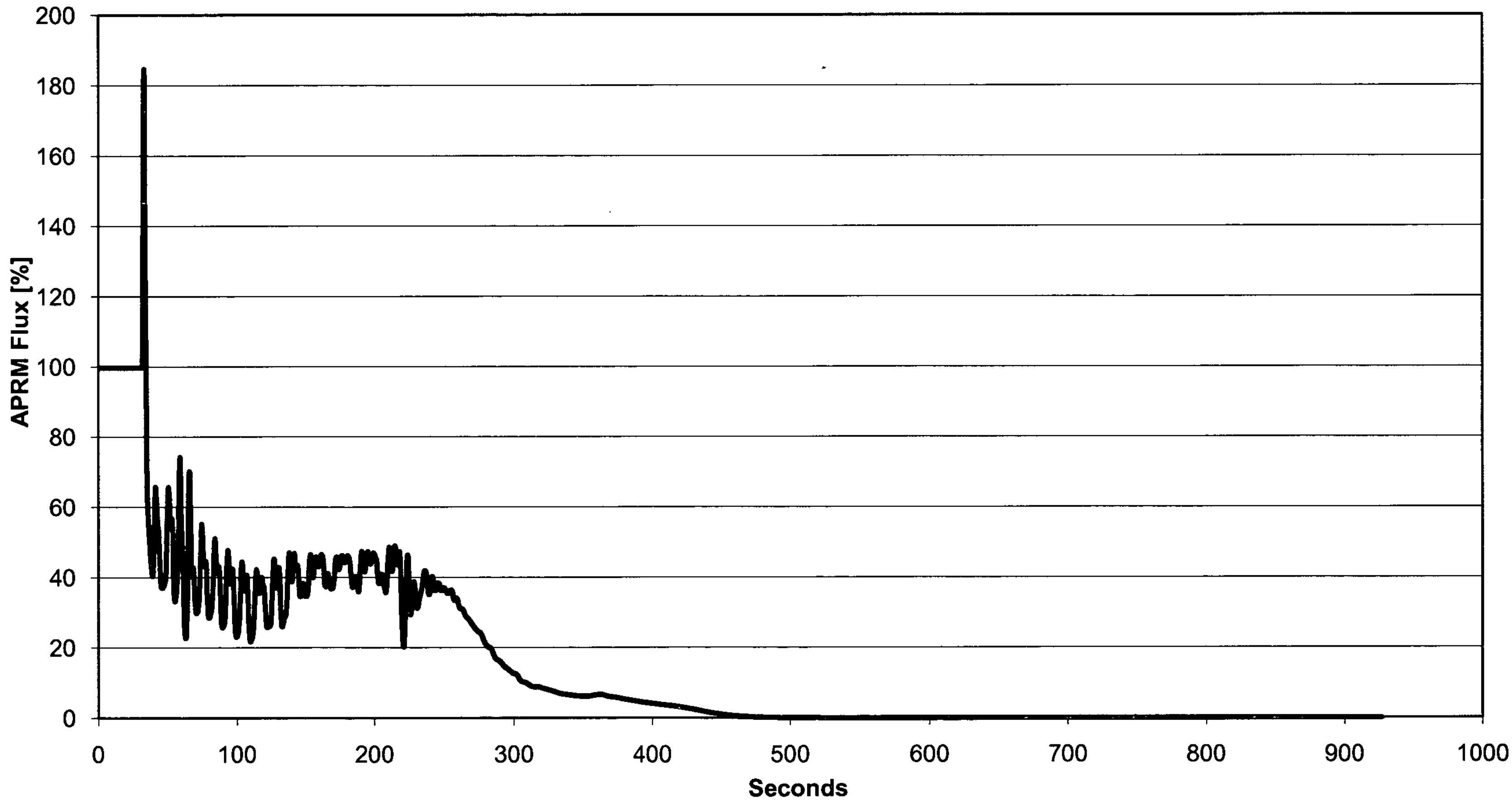


Figure 30
Transient Test EPU Turbine Trip ATWS MELLLA
Narrow Range RPV Level (fwsla101)

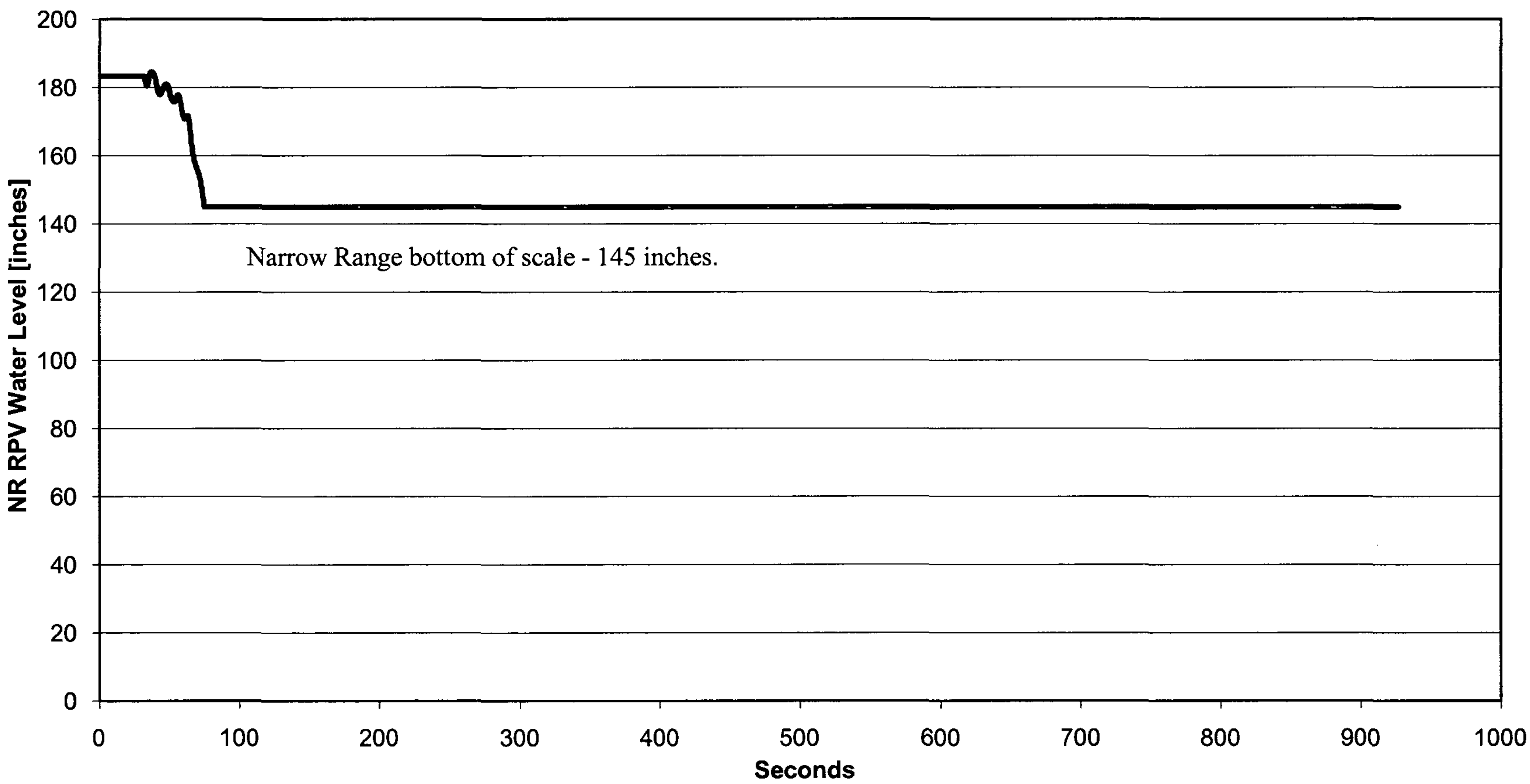


Figure 31
Transient Test EPU Turbine Trip ATWS MELLLA
Wide Range RPV Level (rrlwrn1420)

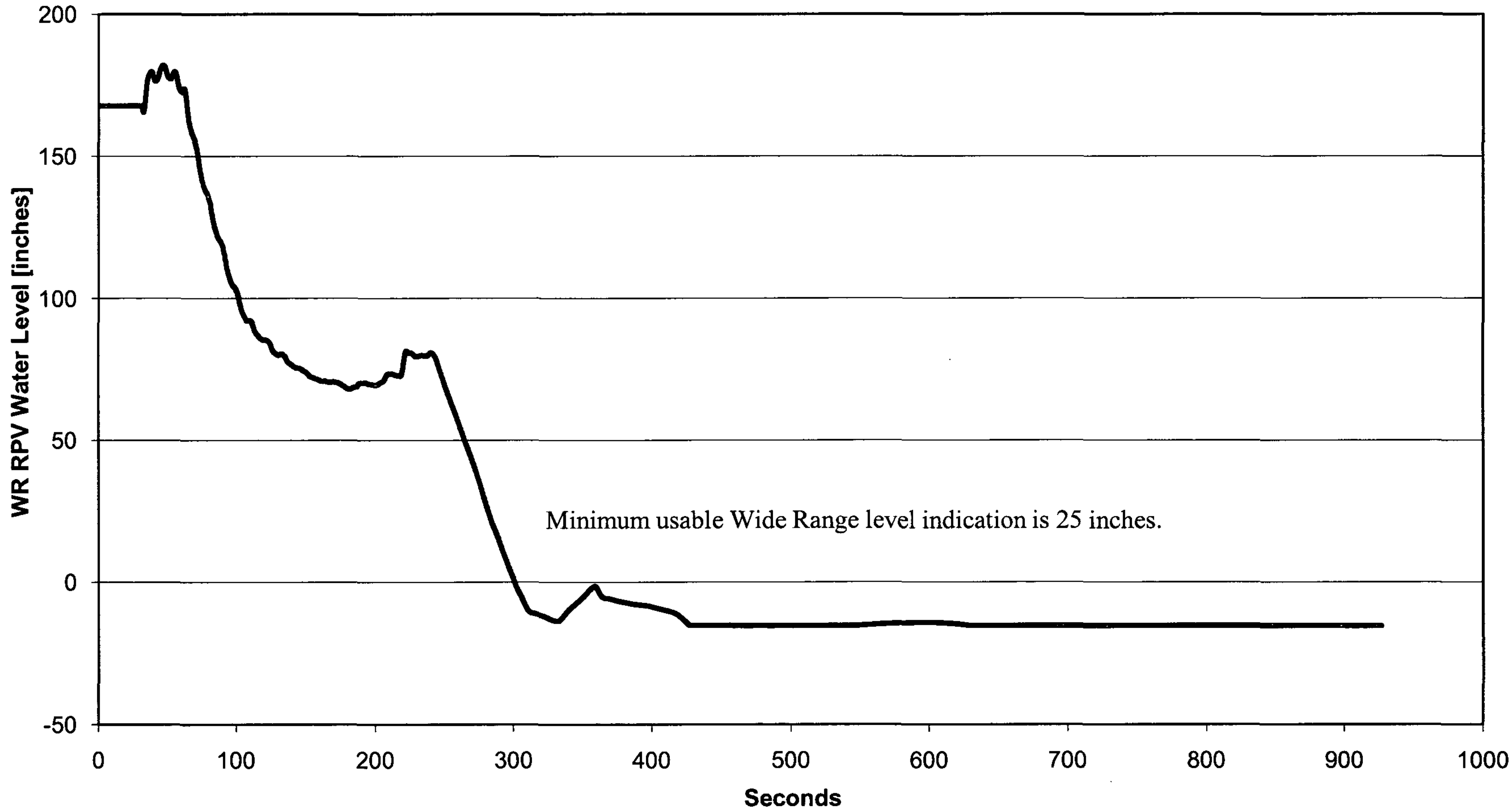


Figure 32
Transient Test EPU Turbine Trip ATWS MELLLA
Feedwater Flow (fwfwtot_z)

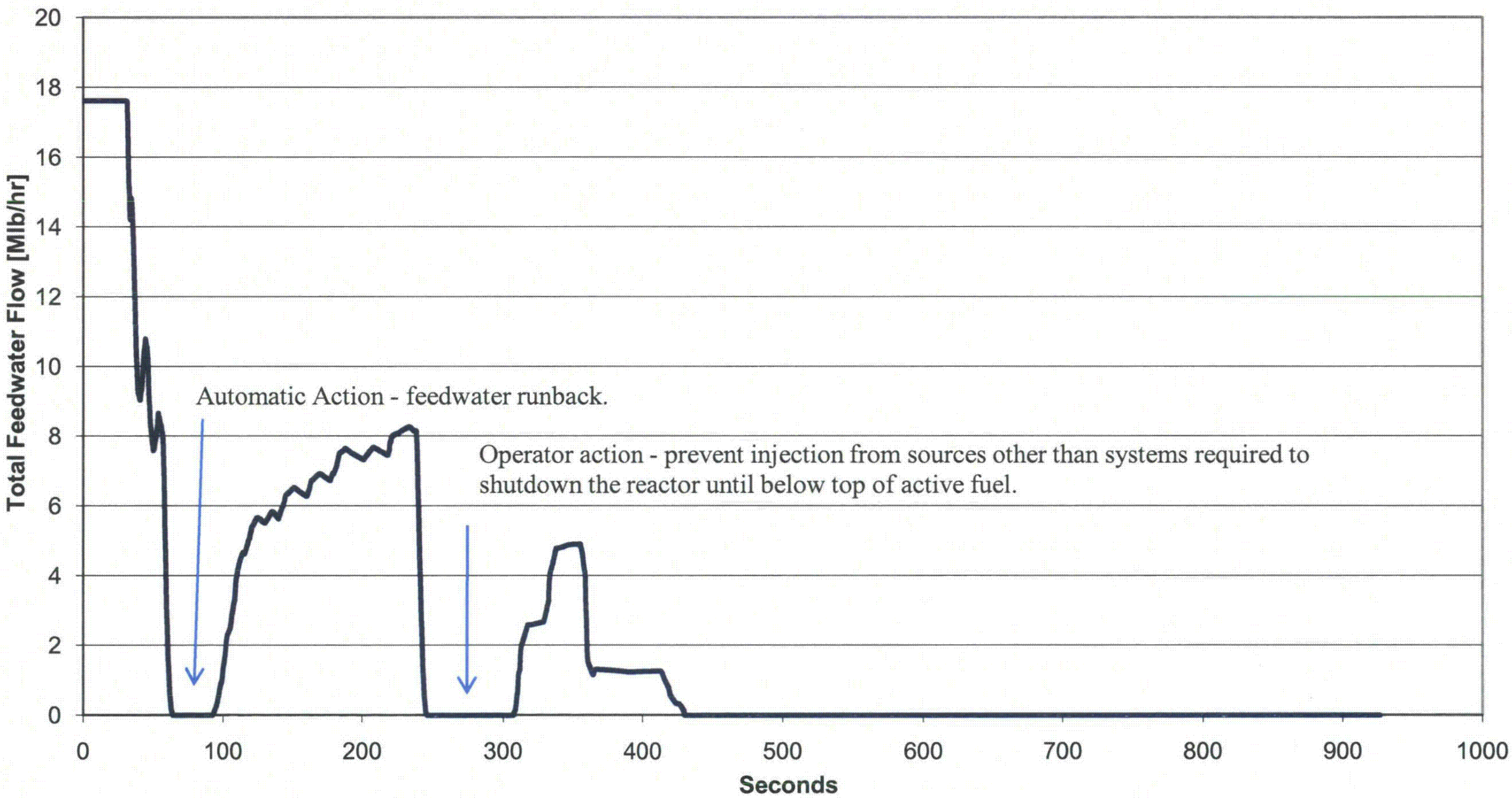


Figure 33
Transient Test EPU Turbine Trip ATWS MELLLA
Main Steam Flow (msfmslt_z)

