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SUBJECT: Responds to NRC RAI re analysis supporting deviations from BWROG Emergency Procedure Guidelines,Rev 4.

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SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING ANALYSIS SUPPORTING DEVIATIONS FROM THE
BWROG EMERGENCY PROCEDURES GUIDELINES REV. 4.
PLA-4308 FILE R41-2

Docket Nos. 50-387
and 50-388

Dear Sir:

This letter serves to forward the additional information in answer to your four (4) questions requested in your letter dated April 10, 1995. In accordance with your direction, Question No. 4 is not responded to as our position on deviations from the standard BWROG EPGs has not changed.

Please contact our Mr. William Williams at 610 774-7742 if you have any questions.

Very truly yours,

R. G. Byram

Attachment: Answers to Follow-Up Questions

copy: NRC Region I
Ms. M.Banerjee NRC Sr. Resident Inspector
Mr. C. Poslusny, Jr. NRC Sr. Project Manager

A001

1. What is the time required to inject the hot shutdown boron weight (HSBW) in Susquehanna? Please provide the following data.

(a) Target Boron Concentration in ppm.

The hot shutdown boron concentration for the power uprate conditions is 494 ppm or an equivalent 363 ppm referenced to 20° C. This is based upon an in-house reactor physics calculation. The following assumptions were used when performing this calculation:

1. All rods full out,

2. Core is at the most reactive exposure,

3. Hot full power Xenon and Iodine concentrations,

4. Hot full power core inlet subcooling,

5. No voids in the core.

(b) Volume to be Borated.

The volume of water to be borated is 16,900 ft^3. This volume includes the RPV volume up to the high level trip set point and the recirculation loops. It does not include the volume associated with the RWCU system. The mass of water is used when computing the HSBW. The water is assumed to be saturated and at the minimum pressure at which an SRV is set to lift. Using these thermodynamic conditions the mass of water to be borated is computed to be 7.67×10^5 lb_m.

(c) SLCS Injection Rate.

The SLCS injection rate is 82.4 gpm.

(d) Calculation of Time to Inject Hot Shutdown Boron Weight.

The operator uses a SLCS tank volume of 2800 gal to determine when HSBW weight has been injected at Susquehanna. This volume is the difference between the minimum SLCS tank volume allowed by plant Technical Specifications and the volume of the sodium pentaborate that must be injected to achieve the HSBW concentration. The minimum volume of sodium pentaborate allowed by Technical Specifications is 4587 gal (See attached technical specification).

The HSBW is calculated using the following equation:

HSBW = (HSPPM x mixture mass)/1,000,000 ppm

Here;

HSPPM is the hot shutdown boron concentration in parts per million. This value is 494 ppm for power uprate conditions.

Mixture mass is the water mass that the boron is to be mixed in. This mass is 7.64×10^5 lbm.

Using these values the HSBW becomes:

HSBW = (494 ppm x 7.67×10^5 lbm)/1,000,000 ppm = 377.4 lbm.

The volume of the SLCS tank fluid that must be injected to reach HSBW becomes:

VHSD = HSBW/{(mass of boron in the SLCS tank/mass of solution in SLCS tank) (solution density)}*

VHSD = (377.4 lbm-B)/{(0.023 lbm-B/lbm-mix) x (9.1 lbm mix./gal)}

VHSD = 1803 gal.

The 2800 gal tank volume which is used by the operator to determine that HSBW has been injected is then computed by subtracting the minimum SLCS tank volume from what is required to inject HSBW or;

HSBW tank volume = 4587 gal - 1803 gal = 2784 gal

This value is rounded off to 2800 gal which is compatible with the SLCS tank instrument accuracy.

The time to inject HSBW then becomes the difference between the nominal volume of sodium pentaborate in the SLCS, 4800 gal and 2800 gal divided by SLCS injection rate, or:

Time to inject HSBW = (4800 gal - 2800 gal)/ 82.4 gpm = 24 min

A reasonable time for the operator to initiate SLCS given the ATWS symptom of power greater than 5% and a valid scram signal is 90 seconds. Therefore the time from the start of the ATWS to when HSBW is injected into the RPV is 25.5 minutes.

*Note: Boron concentration (12.6%) in the SLCS tank is based on maximum tank level (in the approved region, i.e. 4910 gal.)

3/4.1.5 STANDBY LIQUID CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.1.5 The standby liquid control system shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2.

ACTION:

a. In OPERATIONAL CONDITION 1 or 2:

1. With one pump and/or one explosive valve inoperable, restore the inoperable pump and/or explosive valve to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours.

2. With the standby liquid control system otherwise inoperable, restore the system to OPERABLE status within 8 hours or be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.5 The standby liquid control system shall be demonstrated OPERABLE:

a. At least once per 24 hours by verifying that;

1. The temperature of the sodium pentaborate solution is within the limits of Figure 3.1.5-1.

2. The available volume of sodium pentaborate solution is within the limits of Figure 3.1.5-2.

3. The heat tracing circuit is OPERABLE by actuating the test feature and determining that the power available light on the local heat tracing panel energizes.

b. At least once per 31 days by;

1. Verifying the continuity of the explosive charge.

2. Determining that the available weight of sodium pentaborate is greater than or equal to 5500 lbs and the concentration of boron in solution is within the limits of Figure 3.1.5-2 by chemical analysis.*

3. Verifying that each valve, manual, power operated or automatic, in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. Demonstrating that, when tested pursuant to Specification 4.0.5, the minimum flow requirement of 41.2 gpm at a pressure of greater than or equal to 1124 psig is met.

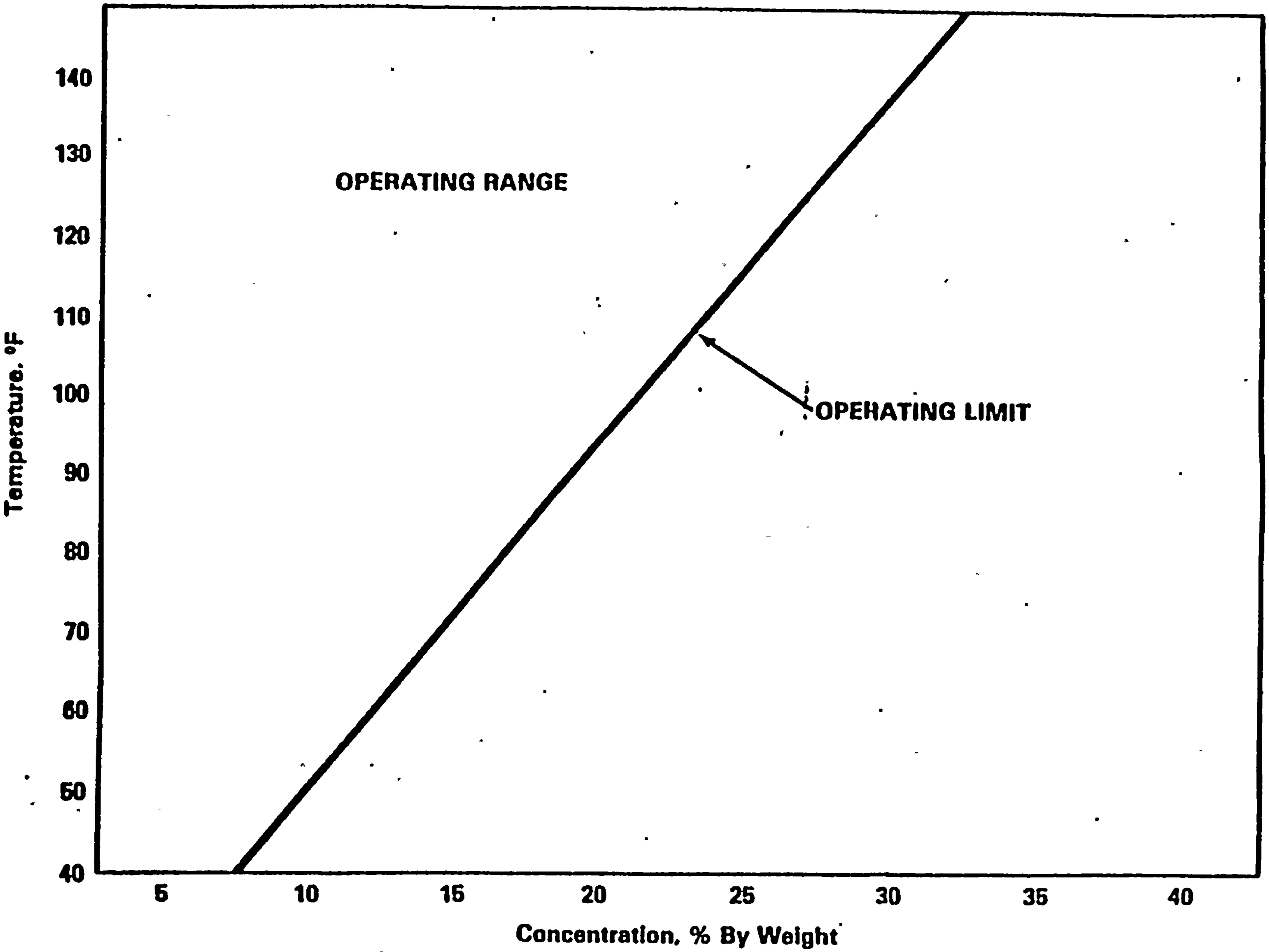
d. At least once per 18 months during shutdown by;

1. Initiating one of the standby liquid control system loops, including an explosive valve, and verifying that a flow path from the pumps to the reactor pressure vessel is available by pumping demineralized water into the reactor vessel. The replacement charge for the explosive valve shall be from the same manufactured batch as the one fired or from another batch which has been certified by having one of that batch successfully fired. Both injection loops shall be tested in 36 months.