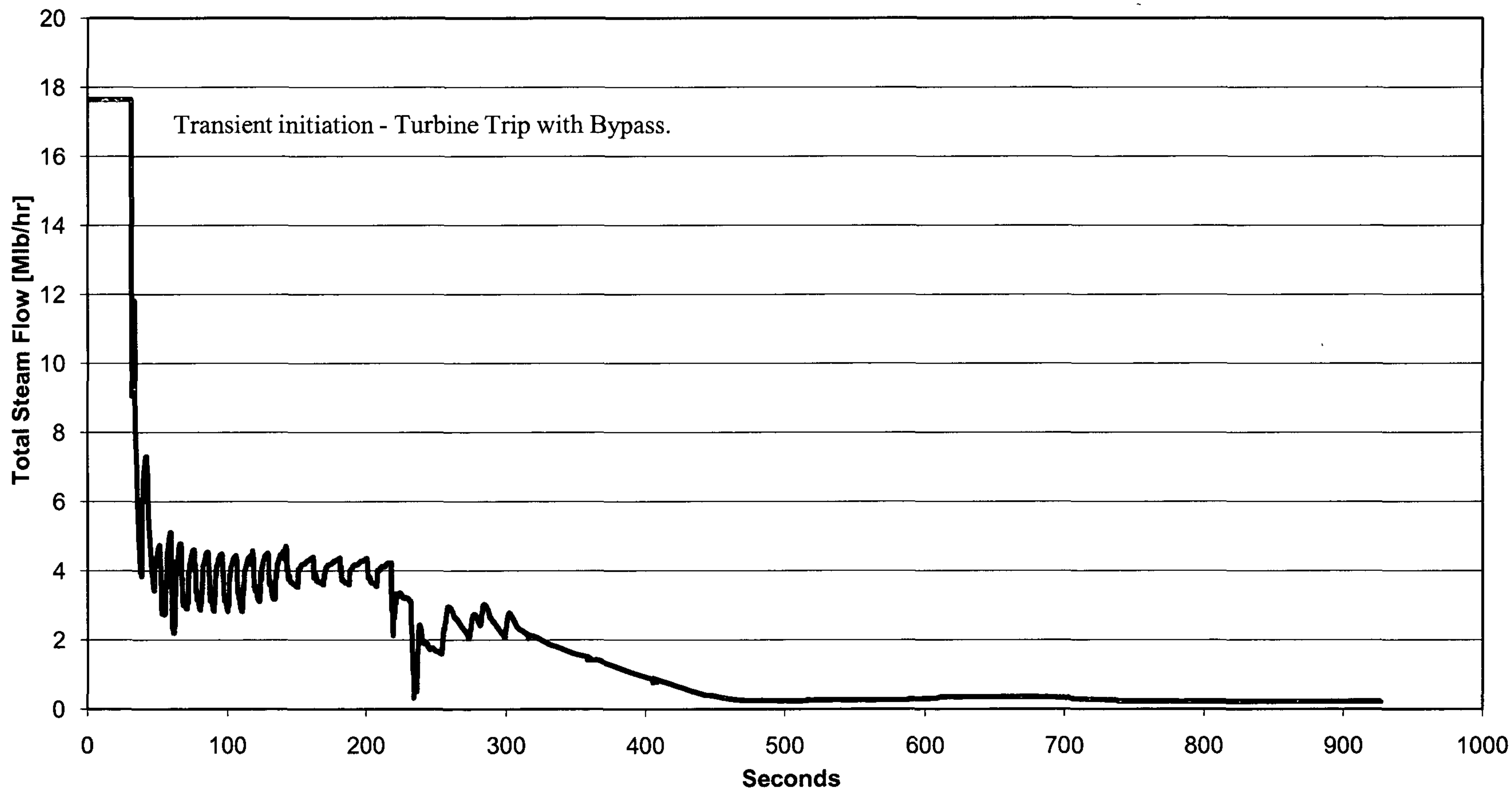


Figure 34
Transient Test EPU Turbine Trip ATWS MELLLA
Total Core Flow (rrffcr_z)

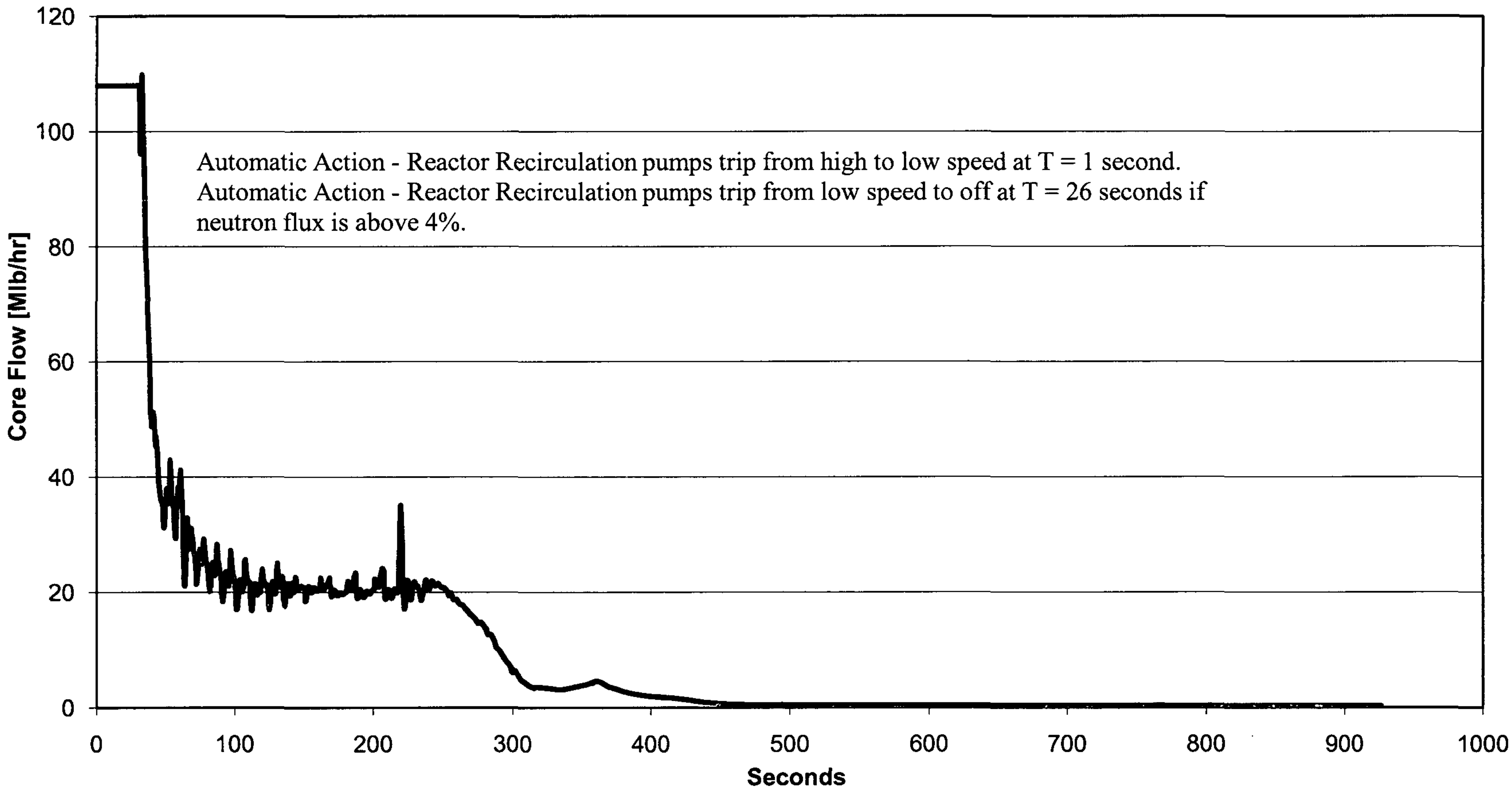


Figure 35
Transient Test EPU Turbine Trip ATWS MELLLA
Final Feedwater Temperature (fwtrxt)

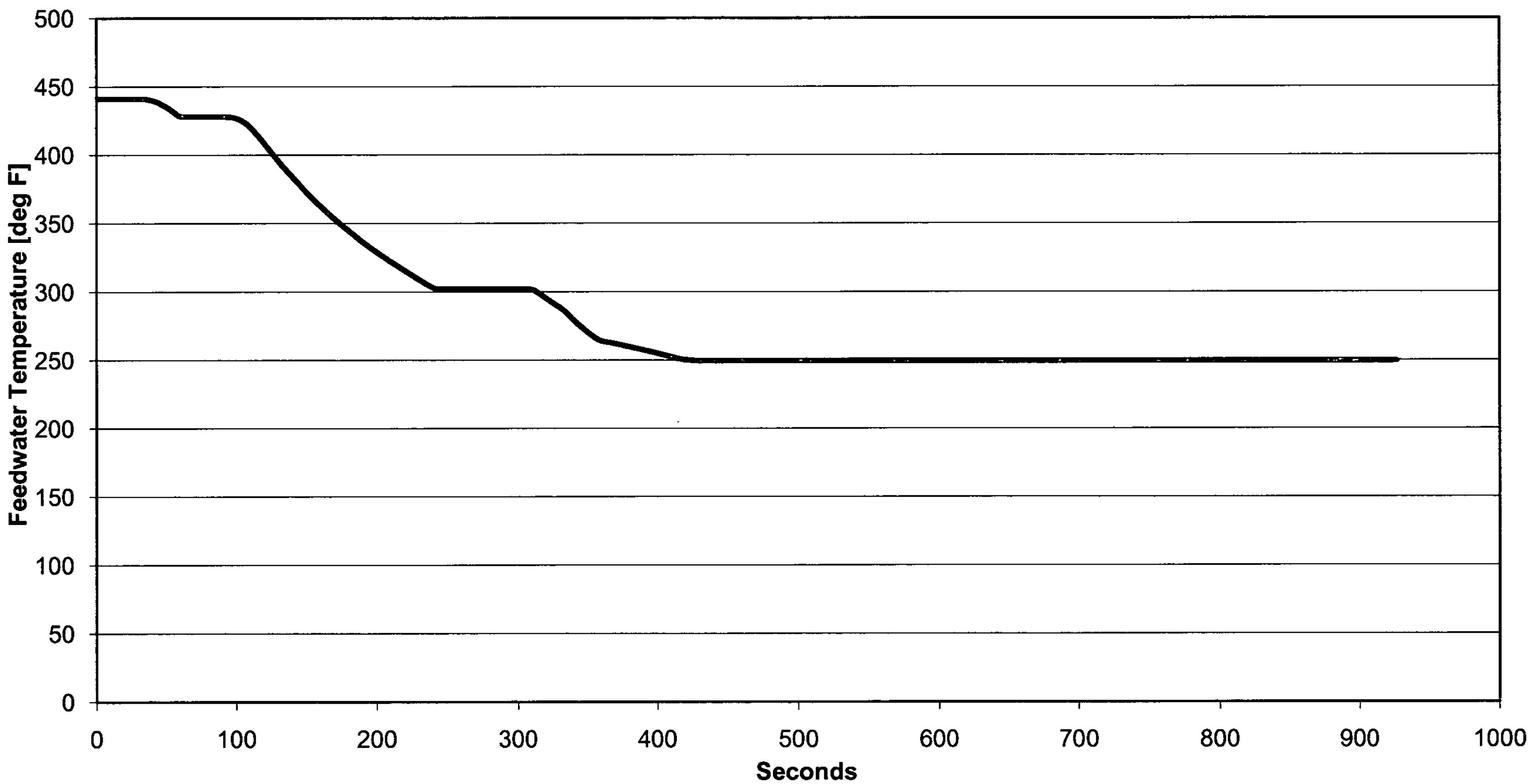


Figure 36
Transient Test EPU Turbine Trip ATWS MELLLA
Main Condenser Vacuum (mxvacb)

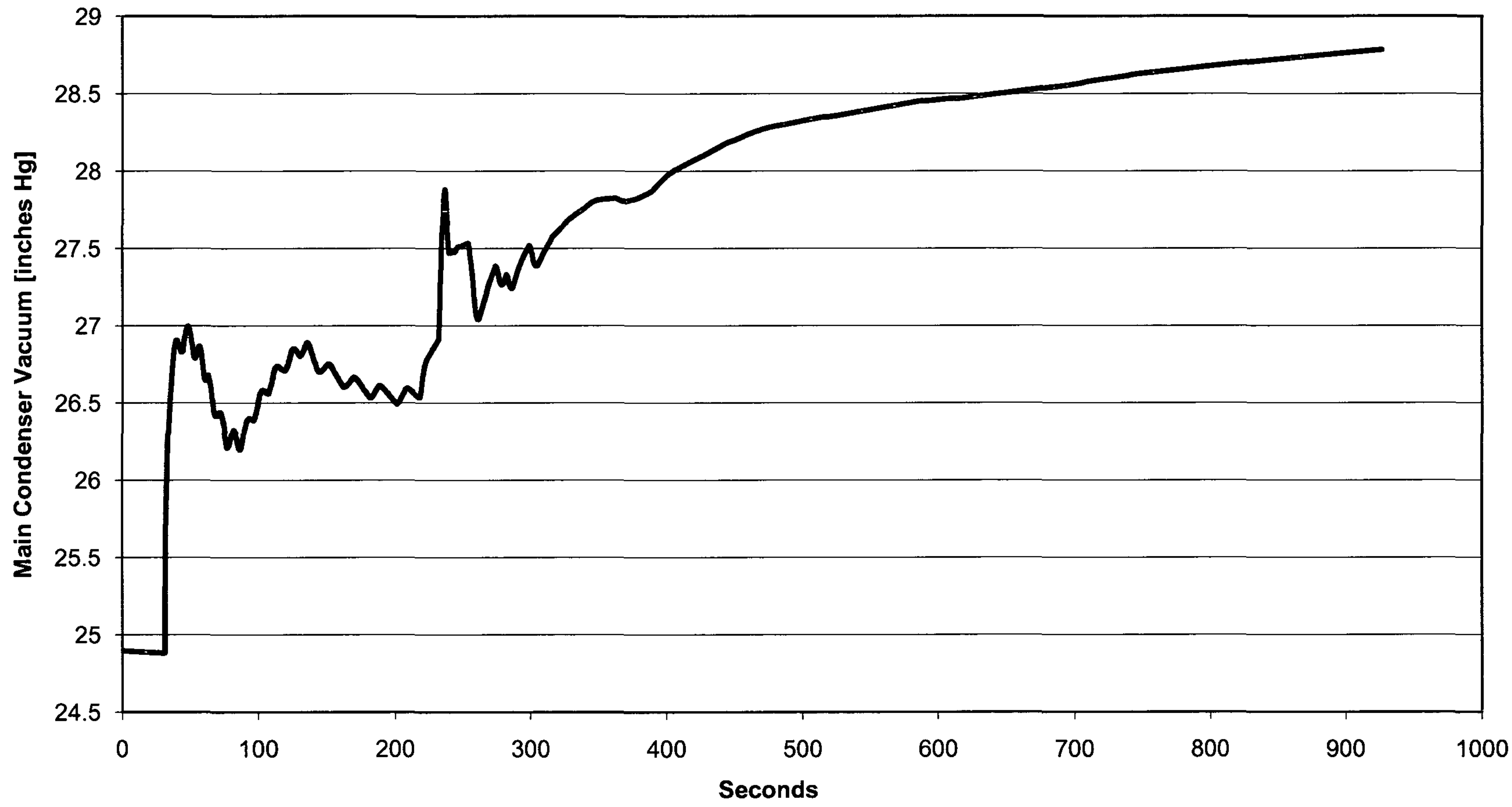


Figure 37
Transient Test EPU Turbine Trip ATWS MELLLA
Turbine Bypass Valve Position (tcvbpvav)

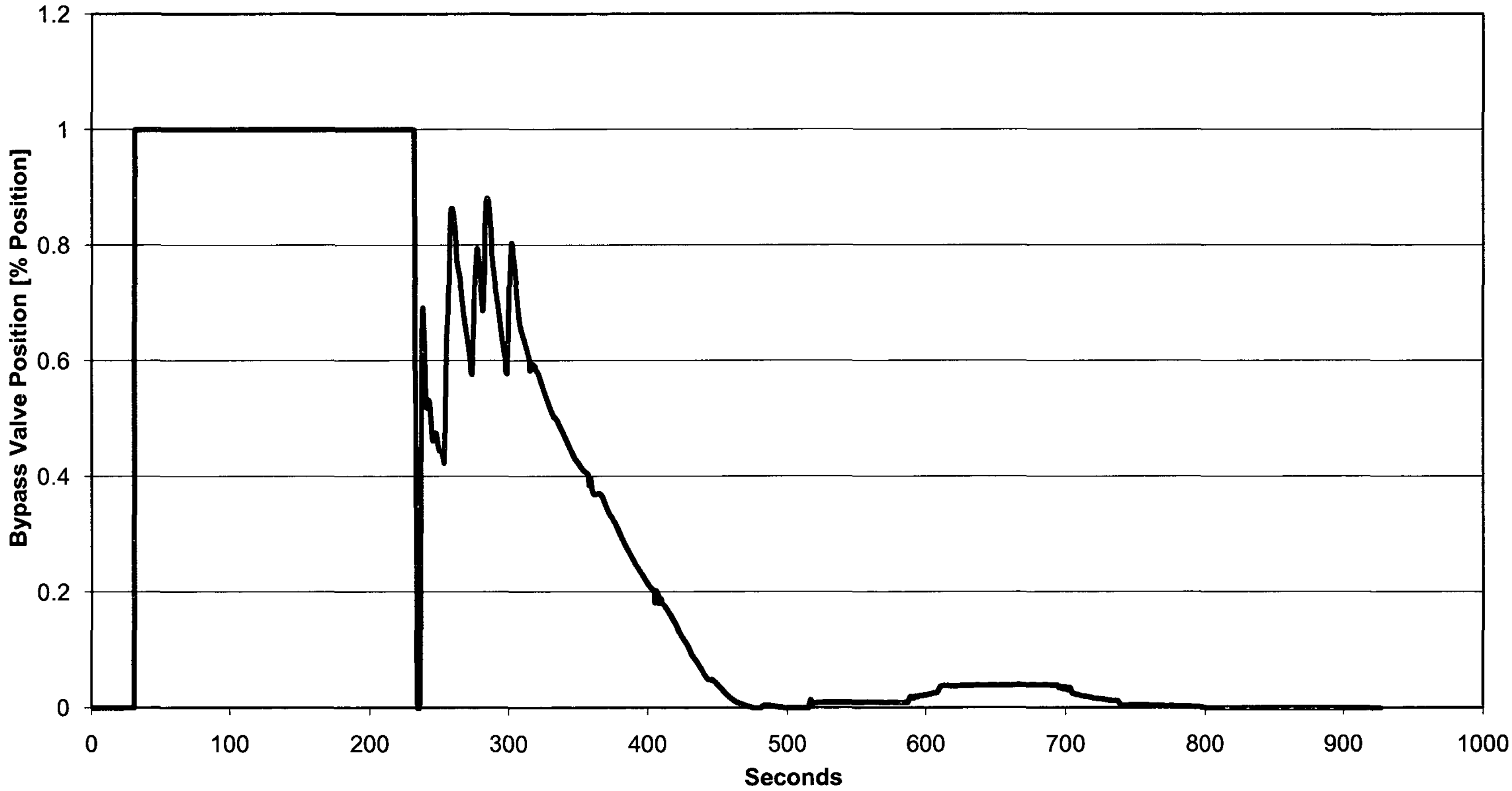


Figure 38
Transient Test EPU Turbine Trip ATWS MELLLA
Turbine Control Valve Position (msvtmcv)

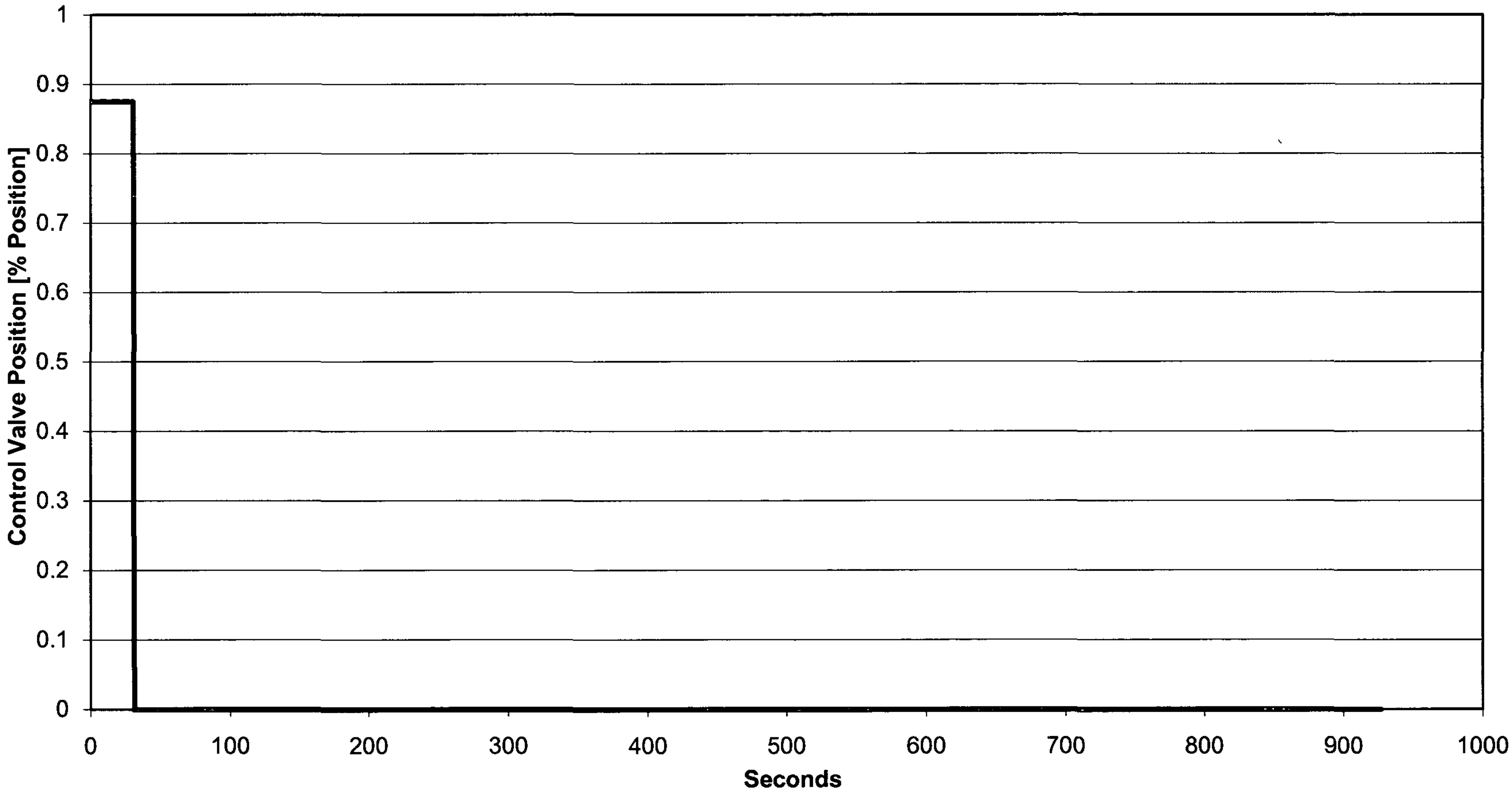


Figure 39
Transient Test EPU Turbine Trip ATWS MELLLA
Fuel Zone RPV Level (ZAR2R610_Z)

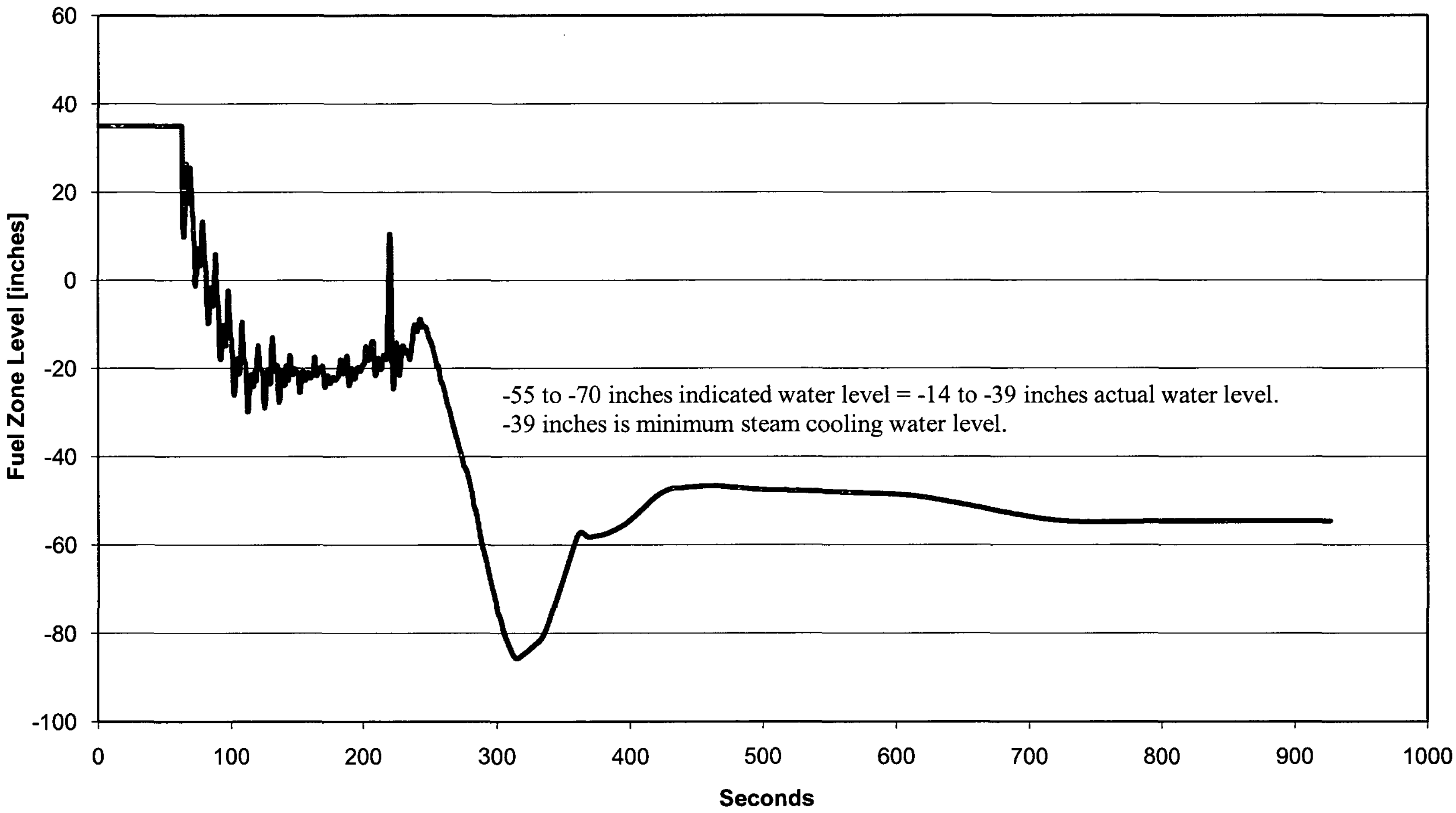


Figure 40
Transient Test EPU Turbine Trip ATWS MELLLA
Drywell Pressure (PCPDWCMS)

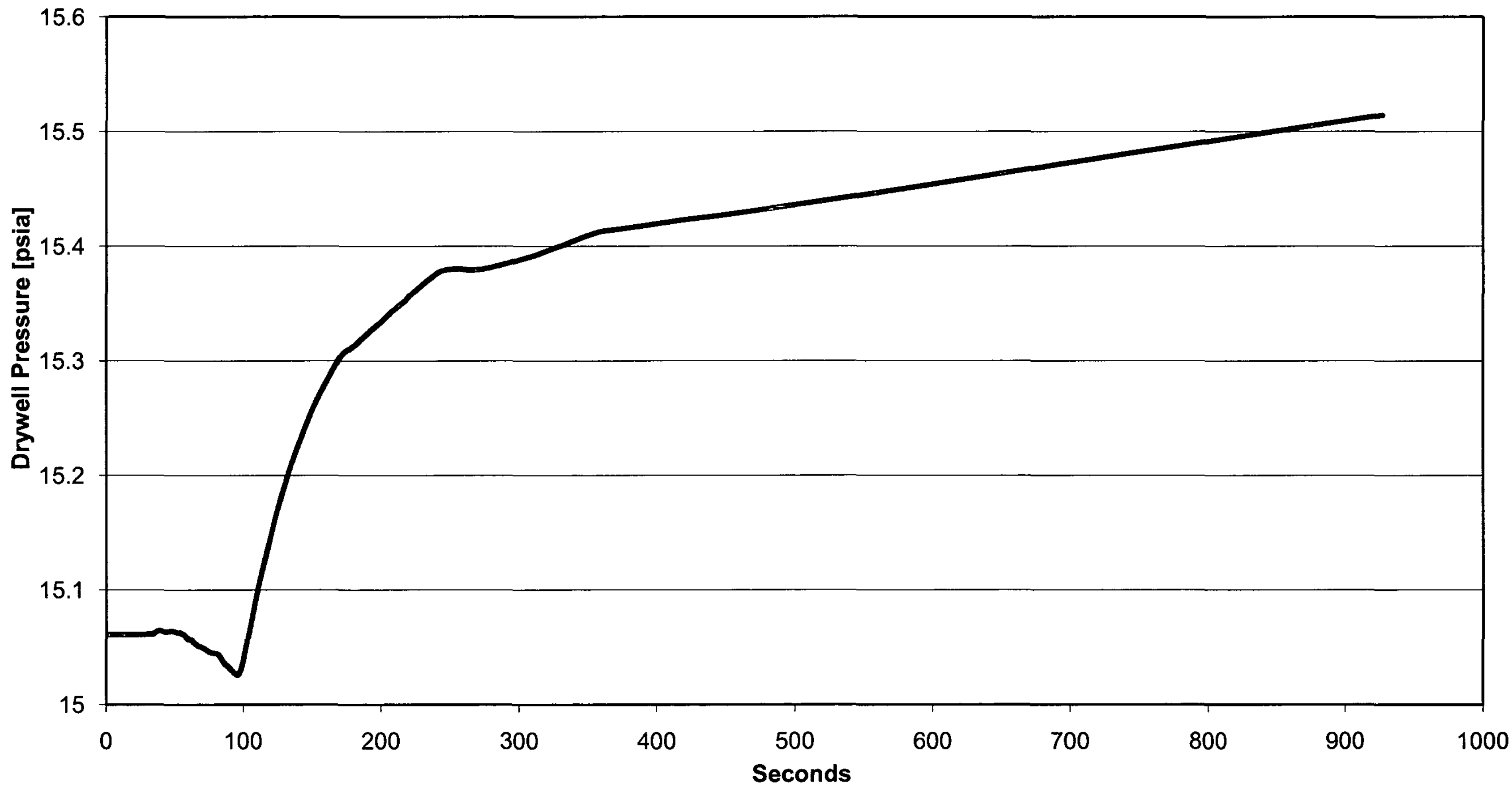


Figure 41
Transient Test EPU Turbine Trip ATWS MELLLA
Suppression Chamber Pressure (PCPCHMB)