2. **Demonstrating that all heat traced piping is unblocked by pumping from the storage tank to the test tank and then draining and flushing the discharge piping and test tank with demineralized water.

* This test shall also be performed anytime water or boron is added to the solution or when the solution temperature drops below the limit of Figure 3.1.5-1.

** This test shall also be performed whenever both heat tracing circuits have been found to be inoperable and may be performed by any series of sequential, overlapping or total flow steps such that the entire flow path is included.



SODIUM PENTABORATE SOLUTION
TEMPERATURE/CONCENTRATION REQUIREMENTS

FIGURE 3.1.5-1

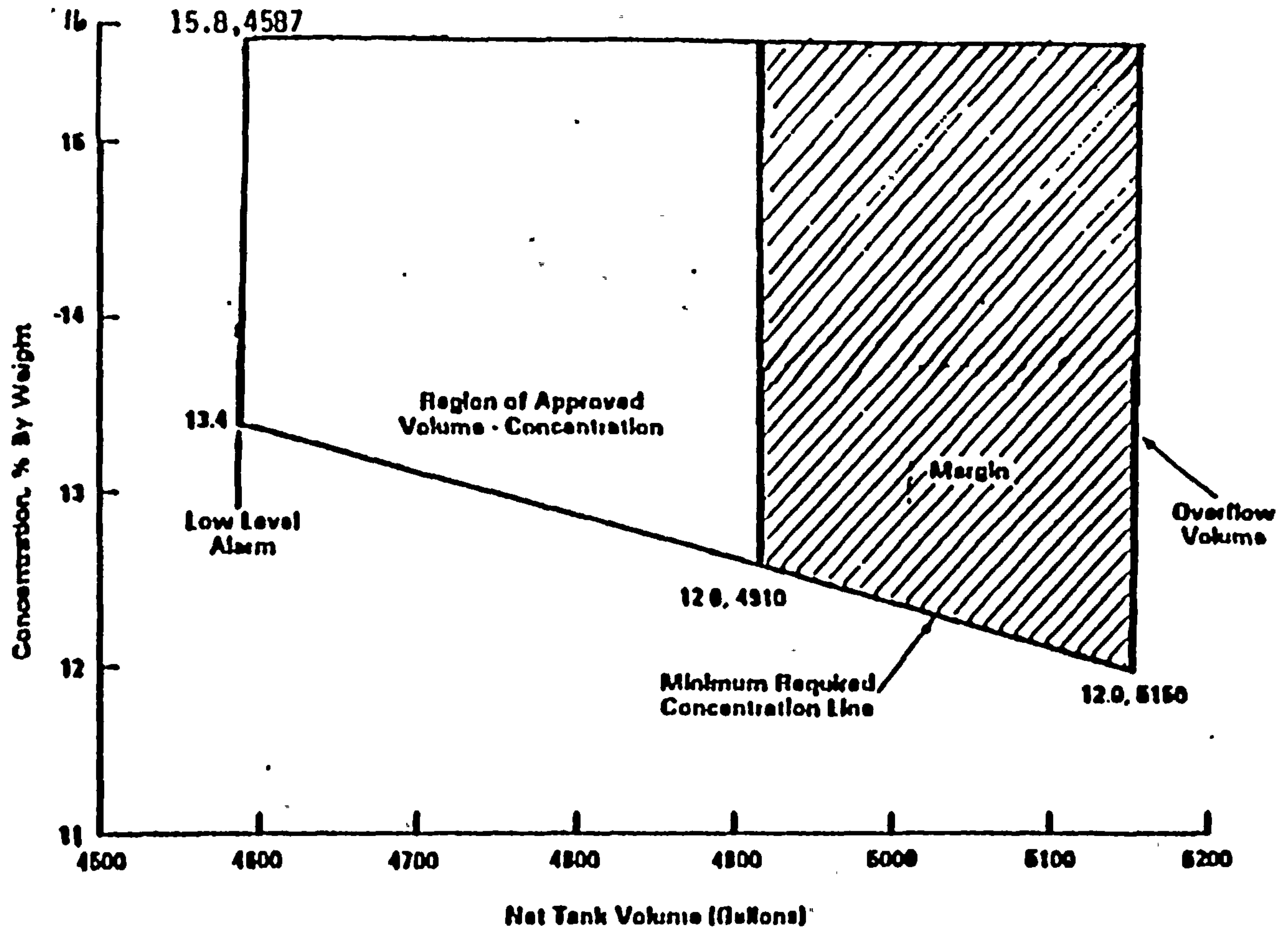


FIGURE 3.1.5-2

SODIUM PENTABORATE
SOLUTION CONCENTRATION

(2) **Provide data from SABRE runs for a MSIV closure ATWS with SLC at different water levels. The data that we are looking for is:**

- (a) **Power, flow, water level, and in-core boron concentration versus time**
- (b) **Time to reach the stagnation flow**
- (c) **Suppression pool temperature**

SABRE Results with Uniform Mixing Model

The attached pages present SABRE calculation results for an MSIV closure ATWS with three different water level control strategies:

1. Above TAF with target band of -80 inches to -110 inches, PP&L strategy, (Table 4.1-1 and Figures 4.1-1 & 4.1-2),
2. Below TAF (Table 4.2-1 and Figures 4.2-1 & 4.2-1), and
3. No water level control (Figures 4.4-1 & 4.4-2).

It should be noted that the results of applying the SABRE calculation to the second water level control strategy (below TAF) is extremely sensitive to assumptions regarding time and effectiveness of boron injection/mixing. Differing assumptions regarding such critical parameters as: (1) time to initiate injection, (2) time to level recovery, and (3) the physical provisions for the injection, could significantly affect the core power profile and containment loading. Such changes would significantly alter the conclusions presented in our analysis. For example, it is estimated the time for level recovery in Strategy 2 could be reduced by up to 6 minutes in this event under other assumptions. This would result in less containment loading and obviate the need for a blowdown. Further, physical differences between units would suggest more careful examination before generic conclusions are drawn. Therefore, it must be emphasized that our analysis applies our understanding of other strategies to the Susquehanna Units utilizing PP&L procedures which produce a unique assessment.

In the third case, where there is no water level control, HPCI/RCIC are allowed to initiate and terminate automatically for the entire transient. In all three cases, any boron which has not stagnated in the bottom of the lower plenum, is assumed to be uniformly distributed throughout the reactor coolant.

The pertinent modeling assumptions used consist of:

1. The threshold flow for boron mixing is 4 Mlb/hr. This value is based on the experimental work of Professor Theofanous.[1]

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[1] M.P. Dias, H. Yan, and T.G. Theofanous, "The Management of ATWS by Boron Injection," NUREG/CR-5951, March 1993.

2. Boron is mixed in accordance with GE remixing data.[2] The only difference is that the remixing time constant is extended to 4Mlb/hr by adding a transition zone between flowrates of 4 and 5 Mlb/hr. In this transition zone, the remixing time constant rapidly increases from the GE value at 5 Mlb/hr to an effectively infinite value at 4 Mlb/hr. This transition layer is added in order to make the remixing phenomena consistent with the experimental results obtained by Theofanous (see #1 above).

3. Boron injection is initiated 90 seconds after scram signal is generated.[3] The transport time from SLC tank to RPV is 30 seconds.[4] An additional 45-second delay is added to account for the ineffectiveness of boron until it travels once around the natural circulation loop. This delay is included because radial dispersion of boron will not occur until it circulates at least once around the natural circulation flow path and re-enters the core. Non-uniform radial distribution of the liquid boron can significantly reduce its reactivity worth.[5]

4. In the PP&L strategy, HPCI and RCIC are allowed to initiate at their set points and inject to the vessel. Level is allowed to drop on its own without immediate throttling of injection flow. When the drop in level begins to slow down, the operator starts to throttle injection flow to drop level into the target region. This approach is consistent with PP&L procedures and operator training.

5. In the strategy where level is controlled below TAF, HPCI and RCIC injection are prevented until RPV water level drops to TAF. This is consistent with the BWROG requirement to terminate and prevent injection while decreasing RPV water level.

6. RPV water level is recovered when SLCS tank level drops to 2800 gallons.[6] This ensures that the Hot Shutdown Boron Weight has been injected. Tank level drops to 2800 gallons at about 26 minutes into the event.

7. The volatility of boron is neglected. All of the boron injected into the RPV remains within the liquid phase of the coolant.

SABRE Results with Boron Transport Model

The SABRE calculations were performed in July of 1994. Additional SABRE calculations have been carried out since that time using a boron transport model instead of the uniform mixing model. With the improved mixing model, boron is transported throughout the reactor vessel by the flow of coolant. The mixing threshold is specified as part of the code input data. This model is more detailed than the uniform mixing model in that it can predict local boron concentrations. When the flow is stagnated (liquid no longer exits the steam separators), the boron concentration within the

[2] L. Chu , "Power Suppression and Boron Remixing Mechanism for General Electric Boiling Water Reactor Emergency Procedure Guidelines," NEDC-22166, 1983.
[3] "Evaluation of Susquehanna ATWS Performance for Power Uprate Conditions," GENE-637-024-0893, Sept. 1993, p. A-6.
[4] GENE-637-024-0893, p. 7.
[5] NUREG/CR-5951.
[6] Susquehanna Emergency Operating Procedure EO-100/200-113, Step LQ/L-17.

reactor coolant is far from uniform. In fact, even when the total core flow is below the mixing threshold, boron can still accumulate within the core region: borated coolant enters the core, but only boron-free steam exits. Consequently, boron concentrates within the core region while it is depleted from other regions of the reactor, particularly the downcomers.