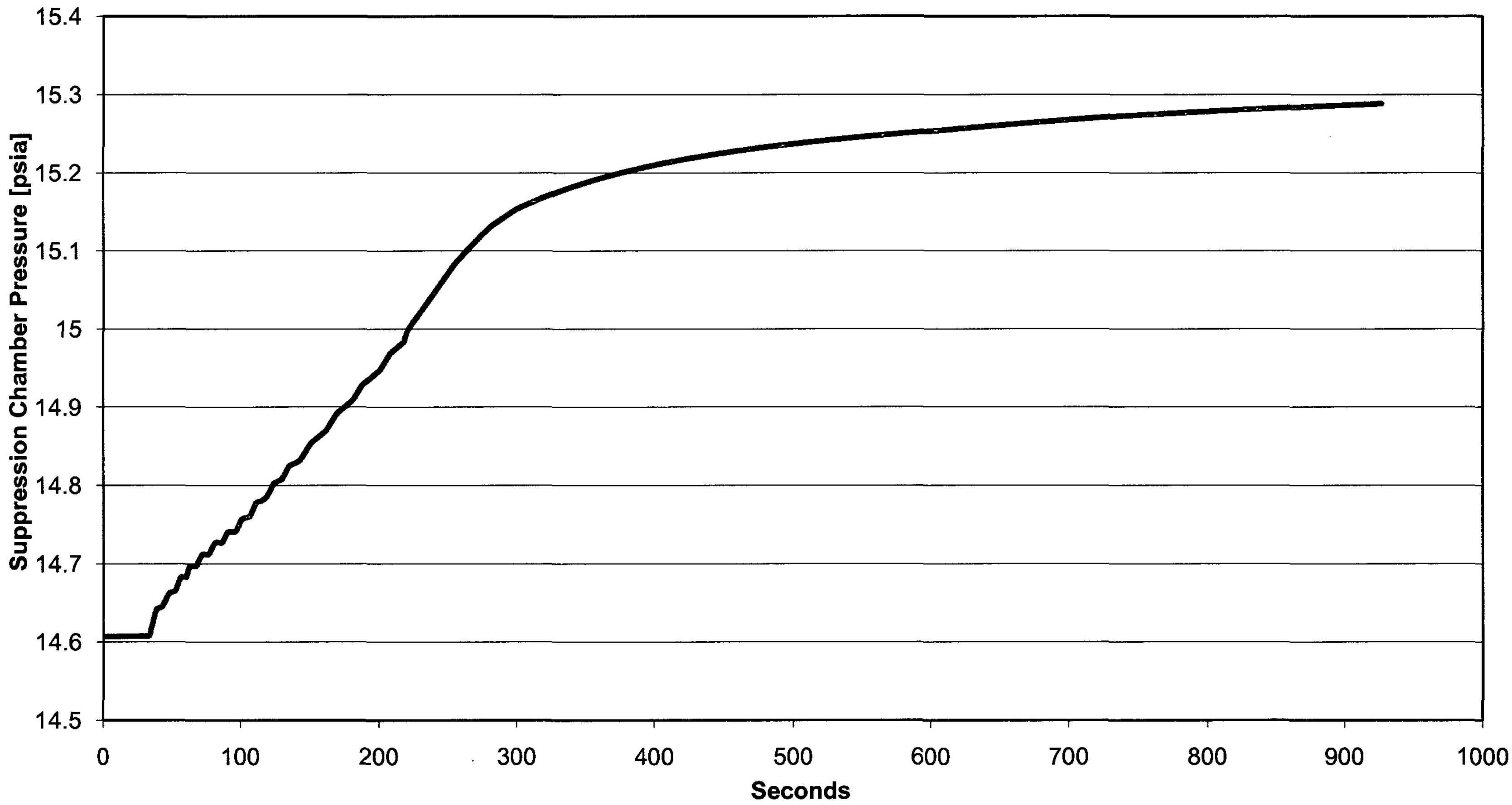


Figure 42
Transient Test EPU Turbine Trip ATWS MELLLA
Drywell Temperature (PCTDRYWL)

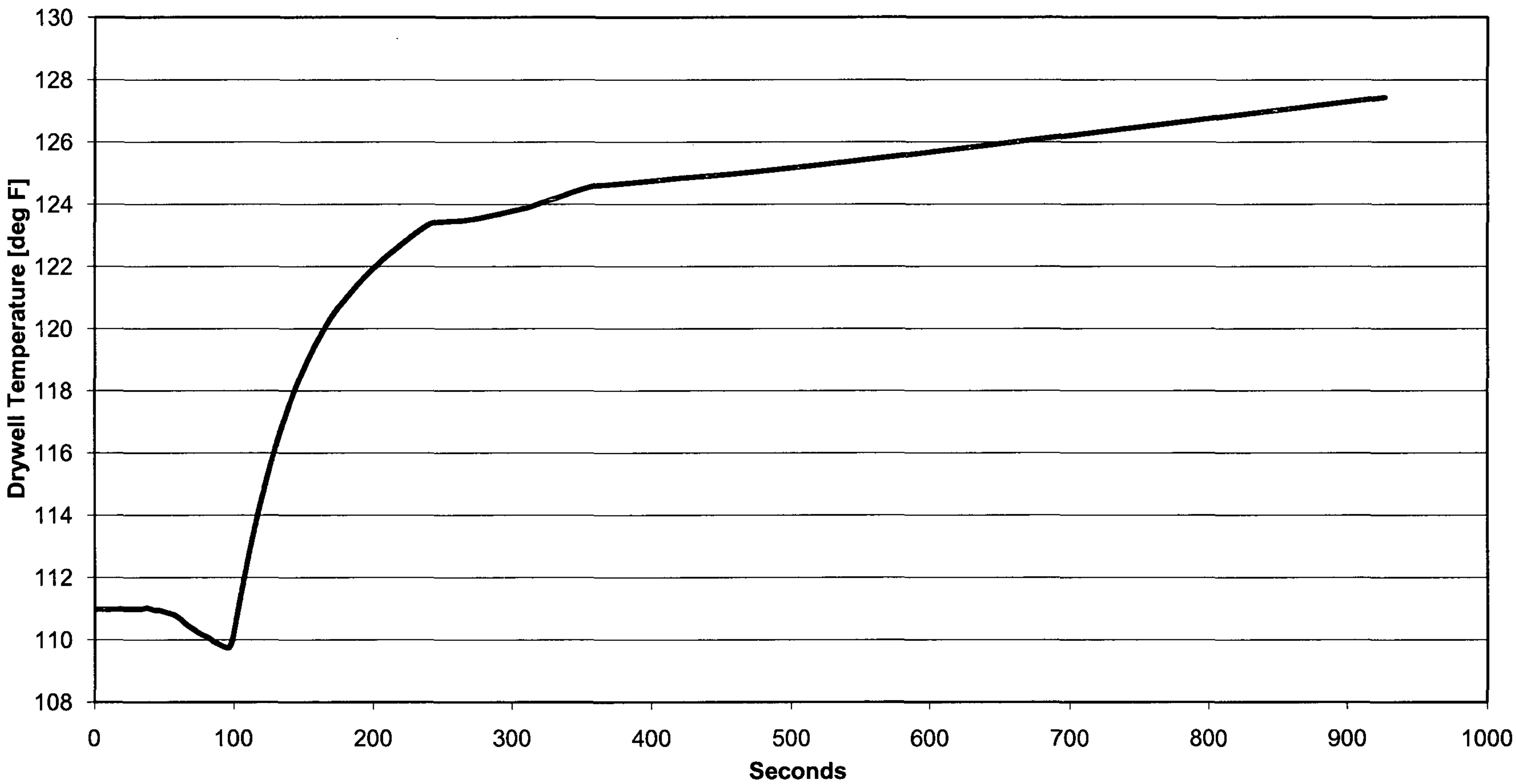


Figure 43
Transient Test EPU Turbine Trip ATWS MELLLA
Suppression Chamber Air Temperature (PCTSPAIR)

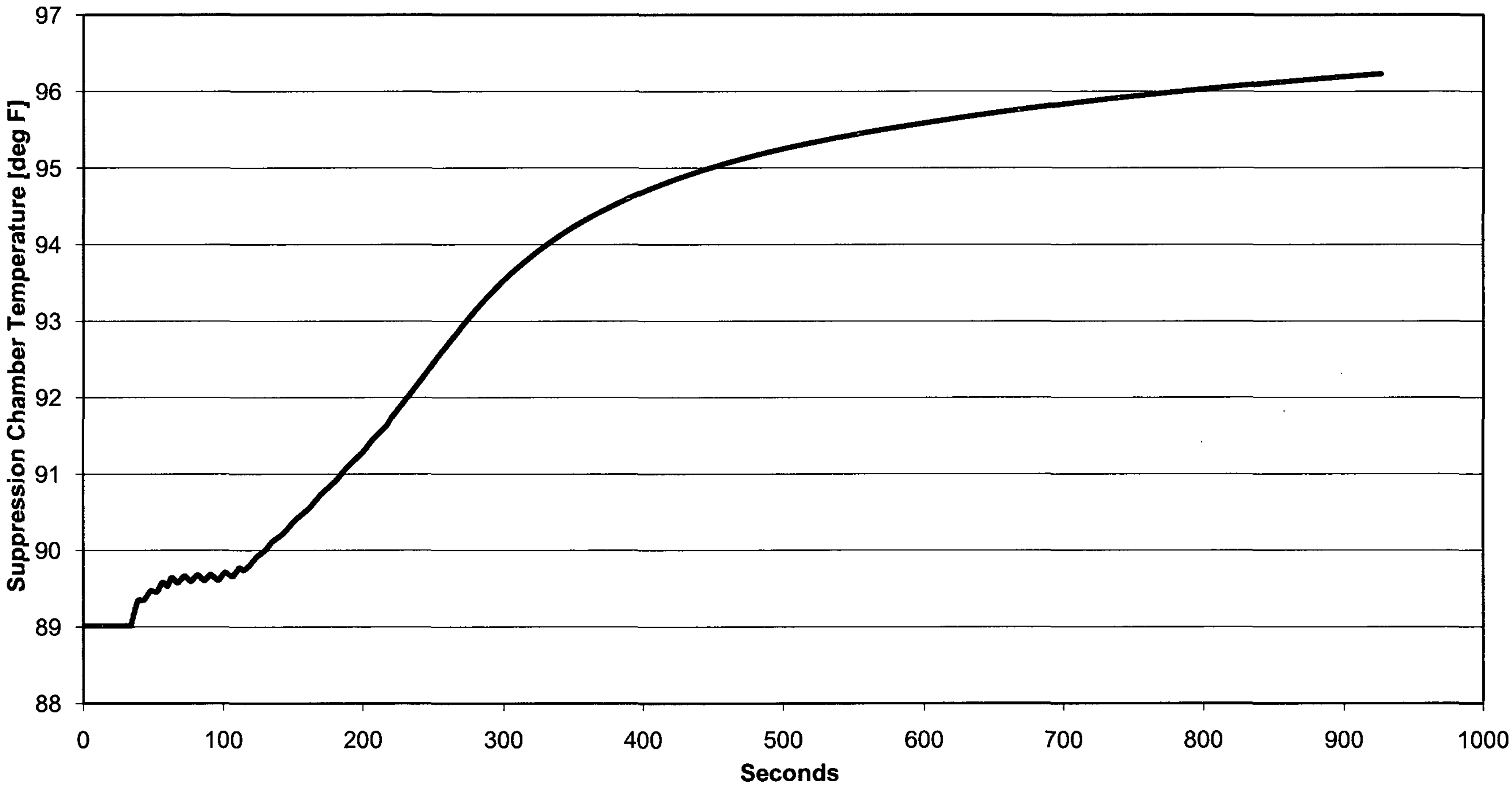


Figure 44
Transient Test EPU Turbine Trip ATWS MELLLA
Suppression Pool Temperature (PCTSP)

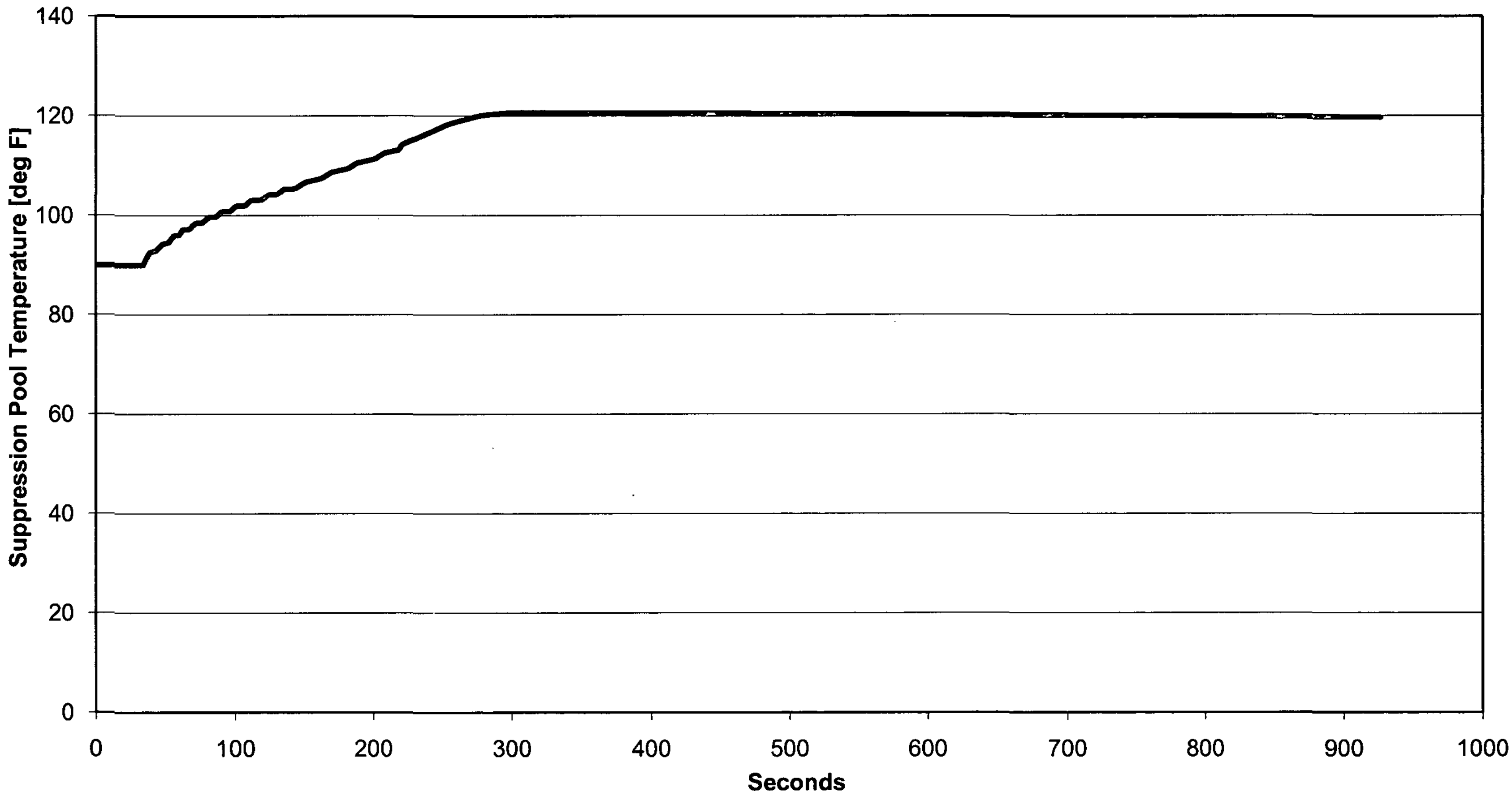


Figure 45
Transient Test EPU Turbine Trip ATWS MELLLA
Boron Injection Flow Rate (SLFTOTALSYSTEM)