This effect leads to reduced power levels and a somewhat lower suppression pool temperature as compared to the uniform mixing model. Although the reduction in suppression pool temperature is significant, it is not, however, substantial. In order to illustrate the effect of explicitly modeling the boron transport process, the transients for the three cases listed above were recalculated with the improved boron mixing model. The results are presented in Tables Q2-1, -2, & -3, and Figures Q2-1, -2, -3, -4, -5, & -6. In these calculations, the transients are simulated up to the point where the Hot Shutdown Boron Weight is injected (~26 minutes). In the case corresponding to level control below TAF (Table Q2-2 and Figures Q2-3 & Q2-4) RPV depressurization on the HCTL would be required by the BWROG guidelines, but it is not simulated here in order to simplify the analysis. Also, the level restoration step is not simulated because there is no appreciable increase in suppression pool temperature following the initiation of level recovery.

Calculations were carried out with a mixing threshold of 5 Mlb/hr. Observe from the plots of total core flow that the results would not change appreciably if a mixing threshold of 4 Mlb/hr was used. The other assumptions used in the calculations are similar to those listed above.

Table 4.1-1

Event Sequence for MSIV Closure ATWS with No Additional Failures

(Above TAF)

Time (sec)	Sequence of Events
0	MSIV closure initiated. Scram fails.
90	Operator initiates boron injection.
115	Feedwater flow ceases because main steam line pressure is no longer sufficient to run feedwater turbines. It is assumed that there is no operator action to reduce RPV injection prior to this time.
~145	Water level drops to HPCI/RCIC initiation setpoints (-30" & -38" respectively). Operator allows full-flow injection to the RPV from these systems.
225	Level is -70" and decreasing. HPCI and RCIC are injecting at full flow.
275	With full HPCI/RCIC flow, level bottoms out at -73". Operator begins to throttle injection flow to lower level into target region of -80" to -110".
900	1 loop of suppression pool cooling is in service.
1200	2nd loop of suppression pool cooling is brought into service.
1250	Suppression pool temperature is 176 °F. Operator maintains level within control band (-80" to -110"), and maintains reactor at rated pressure.
1506	Suppression pool temperature reaches maximum value of 178.8 °F.
1530	Hot shutdown boron weight is injected. Injection is increased to restore level to +13" to +54". Level is recovered to remix boron which has stagnated in lower plenum.
1545	Operator is beginning to recover level.
1892	Suppression pool temperature is 178.0 °F and decreasing.

Figure 4.1-1

SABRE Results for MSIV-Closure ATWS with No Addition Failures (Water Level >TAF)

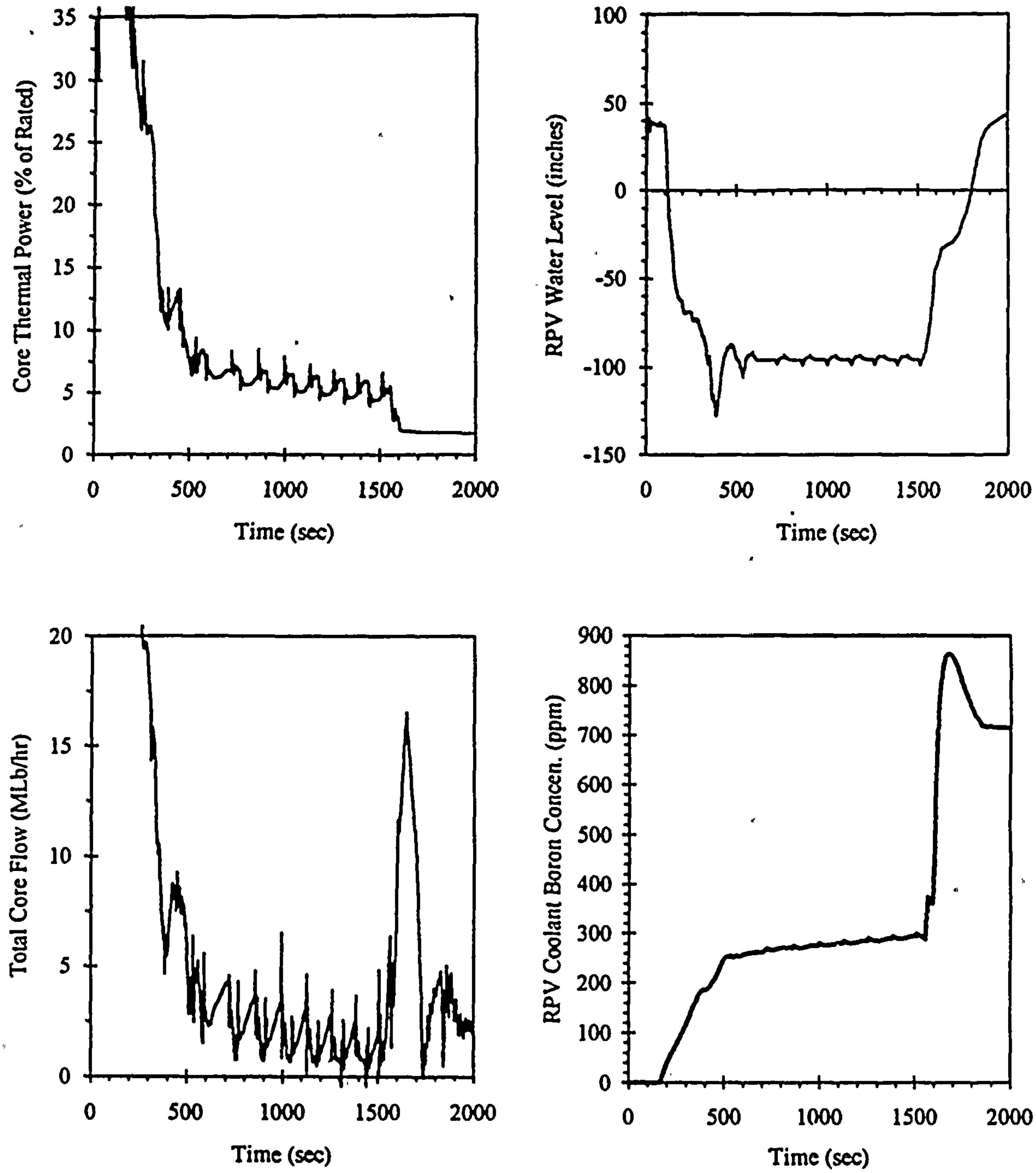

Figure 4.1-2

SABRE Results for MSIV-Closure ATWS with No Addition Failures (Water Level >TAF)

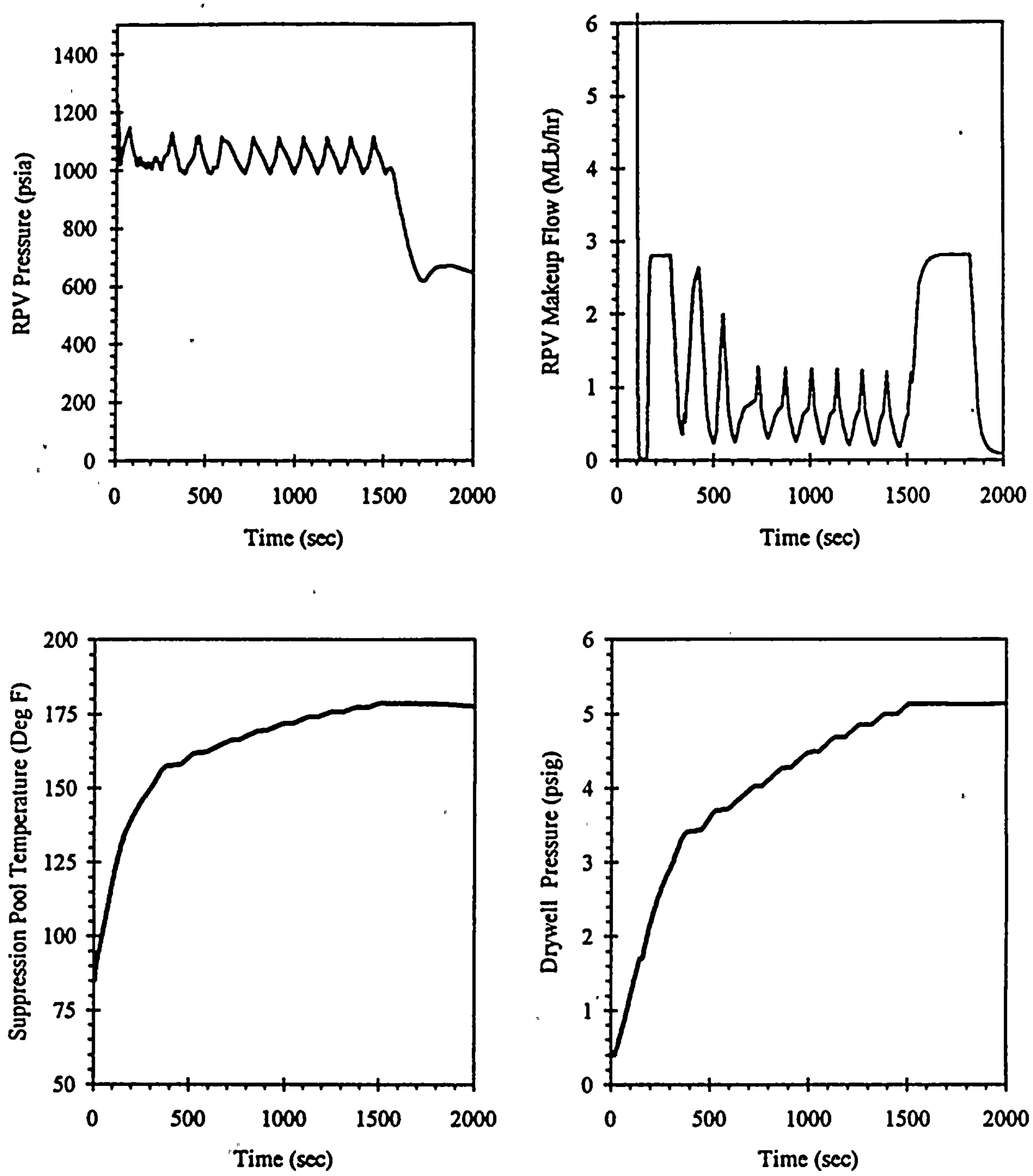

Table 4.2-1

Sequence of Events for MSIV Closure ATWS with No Additional Failures

(Water Level <TAF)

Time (sec)	Sequence of Events
0	MSIV closure initiated. Scram fails.
90	Operator initiates boron injection.
115	Feedwater flow ceases because main steam line pressure is no longer sufficient to run feedwater turbines. It is assumed that there is no operator action to reduce RPV injection prior to this time.
~145	Water level drops to HPCI/RCIC initiation setpoints (-30" & -38" respectively). In accordance with BWROG EPGs, operator prevents injection from these systems.
225	RPV water level drops below TAF. Operator re-initiates HPCI and RCIC injection to maintain level between TAF and TAF-2.6'.
275	Operator maintains level between TAF and TAF-2.6'.
900	1 loop of suppression pool cooling is in service.
1200	2nd loop of suppression pool cooling is brought into service.
1250	Suppression pool temperature reaches HCTL (~193 °F); operator terminates HPCI injection and initiates RPV blowdown.
1506	Suppression pool temperature is 207.3 °F and increasing.
1530	Hot Shutdown Boron Weight (HSBW) injected. Reactor still depressurizing. Operator must wait untill pressure drops to Minimum Alternate RPV Flooding Pressure (MARFP).
1545	Reactor pressure drops to MARFP (163 psia). EOPs allow operator to restore injection to vessel from systems other than SLCS, RCIC, and CRD. Operator initiates injection with condensate pump. Since HSBW is injected, operator restores level to +13" to +54".
1892	Suppression pool temperature reaches maximum value of 209.2 °F.

Figure 4.2-1

MSIV-Closure ATWS with No Addition Failures (Water Level <TAF)

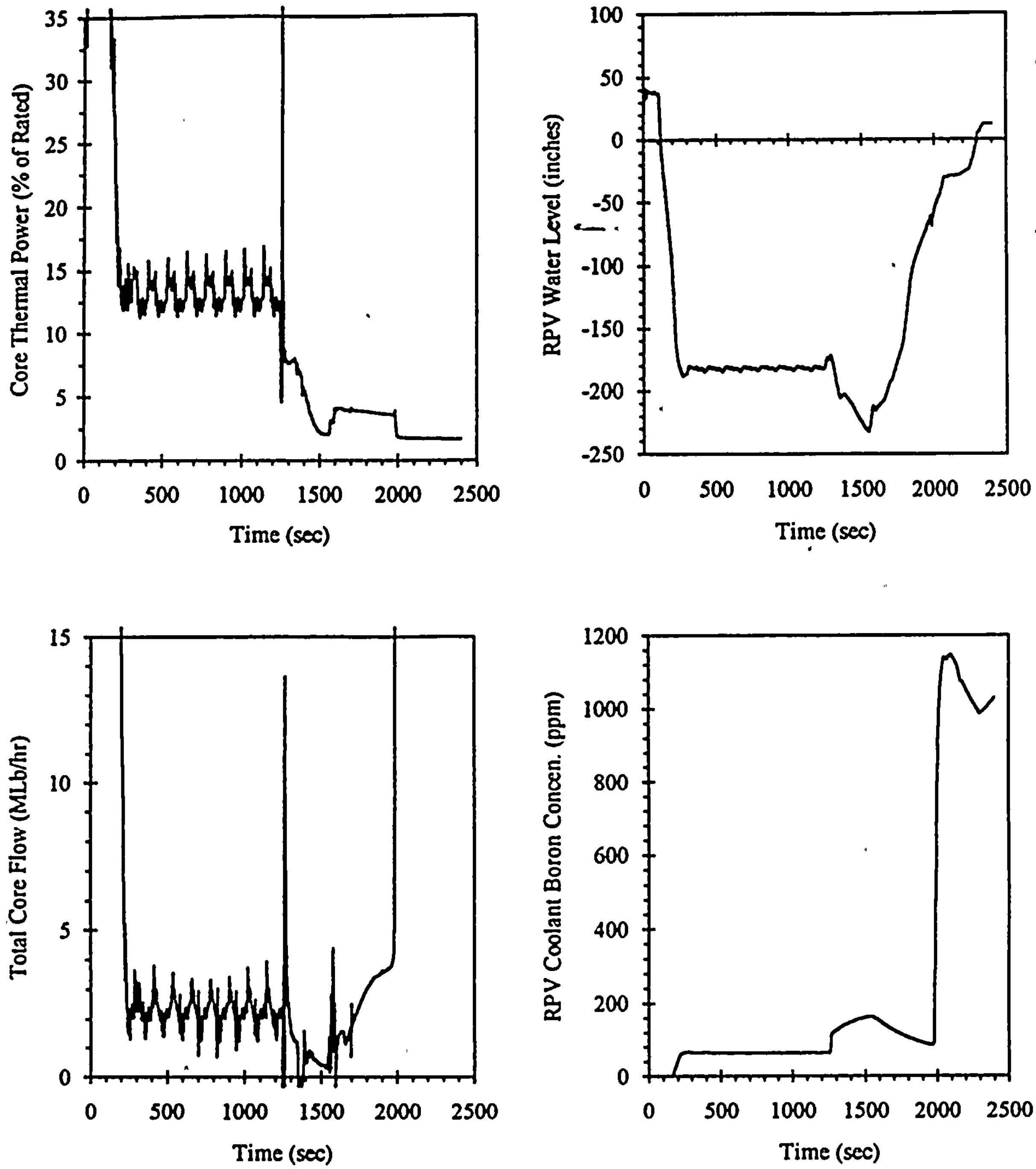

Figure 4.2-2

MSIV-Closure ATWS with No Addition Failures (Water Level <TAF)