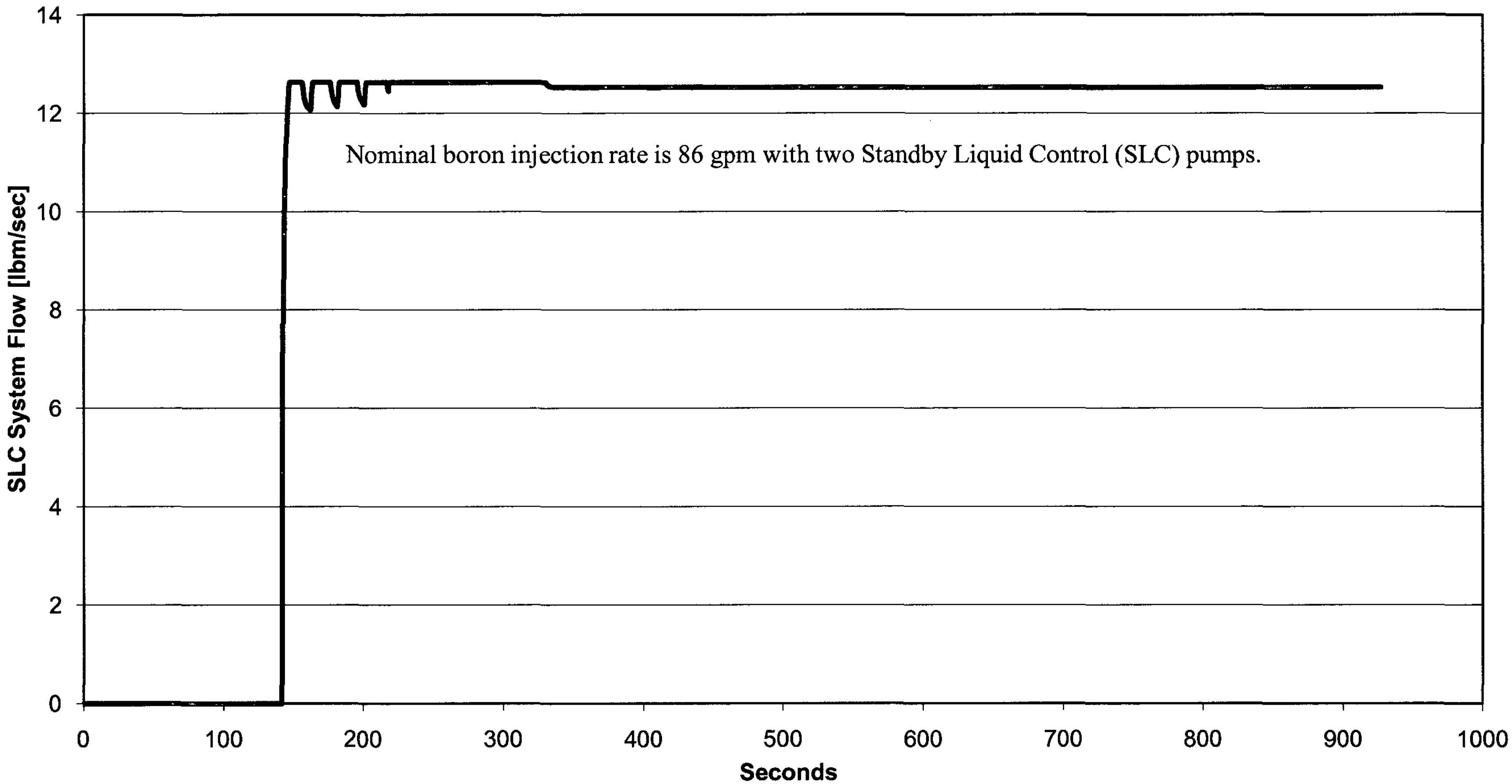


Figure 46
Transient Test EPU Turbine Trip ATWS MELLLA
RPV Boron Concentration (RRCBORON)

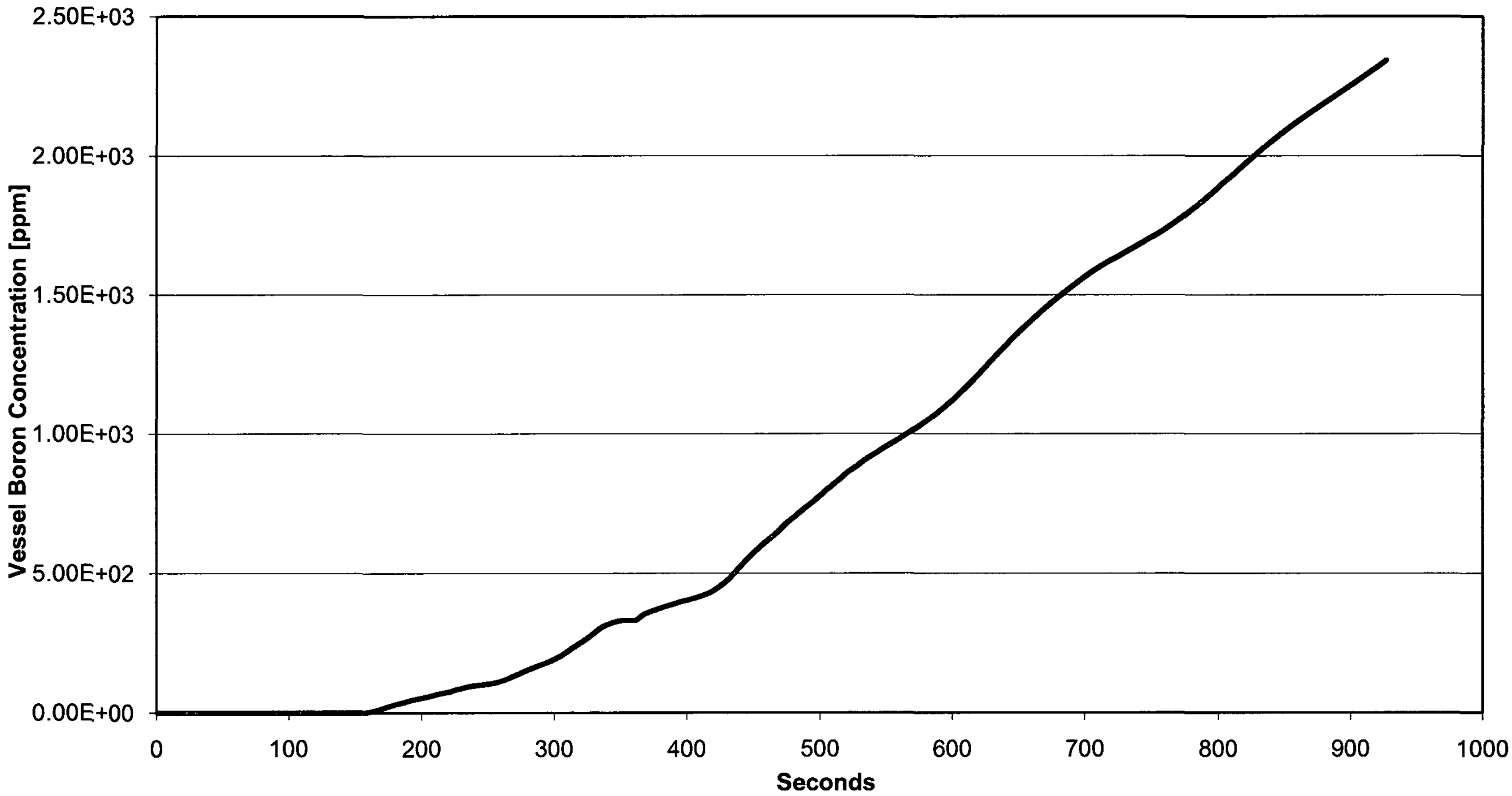


Figure 47
Transient Test EPU Turbine Trip ATWS MELLLA
Core Reactivity (CRXREAC)

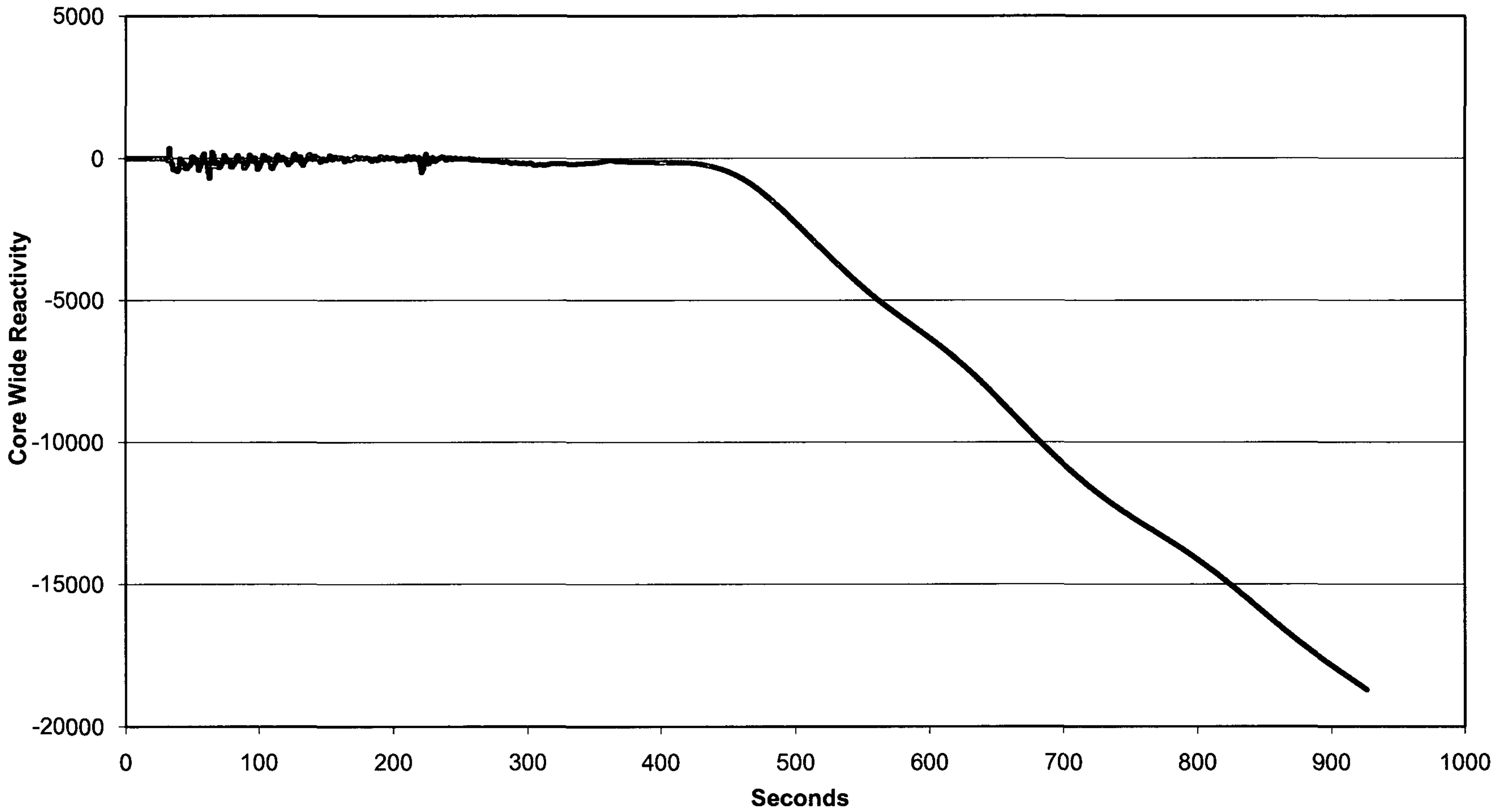


Figure 48
Transient Test EPU Turbine Trip ATWS MELLLA
HCTL Limit (SPDSA118)