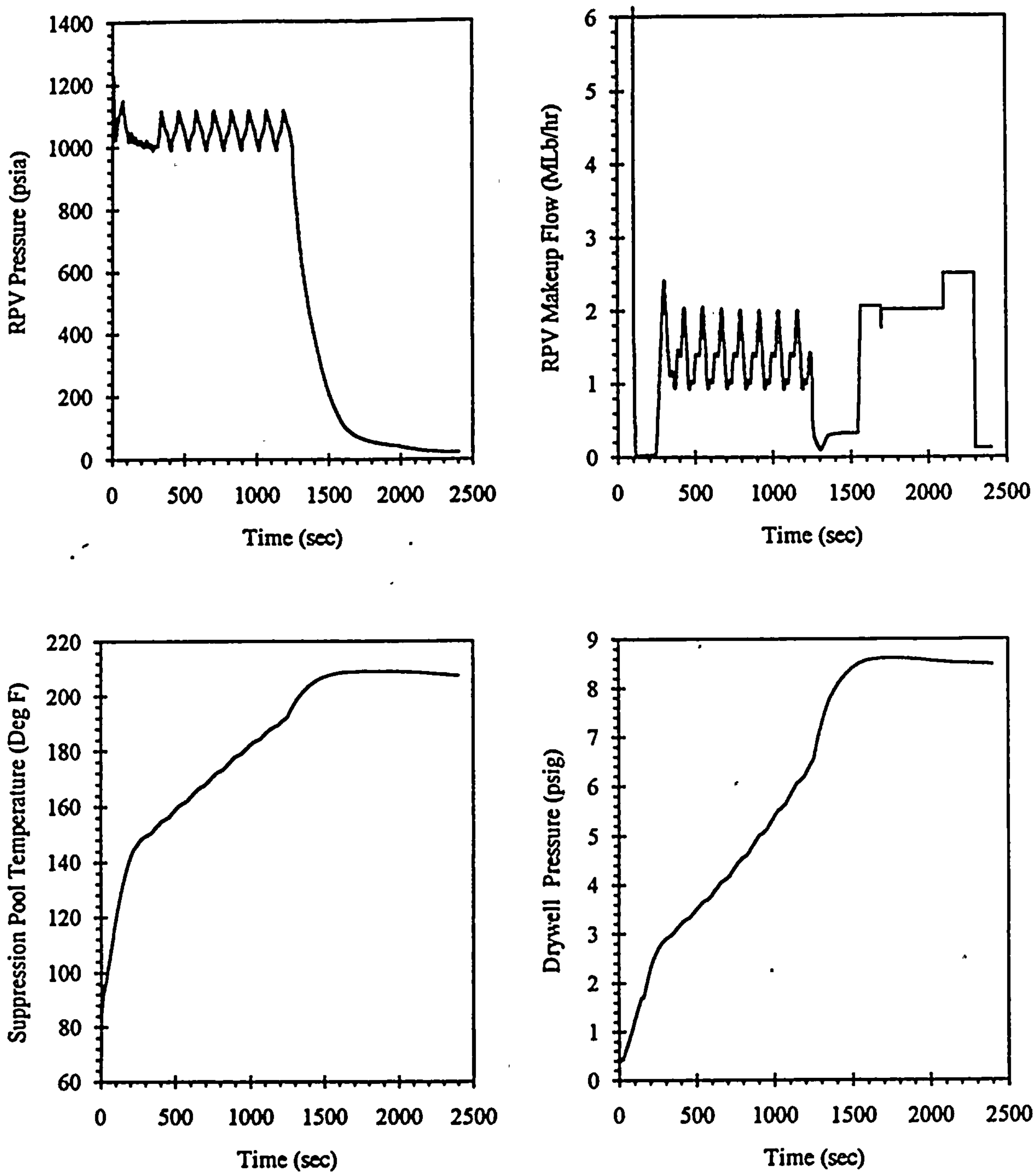

Figure 4.4-1
MSIV Closure ATWS with No Water Level Control

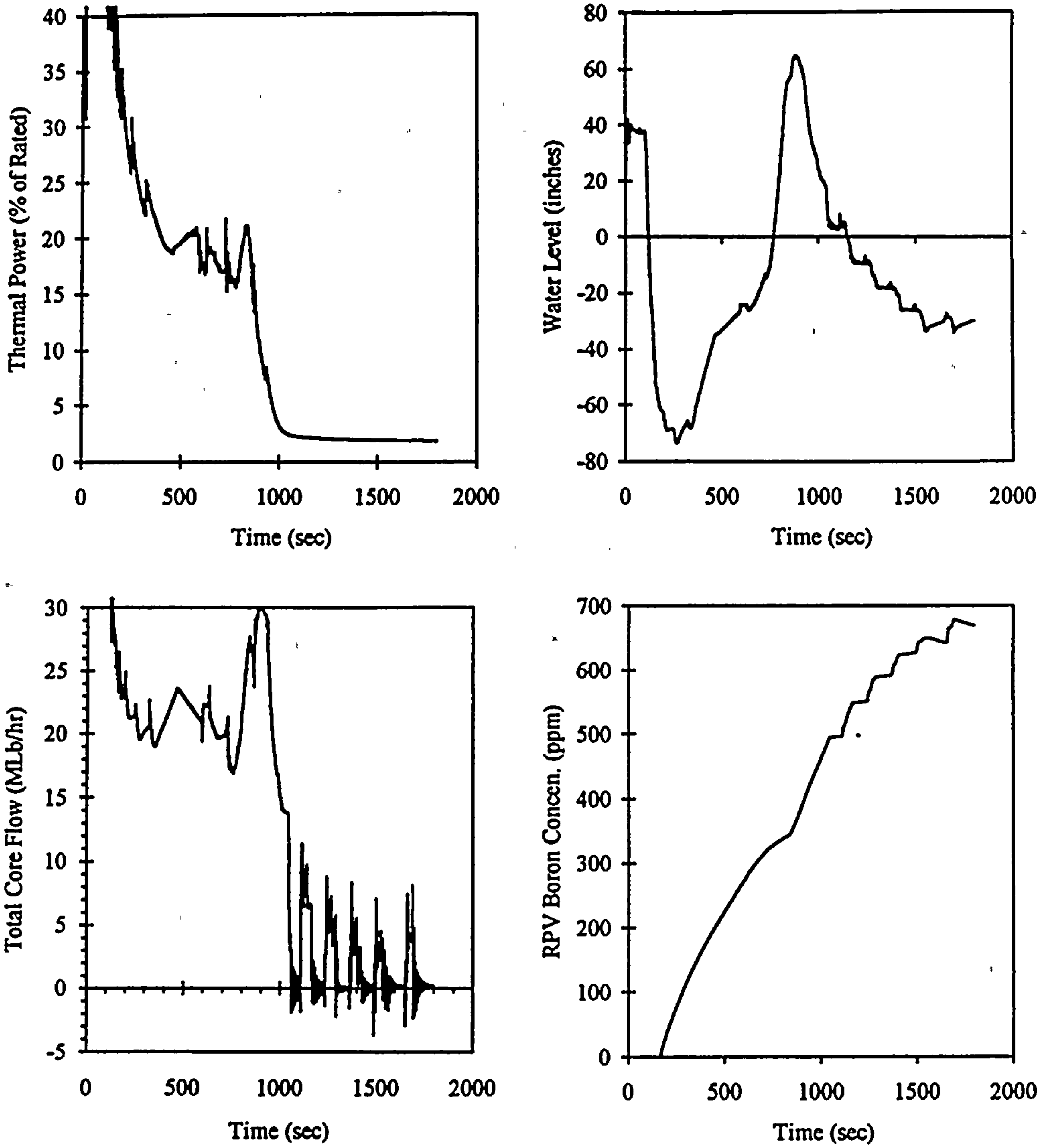

Figure 4.4-2
MSIV Closure ATWS with No Water Level Control

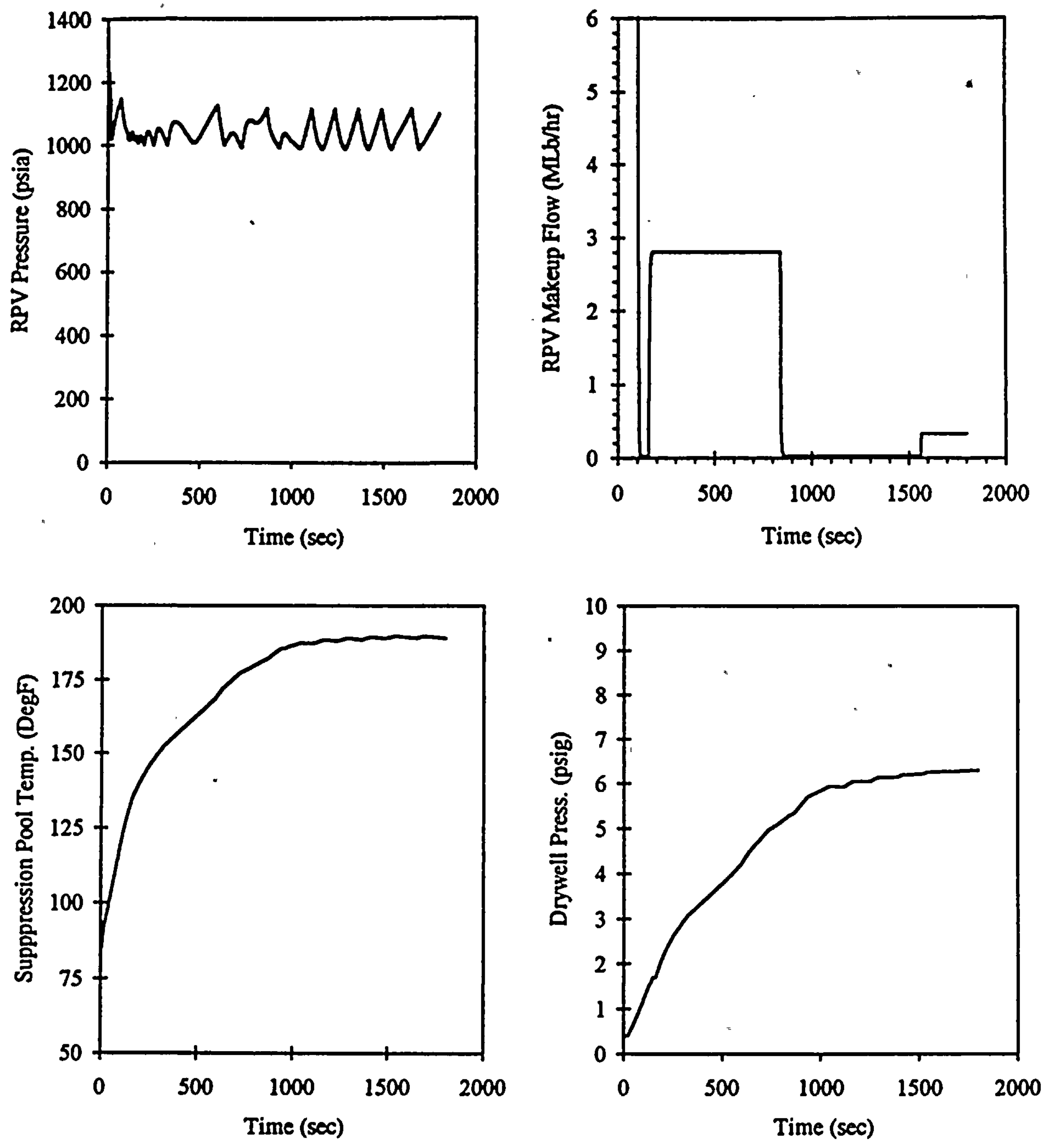

Table Q2-1

Sequence of Events Generated by SABRE Code for MSIV Closure ATWS with RPV Level Control in Accordance with PP&L EOPs

t(sec) - 0.000 Scram is Failed.

t(sec) - 0.000 ADS actuation is defeated.

t(sec) - 0.030 MSIV closure on specified time.

t(sec) - 4.050 MSIVs are closed.

t(sec) - 4.260 Recirc pump trip on hi Rx press.
Setpoint for trip - 1135.00 psig.

t(sec) - 95.020 SCLS Initiation.
Number of Operable SLCS pumps - 2.
Transport delay to vessel - 75.00 sec.

t(sec) - 109.230 Feedwater Trip on low Stm Line Press.
Flow stops when press < 160.30 psia.

t(sec) - 123.090 Level Setpoint Setdown.
Setdown occurs when level drops to 13.00 in.
Delay for setpoint setdown - 11.00 sec.

t(sec) - 148.605 RCIC initiation on low water level.
Setpoint for initiation - -30.00 in.

t(sec) - 155.710 HPCI initiation on low water level.
Setpoint for initiation - -38.00 in.

t(sec) - 155.710 DW Cooler Trip on Low Rx Level.
Trip Setpoint - -38.000 inches.

t(sec) - 200.020 Operator takes control of HPCI inj.

t(sec) - 500.005 Operator takes control of RCIC inj.

t(sec) - 900.020 Loop 1 of Supp Pool Cool Effective.
Service Water Temperature - 88.00 °F.

t(sec) - 1200.005 Loop 2 of Supp Pool Cool Effective.
Service Water Temperature - 88.00 °F.

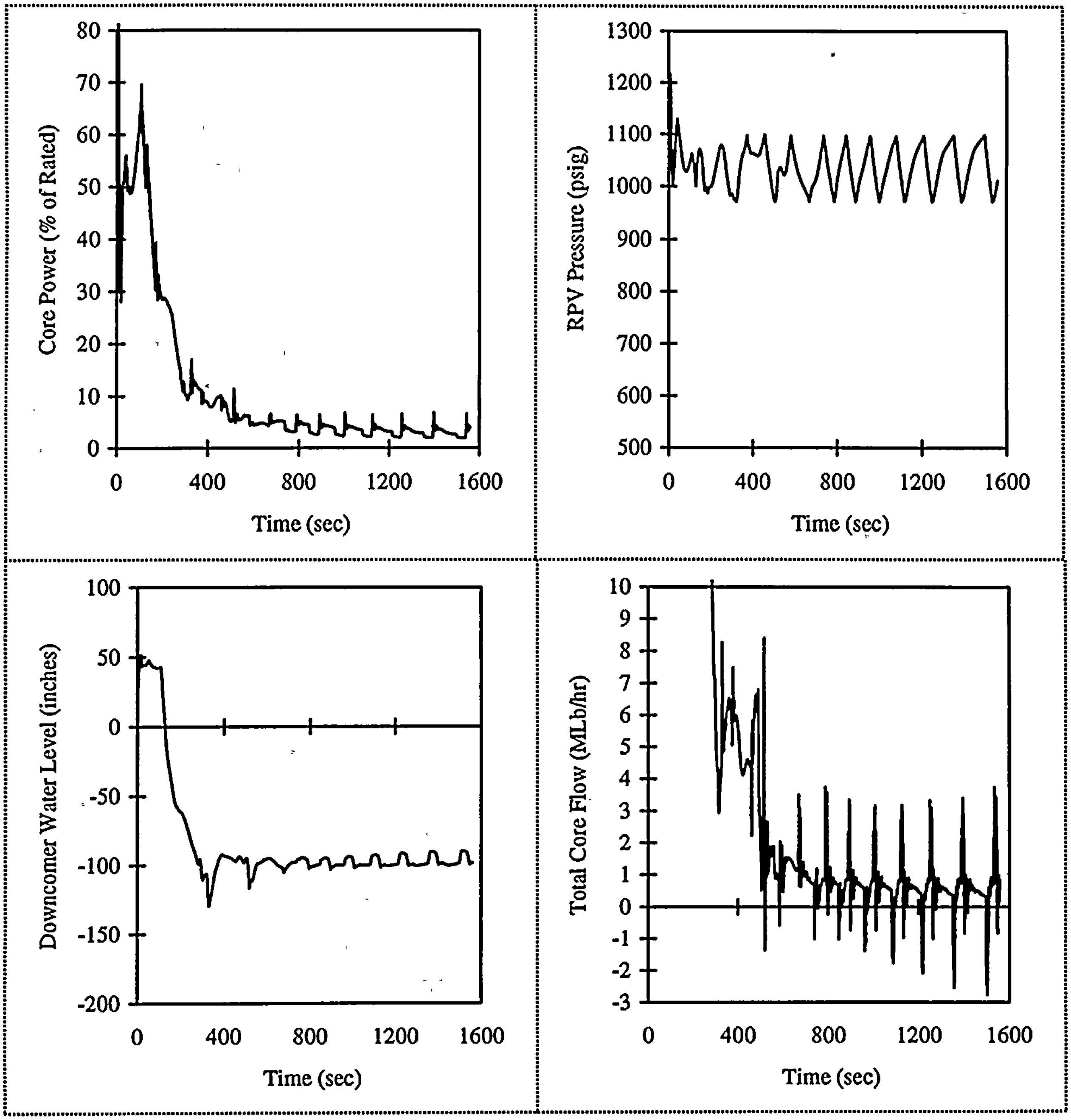

Figure Q2-1 SABRE calculation for MSIV closure ATWS with level control near -100". HPCI and RCIC are allowed to initiate at setpoints. Injection flow is throttled as necessary to reduce water level. Boron transport calculated from SABRE flow model. Boron mixing threshold is 5 MLb/hr.

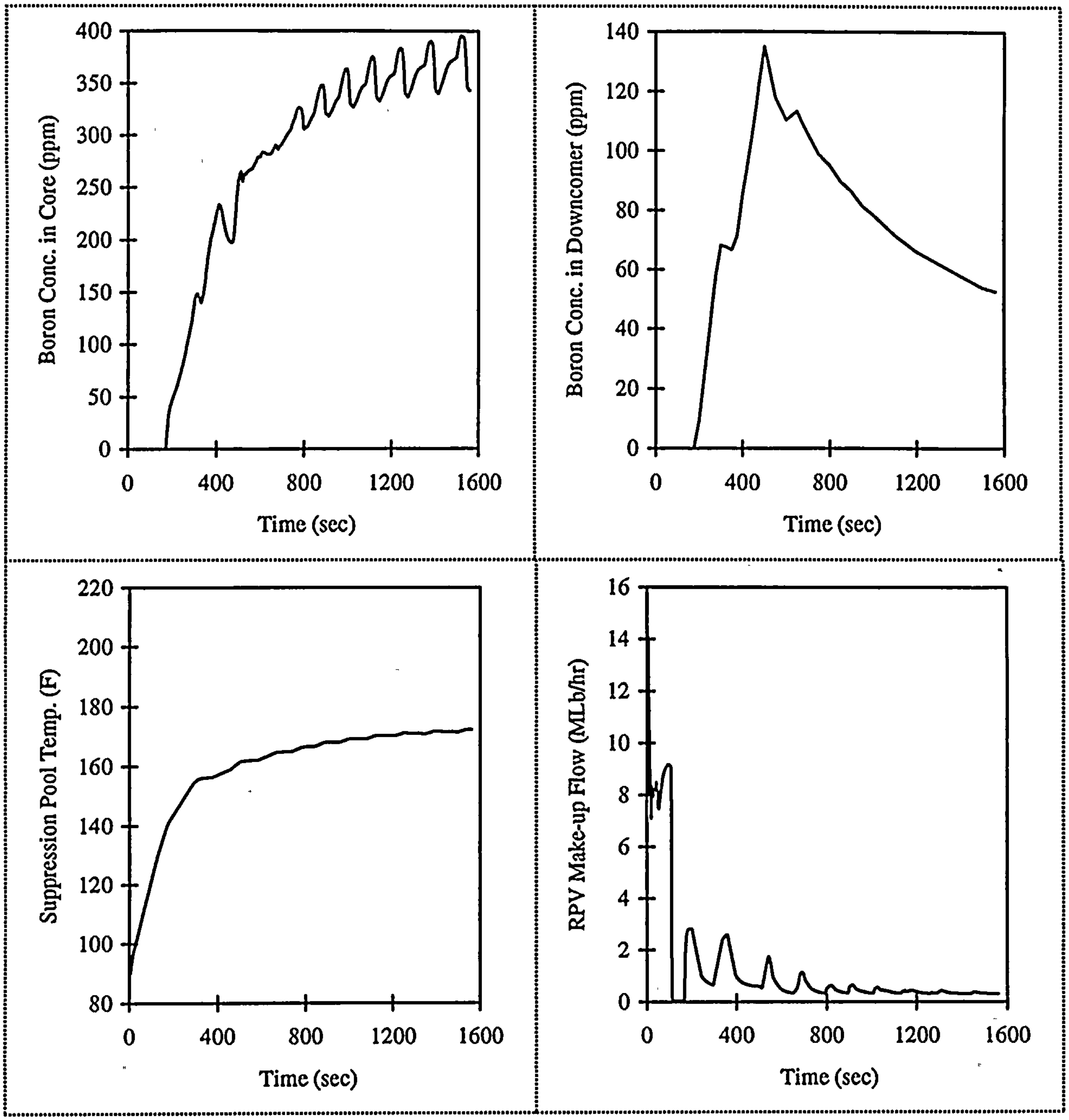

Figure Q2-2 SABRE calculation for MSIV closure ATWS with level control near -100". HPCI and RCIC are allowed to initiate at setpoints. Injection flow is throttled as necessary to reduce water level. Boron transport calculated from SABRE flow model. Boron mixing threshold is 5Mlb/hr.

Table Q2-2

Sequence of Events Generated by SABRE Code for MSIV Closure ATWS with RPV Level Control Below TAF

t(sec)	-	0.000 Scram is Failed.
t(sec)	-	0.000 ADS actuation is defeated.
t(sec)	-	0.030 MSIV closure on specified time.
t(sec)	-	4.050 MSIVs are closed.
t(sec)	-	4.260 Recirc pump trip on hi Rx press. Setpoint for trip - 1135.00 psig.
t(sec)	-	95.020 SCLS Initiation. Number of Operable SLCS pumps - 2. Transport delay to vessel - 75.00 sec.
t(sec)	-	109.230 Feedwater Trip on low Stm Line Press Flow stops when press < 160.30 psia
t(sec)	-	123.090 Level Setpoint Setdown. Setdown occurs when level drops to 13.00 in. Delay for setpoint setdown - 11.00 sec
t(sec)	-	155.605 DW Cooler Trip on Low Rx Level. Trip Setpoint - -38.000 inches.
t(sec)	-	227.810 HPCI initiation on low water level. Setpoint for initiation - -149.00 in.
t(sec)	-	227.810 RCIC initiation on low water level. Setpoint for initiation - -149.00 in.
t(sec)	-	227.810 Operator takes control of HPCI inj.
t(sec)	-	500.005 Operator takes control of RCIC inj.
t(sec)	-	900.020 Loop 1 of Supp Pool Cool Effective. Service Water Temperature - 88.00 °F.
t(sec)	-	1200.005 Loop 2 of Supp Pool Cool Effective. Service Water Temperature - 88.00 °F.