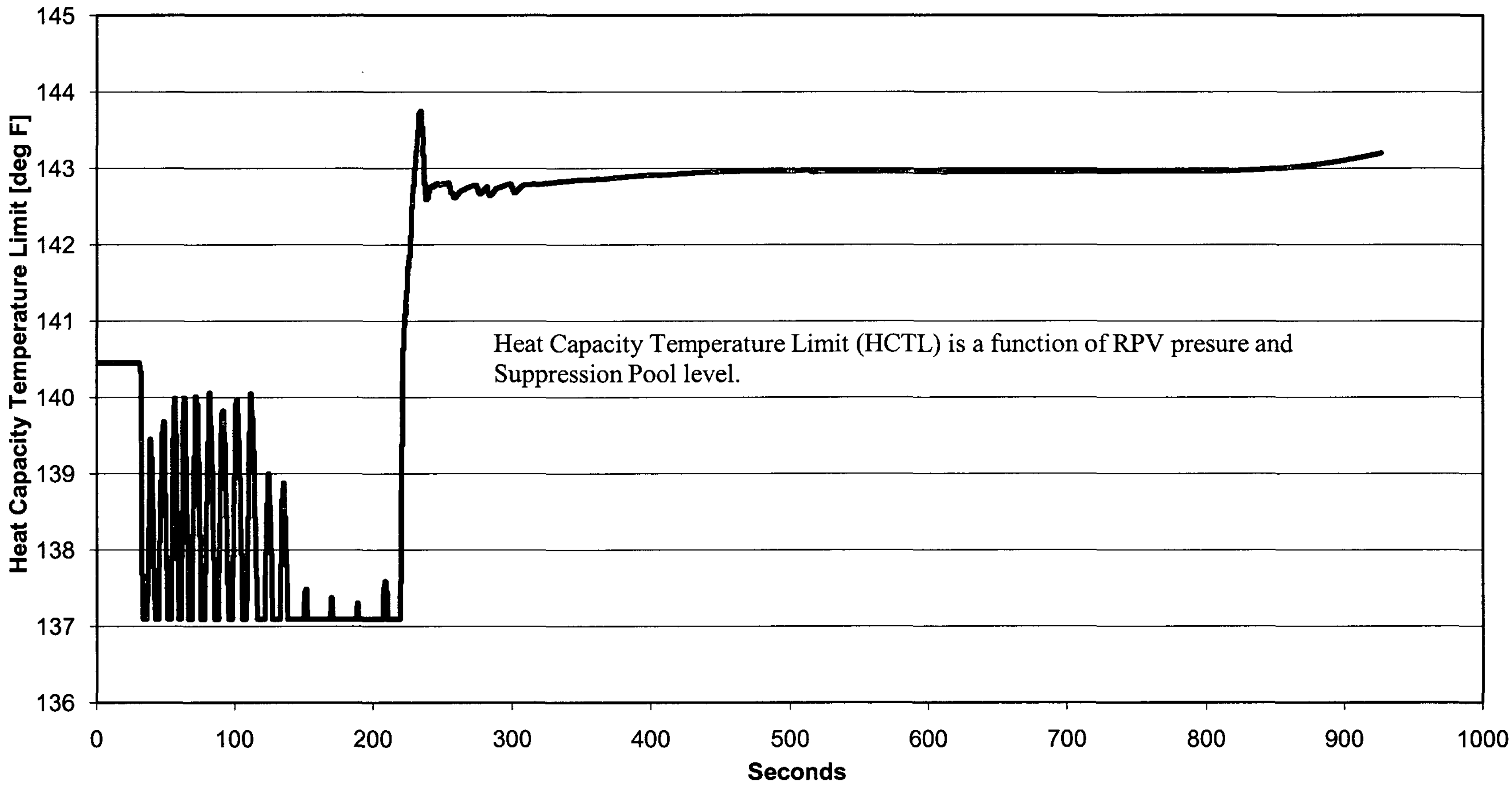


Figure 49
Transient Test EPU Turbine Trip ATWS MELLLA
HCTL Margin SPDSA119

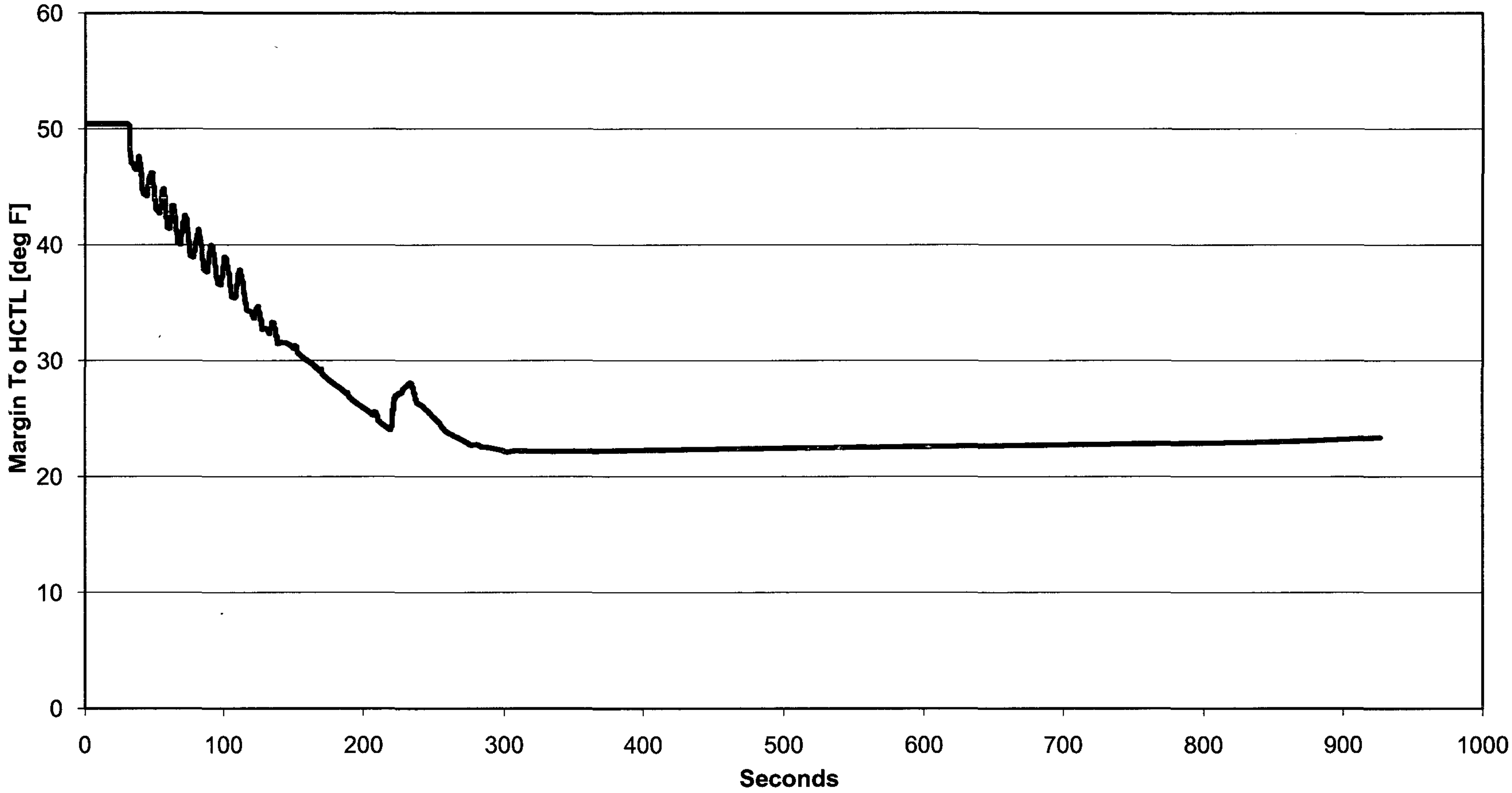


Figure 50
Transient Test EPU Turbine Trip ATWS MELLLA
RHR "A" Pump Flow (RHFPMP1A)

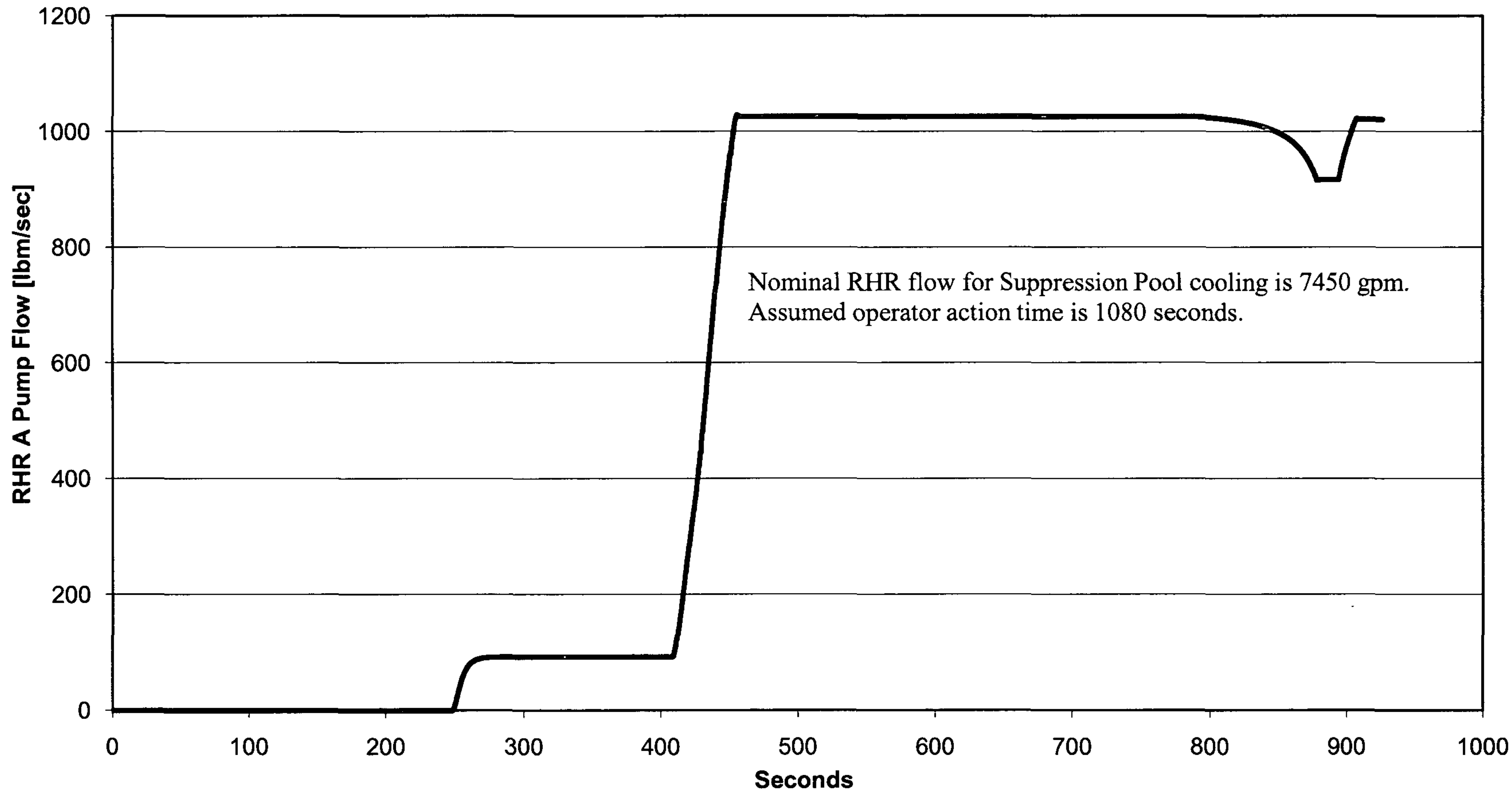


Figure 51
Transient Test EPU Turbine Trip ATWS MELLLA
RHR "B" Pump Flow (RHFPMP1B)

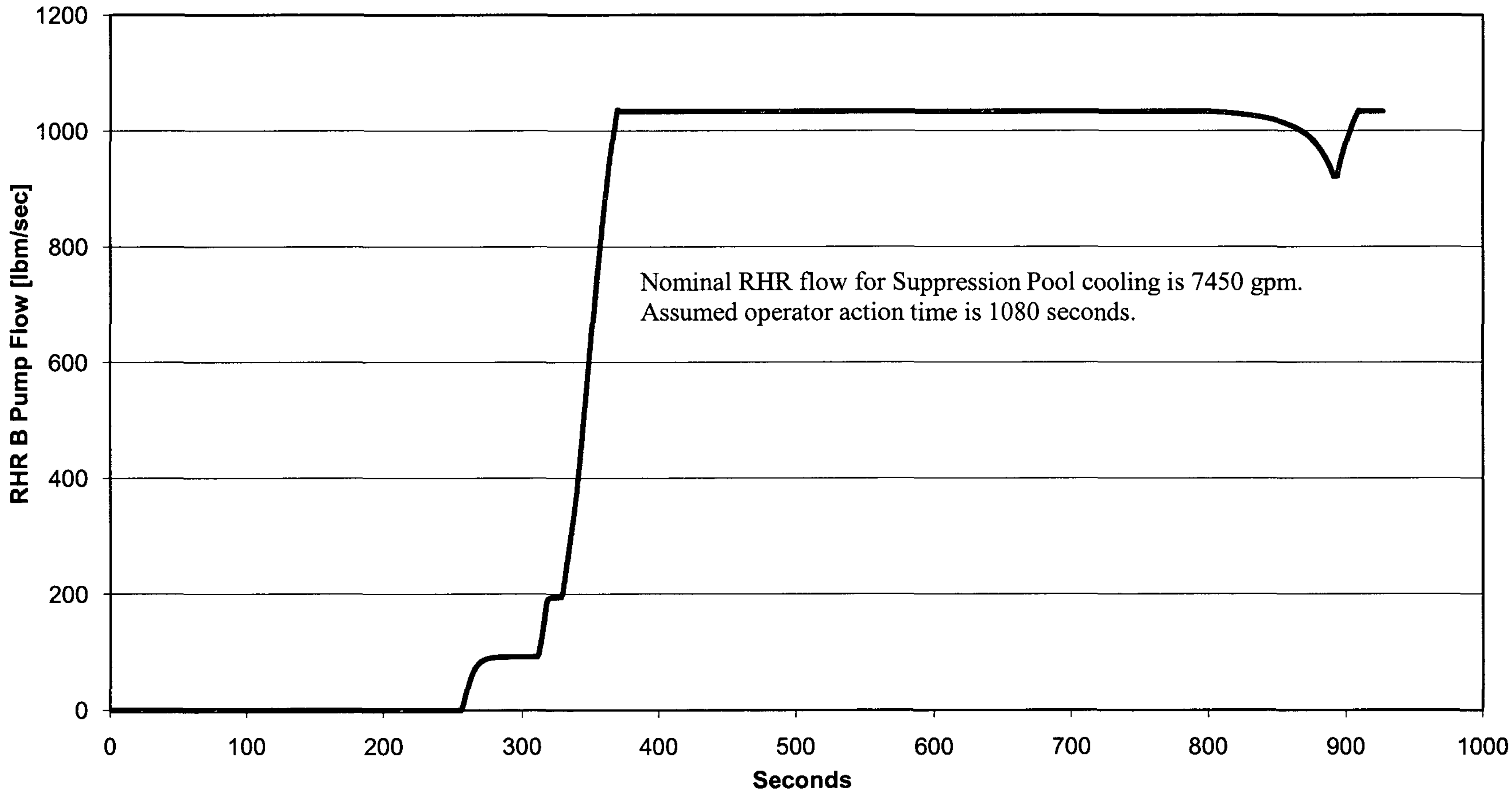


Figure 52
Transient Test EPU Turbine Trip ATWS MELLLA
RHR "C" Pump Flow (RHFPMP1C)

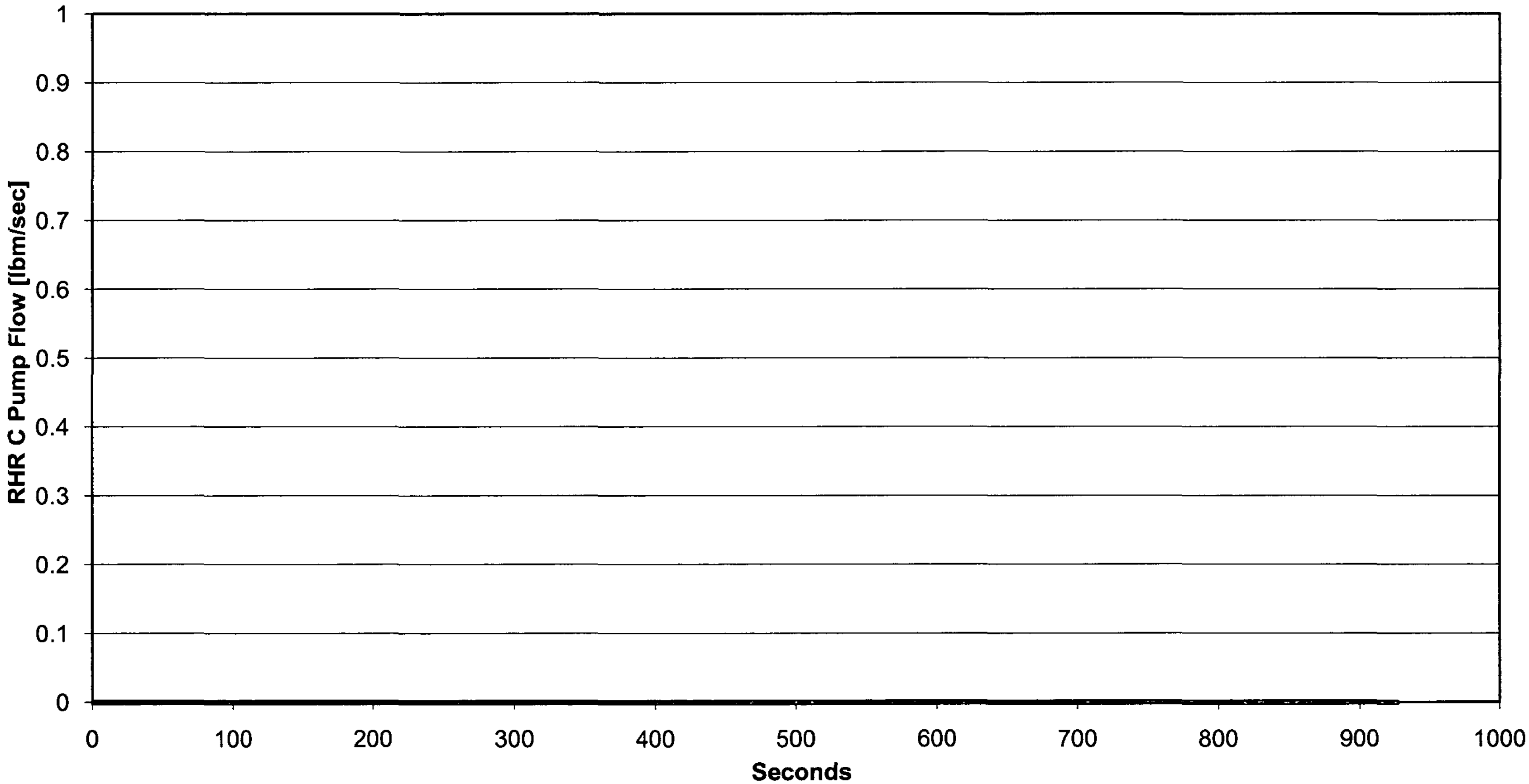


Figure 53
Transient Test EPU Turbine Trip ATWS MELLLA
Total SRV Flow (MSFSRVWTRSC)

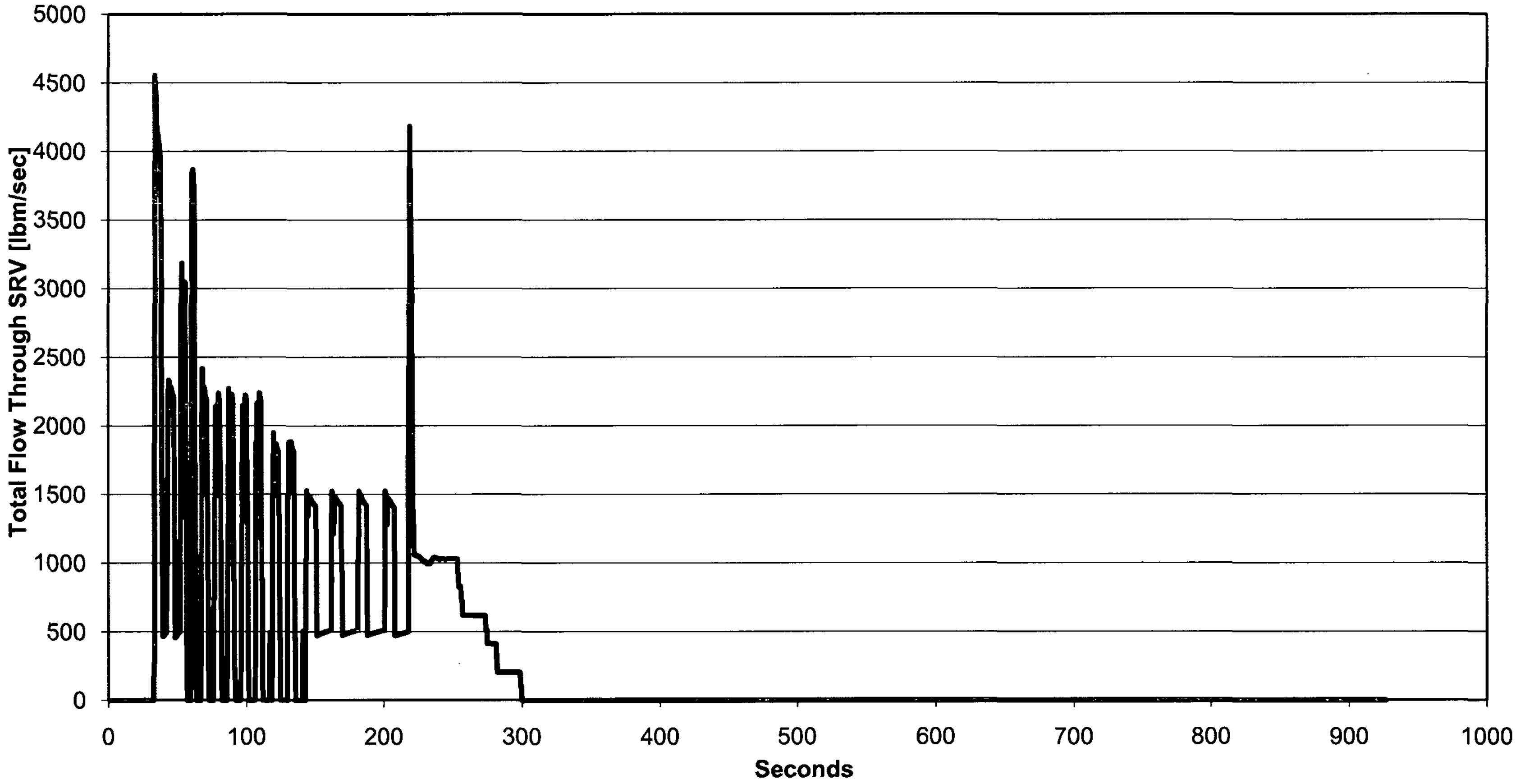
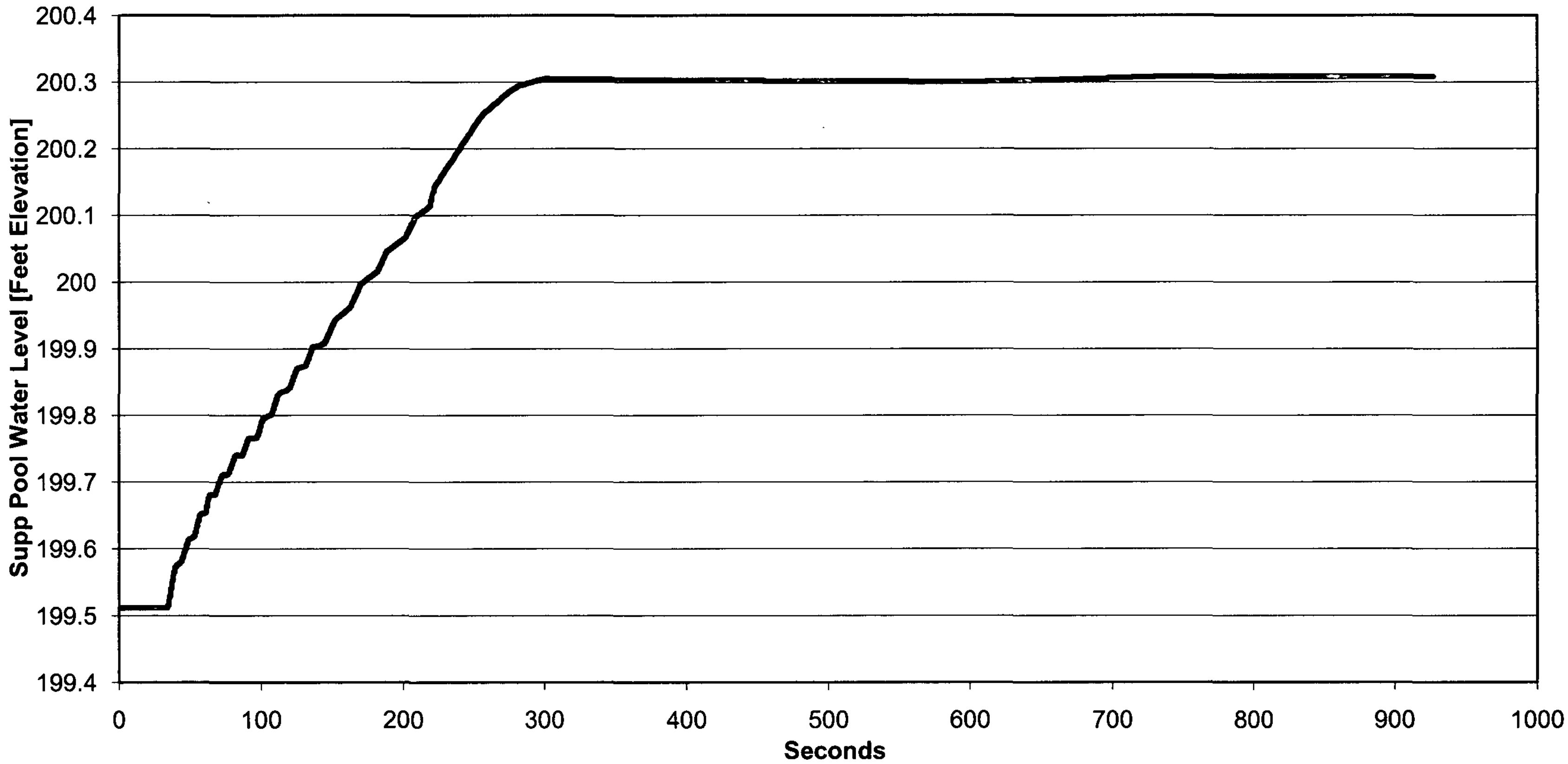


Figure 54
Transient Test EPU Turbine Trip ATWS MELLLA
Suppression Pool Level (SPDSA117)



NMPNS Response to 2) above

Table 1 provides the full name/nomenclature to describe/define each column field.

Table 1
Excel Spreadsheet Nomenclature References

Column Reference	Description/definition
rrpdome	Reactor Pressure Vessel (RPV) Dome Pressure (psig)
nmapmfx_z	Neutron Flux (%)
fwsla101	Narrow Range RPV Level (inches)
rrlwrn1420	Wide Range RPV Level (inches)
fwfwtot_z	Feedwater Flow (Mlbm/hr)
msfmslt_z	Main Steam Flow (Mlbm/hr)
rrffcr_z	Recirculation Flow (Mlbm/hr)
fwtrxt	Final Feedwater Temperature (°F)
mxvacb	Main Condenser Vacuum (inches Hg)
tcvbpvav	Turbine Bypass Valve Position
msvtmcv	Turbine Control Valve Position
ZAR2R610_Z	Fuel Zone RPV Level (inches)
PCPDWCMS	Drywell Pressure (psia)
PCPCHMB	Suppression Chamber Pressure (psia)
PCTDRYWL	Drywell Temperature (°F)
PCTSPAIR	Suppression Chamber Air Temperature (°F)
PCTSP	Suppression Pool Temperature (°F)
SLFTOTALSYSTEM	Boron Injection Flowrate (lbm/sec)
RRCBORON	RPV Boron Concentration (ppm)
CRXREAC	Core Reactivity ($)
SPDSA118	Heat Capacity Temperature Limit (HCTL) (°F)
SPDSA119	HCTL Margin (°F)
RHFPMP1A	Residual Heat Removal (RHR) "A" Pump Flow (lbm/sec)
RHFPMP1B	RHR "B" Pump Flow (lbm/sec)
RHFPMP1C	RHR "C" Pump Flow (lbm/sec)
MSFSRVWTRSC	Total Safety Relief Valve (SRV) flow (lbm/sec)
SPDSA117	Suppression Pool Level (feet)

NMPNS Response to 3) above

Figures 55 and 56 provide overlay plots that show RPV pressure and reactor power versus time for both of the ATWS Simulator exercises.

Figure 55
Transient Test EPU Isolated ATWS MELLLA

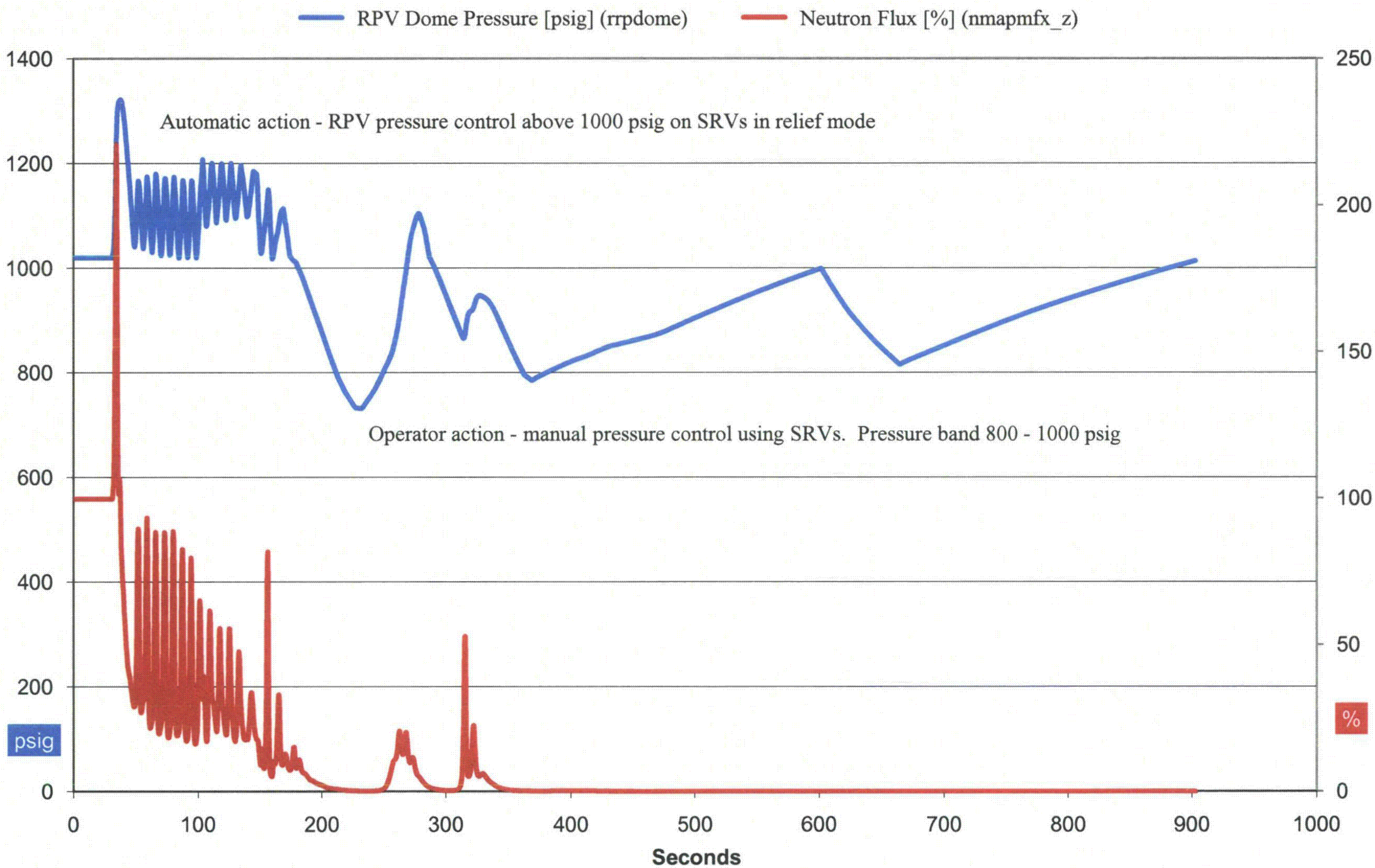
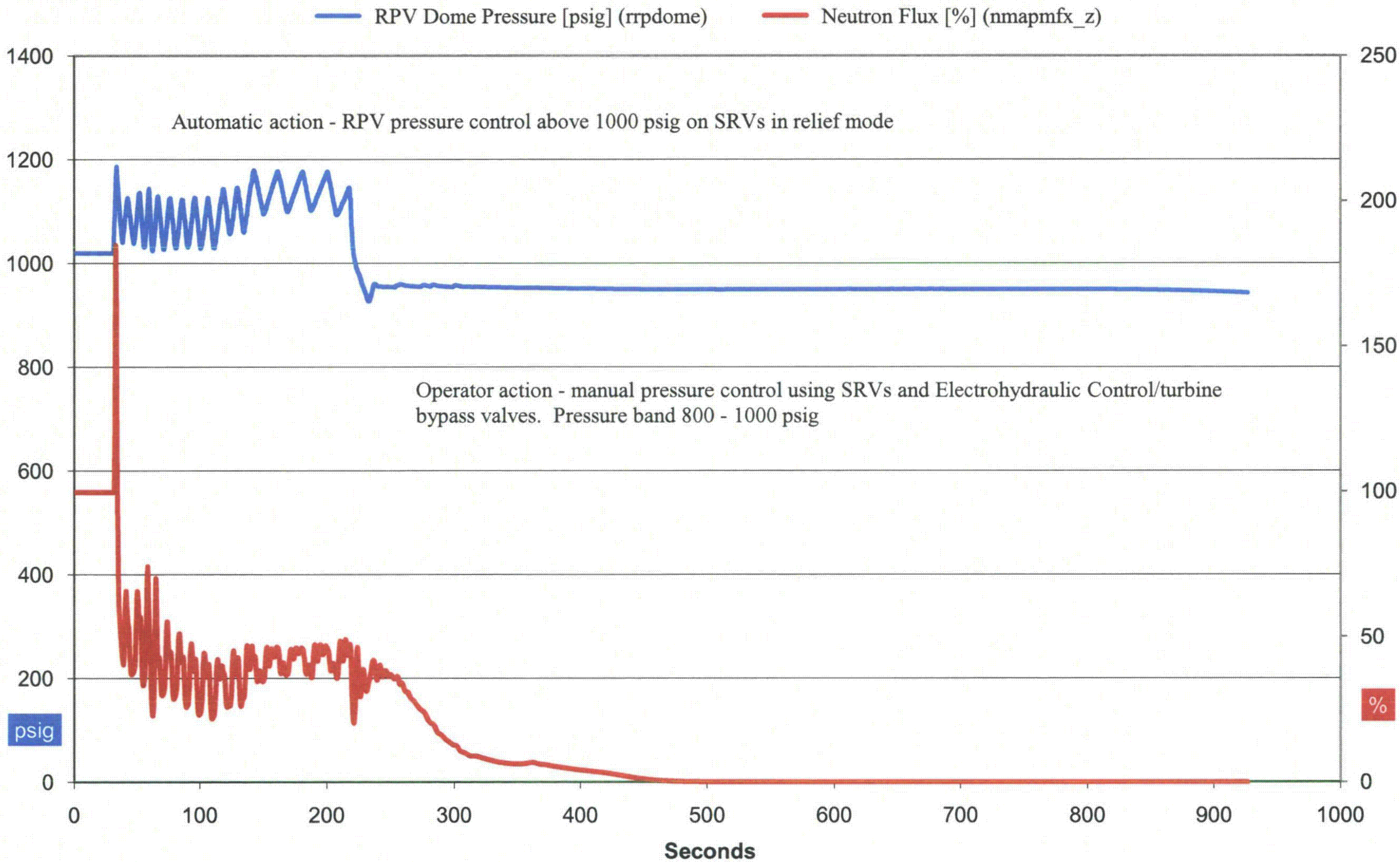