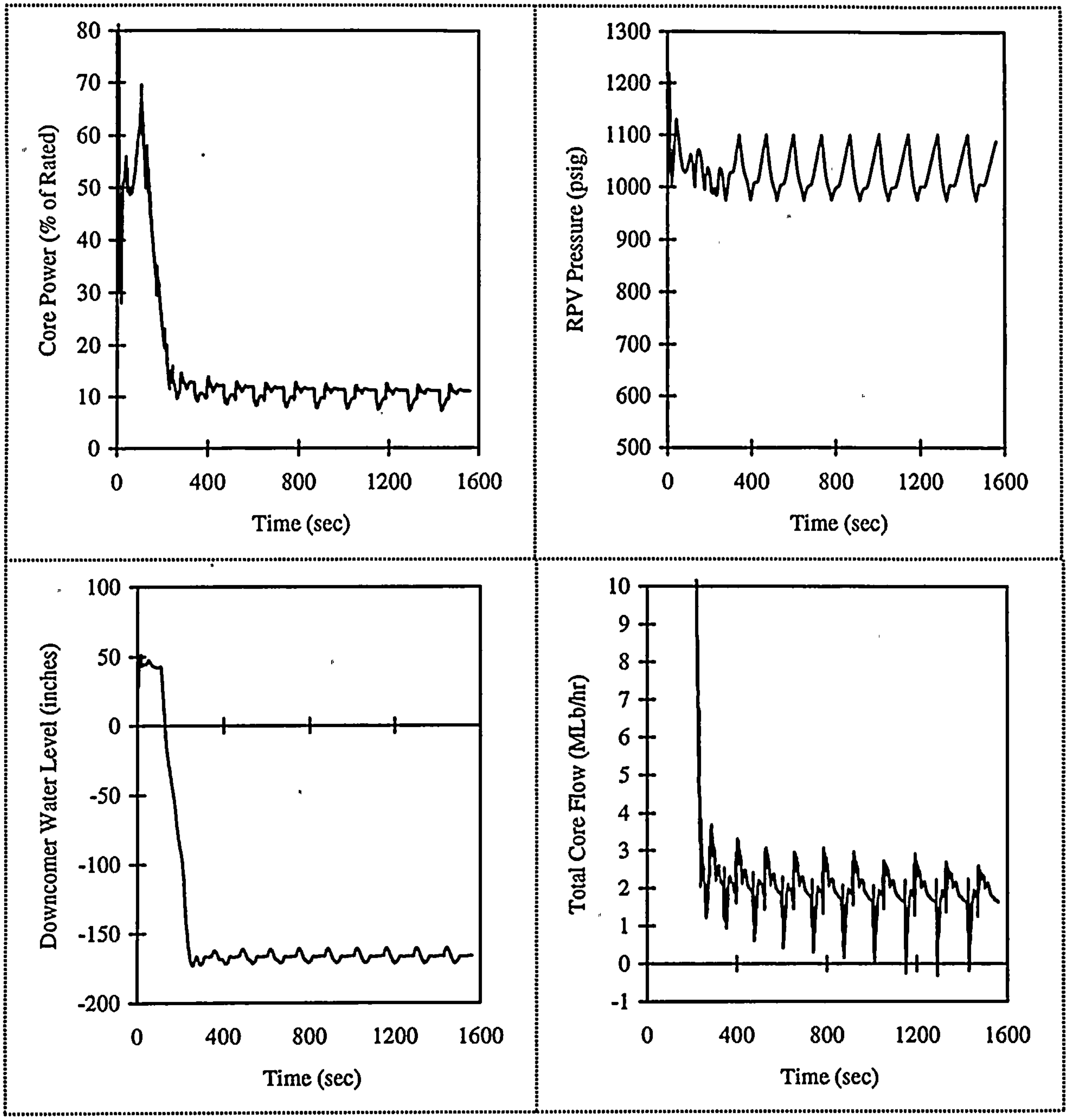

Figure Q2-3 SABRE calculation for MSIV closure ATWS with level control below TAF. HPCI and RCIC injection are prevented until level drops to TAF. Boron transport calculated from SABRE flow model. Boron mixing threshold is 5MLb/hr.

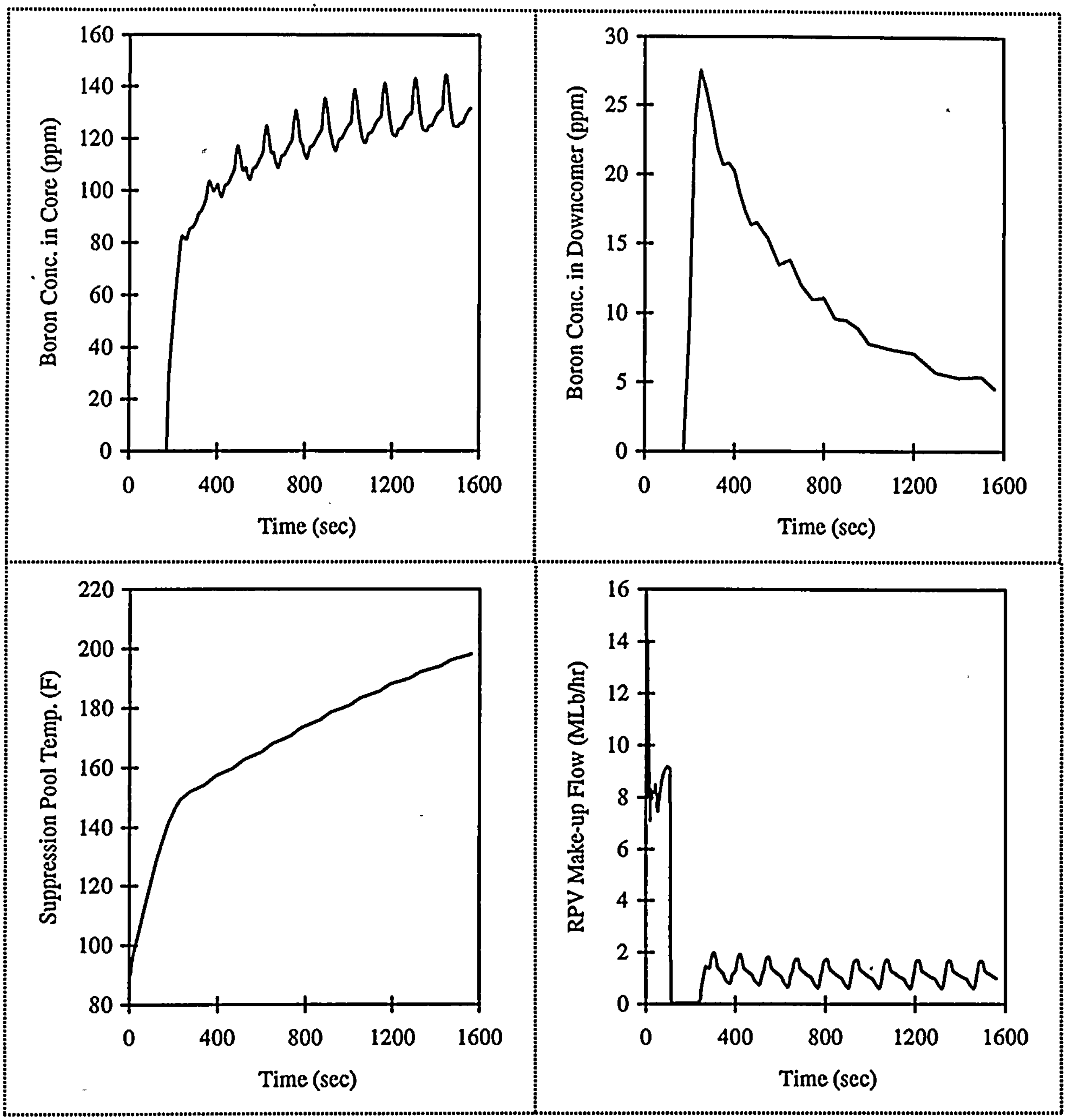

Figure Q2-4 SABRE calculation for MSIV closure ATWS with level control below TAF. HPCI and RCIC injection are prevented until level drops to TAF. Boron transport calculated from SABRE flow model. Boron mixing threshold is 5Mlb/hr.

Table Q2-3

Sequence of Events Generated by SABRE Code for MSIV Closure ATWS with No RPV Level Control

t(sec)	-	0.000 Scram is Failed.	
t(sec)	-	0.000 ADS actuation is defeated.	
t(sec)	-	0.030 MSIV closure on specified time.	
t(sec)	-	4.050 MSIVs are closed.	
t(sec)	-	4.260 Recirc pump trip on hi Rx press.	
		Setpoint for trip	- 1135.00 psig.
t(sec)	-	95.020 SCLS Initiation.	
		Number of Operable SLCS pumps	- 2.
		Transport delay to vessel	- 75.00 sec.
t(sec)	-	109.230 Feedwater Trip on low Stm Line Press.	
		Flow stops when press	< 160.30 psia.
t(sec)	-	123.090 Level Setpoint Setdown.	
		Setdown occurs when level drops to 13.00 in.	
		Delay for setpoint setdown	- 11.00 sec.
t(sec)	-	148.605 RCIC initiation on low water level.	
		Setpoint for initiation	- -30.00 in.
t(sec)	-	155.710 HPCI initiation on low water level.	
		Setpoint for initiation	- -38.00 in.
t(sec)	-	155.710 DW Cooler Trip on Low Rx Level.	
		Trip Setpoint	- -38.000 inches.
t(sec)	-	837.370 RCIC Trip on hi water level.	
		Trip Setpoint	- 54.00 in.
t(sec)	-	837.370 HPCI Trip on hi water level.	
		Trip Setpoint	- 54.00 in.
t(sec)	-	900.020 Loop 1 of Supp Pool Cool Effective.	
		Service Water Temperature	- 88.00 °F.
t(sec)	-	1200.005 Loop 2 of Supp Pool Cool Effective.	
		Service Water Temperature	- 88.00 °F.
t(sec)	-	1418.230 RCIC initiation on low water level.	
		Setpoint for initiation	- -30.00 in.