Figure 56
Transient Test EPU Turbine Trip ATWS MELLLA



RAI from NRC E-mail dated July 27, 2011

ECCS NPSH Station Blackout (SBO) Scenario

The technical staff requests additional clarification in NMPNS' RAI response dated May 9, 2011, regarding the operation of the pumps during [a] SBO, particularly after the coping period. The RAI response stated that the SBO scenario was not included in the licensee's evaluation as the [Reactor Core Isolation Cooling] RCIC pump is relied upon during the coping period. Nothing was said in the response about operation of other pumps past the SBO coping period.

NMPNS Response

Following the 4-hour SBO coping period, there are a number of different scenarios that could be analyzed due to the various offsite or on-site electrical power sources that could be returned to service. To address NPSH margins during the recovery period of a SBO event, NMPNS made the following assumptions to maximize suppression pool temperature:

- Only one Emergency Diesel Generator or Offsite AC power supply to one emergency bus is restored after 4 hours. Thus, a single loop of Residual Heat Removal (RHR) suppression pool cooling is assumed to become available after 4 hours.
- This recovery evaluation conservatively assumes reduced containment spray mode flow rate through the RHR heat exchanger, which reduces the assumed heat removal as compared to the suppression pool cooling spray mode that would be used for the majority of the restoration time frame. Note: this flow rate is lower than that assumed for the Design Basis Accident - Loss of Coolant Accident (DBA-LOCA) or Alternate Shutdown Cooling (ASDC) scenarios. The RHR pump NPSH calculations conservatively assume maximum LPCI mode run-out flow conditions.
- As defined in Section 2.3.5 of Attachment 11 to the NMP2 EPU License Amendment Request dated May 27, 2009, the suppression pool temperature after 4 hours is 186°F. For that SBO scenario, the reactor pressure after 4 hours is 180 psia (165.3 psig).
- The Shutdown Cooling (SDC) interlock is at 128 psig; therefore, the suppression pool heatup would continue with one RHR loop of suppression pool cooling until SDC is initiated when reactor pressure is reduced below 128 psig. This evaluation conservatively assumes SDC initiation is achieved when reactor pressure reaches 100 psia (85 psig).
- Reactor depressurization from 180 psia (165.3 psig) to below the SDC permissive is achieved with one SRV remaining open to the suppression pool with one loop of RHR in suppression pool cooling mode.
- The 3 RHR pumps at NMP2 have individual suction strainers; therefore, a multiple RHR pump suction lineup on a common header suppression pool source is not applicable to the NMP2 RHR pump SBO recovery.

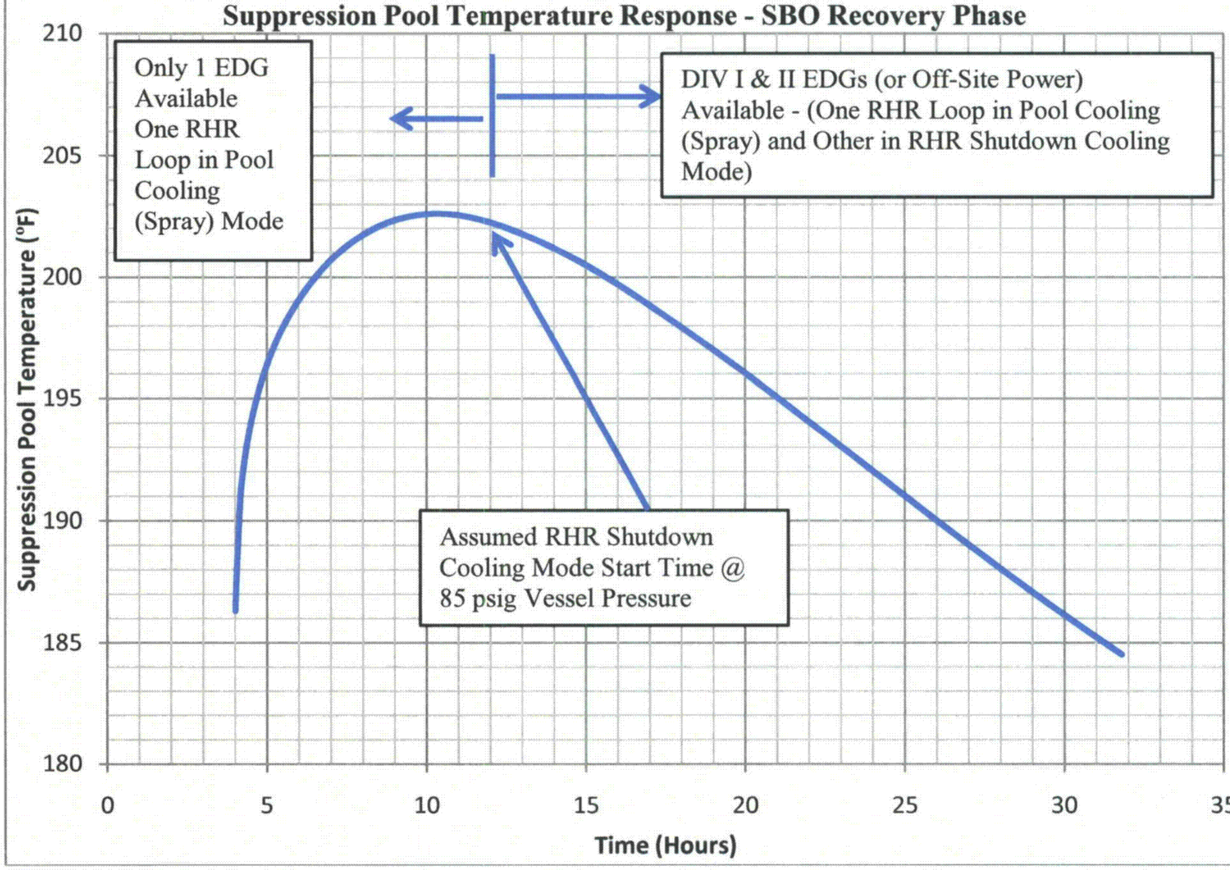
Qualitative Discussion:

With the above-described assumptions, suppression pool temperature would increase during the reactor cooldown and operations would control the cooldown to below 212°F if no containment accident pressure is assumed to exist as a result of containment spray. As analyzed, the suppression pool level is increased by greater than 2 feet at the end of the 4-hour coping period. This represents an additional 2 feet of head above that assumed for the RHR pump NPSH margins for the ASDC event. Note that the RCIC suction source is the Condensate Storage Tank (CST). During SBO recovery, no debris loading on the strainer is assumed. Thus, for SBO recovery, the margin is defined based on the ASDC event margin plus 2 feet of head, which results in a minimum NPSH margin ratio above 1.6 when the suppression pool is at 212°F.

Quantitative Assessment:

With the assumptions noted above, a simple suppression pool heatup estimate is shown in Figure 57. The suppression pool temperature increases over a two to three hour period to above 200°F, but is predicted to remain below 208°F for the duration of the recovery period. The reactor pressure is reduced below the assumed 85 psig after approximately 12 hours from SBO initiation (8 hours after the initial 4-hour coping period). Consistent with the ASDC assumptions, the 1.6 margin ratio is maintained with suppression pool temperature below 208°F. Therefore, the 1.6 margin ratio is maintained assuming no containment accident pressure and conservatively assuming no credit for the increased suppression pool level predicted for SBO during the recovery phase with RCIC taking suction from the CST.

Figure 57
Suppression Pool Temperature Response - SBO Recovery Phase



RAI from NRC E-mail dated August 4, 2011

ECCS NPSH

In letter dated May 9, 2011, it was stated that the [Low Pressure Coolant Injection] LPCI ([Residual Heat Removal] RHR) pumps could operate at margin ratio of less than 1.6 for approximately 839 minutes (~14 hours) for [Design Basis Accident – Loss of Coolant Accident] DBA-LOCA and 376 minutes (~6.3 hours) for [Alternate Shutdown Cooling] ASDC. It was further stated that the operational times were based on the tabular values for suppression pool temperature versus time developed to generate the graphs in NMP2 EPU LAR dated May 27, 2009. However, the graphs that were included in the EPU LAR only go up to 10^5 seconds (~28 hours). It is not clear how long a period did NMPNS evaluate the operation of the pumps. During long-term cool-down, the pumps could operate at a flow rate higher than during short-term, thus potentially reducing [Net Positive Suction Head] NPSHA. Please provide additional information to assure the staff that NMPNS has considered all factors that could potentially affect the margin ratio during long-term cooling in arriving at the above mentioned times.

NMPNS Response

Figures 58 and 59 provide the long term suppression pool temperature versus time for the DBA-LOCA and ASDC scenarios. The evaluated time periods for the DBA-LOCA and ASDC scenarios are approximately 12 days and approximately 2.5 days, respectively. Both scenarios assume that the RHR pumps are operating at the design basis suppression pool cooling flow rate for the duration of the event. The NPSH margin assessment conservatively applied the design basis runout flow assumption.

For the DBA-LOCA and ASDC scenarios, the NPSH margin ratios are above 1.6 for suppression pool temperatures below 202°F and 208°F, respectively. (Note: The difference in maximum temperatures is due to assuming a debris loading on the strainer for the DBA-LOCA case and assuming no debris loading on the strainer for the ASDC case.)

Figure 58
DBA LOCA Long Term Suppression Pool Temperature Response

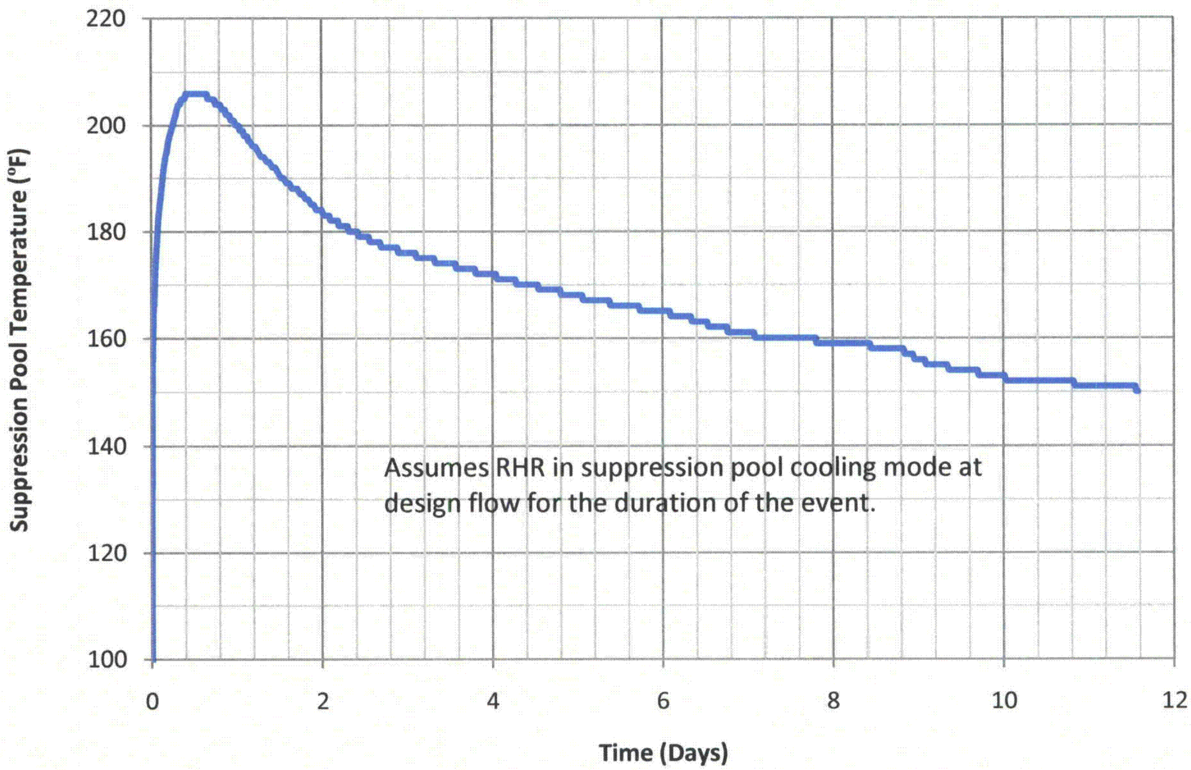


Figure 59
ASDC Long Term Suppression Pool Temperature Response