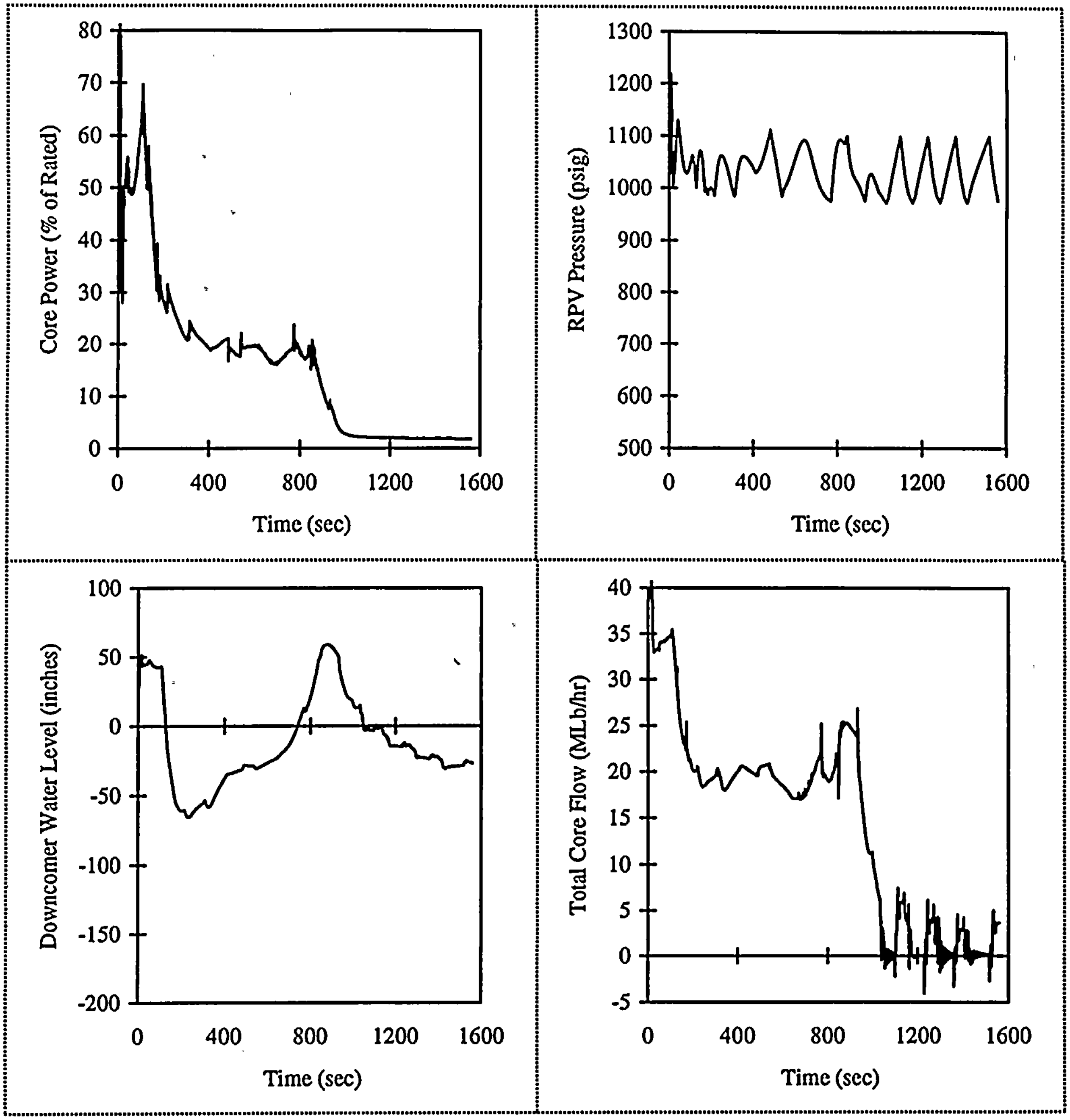

Figure Q2-5 SABRE calculation for MSIV closure ATWS with no manual water level control. HPCI and RCIC are allowed to initiate on low-level setpoints, inject at full flow, and trip on high-level setpoints. Boron transport calculated from SABRE flow model. Boron mixing threshold is 5 MLb/hr.

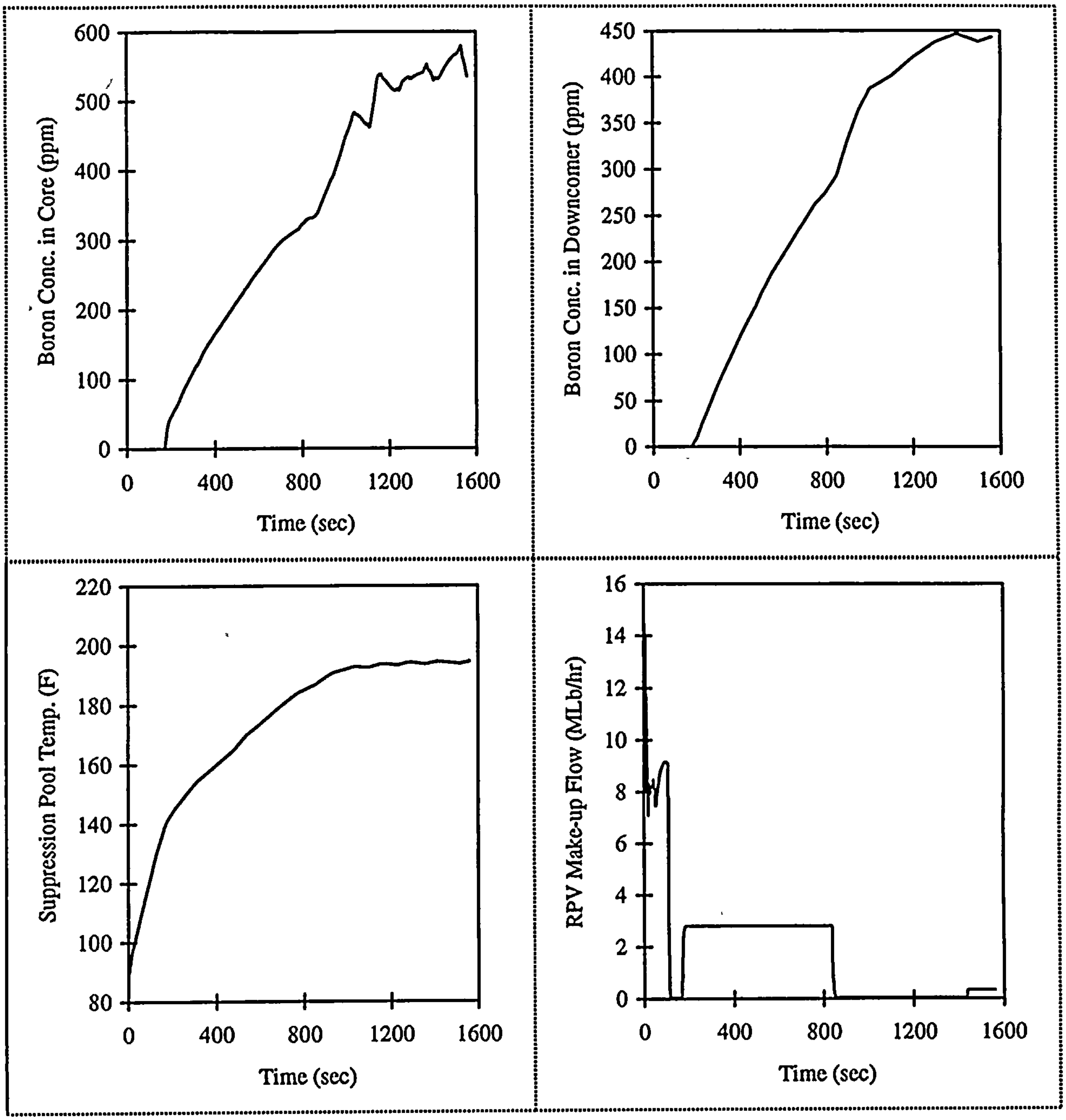

Figure Q2-6 SABRE calculation for MSIV closure ATWS with no manual water level control. HPCI and RCIC are allowed to initiate on low-level setpoints, inject at full flow, and trip on high-level setpoints. Boron transport calculated from SABRE flow model. Boron mixing threshold is 5Mlb/hr.

(3) Data for run similar to the one documented in figs 2.1.2.4-1 of the old 1992 document (NE-92-001) - Water level at TAF with large power oscillations attributed to SRV with level at TAF using the improved models in SABRE.

Figure Q3-1 shows SABRE calculation results for an MSIV-closure ATWS with level maintained near TAF (-161"). In this case there is no boron injection or manual control rod insertion. Level is controlled near TAF using HPCI and RCIC. The results do not show the large power oscillations that were evident in the 1992 report NE-92-001. The current SABRE calculations show only small power oscillations as a result of the following two modeling improvements:

1. SRV set points are now staggered to allow for instrument drift. In the 1992 report (NE-92-001), SRVs actuated in groups so there was a stronger interaction between reactor pressure and core power/flow.

2. The SABRE flow model used in the 1992 report was restricted to the co-current flow regime. During SRV actuation, this flow model over-predicted the incursion of moderator into the core, and consequently, the power response was exaggerated. In the current version of SABRE, co-current and counter-current flow regimes can be described. This full-range flow model predicts a much more dampened flow response to pressure perturbations. As a result, power oscillations due to SRV cycling are well behaved.

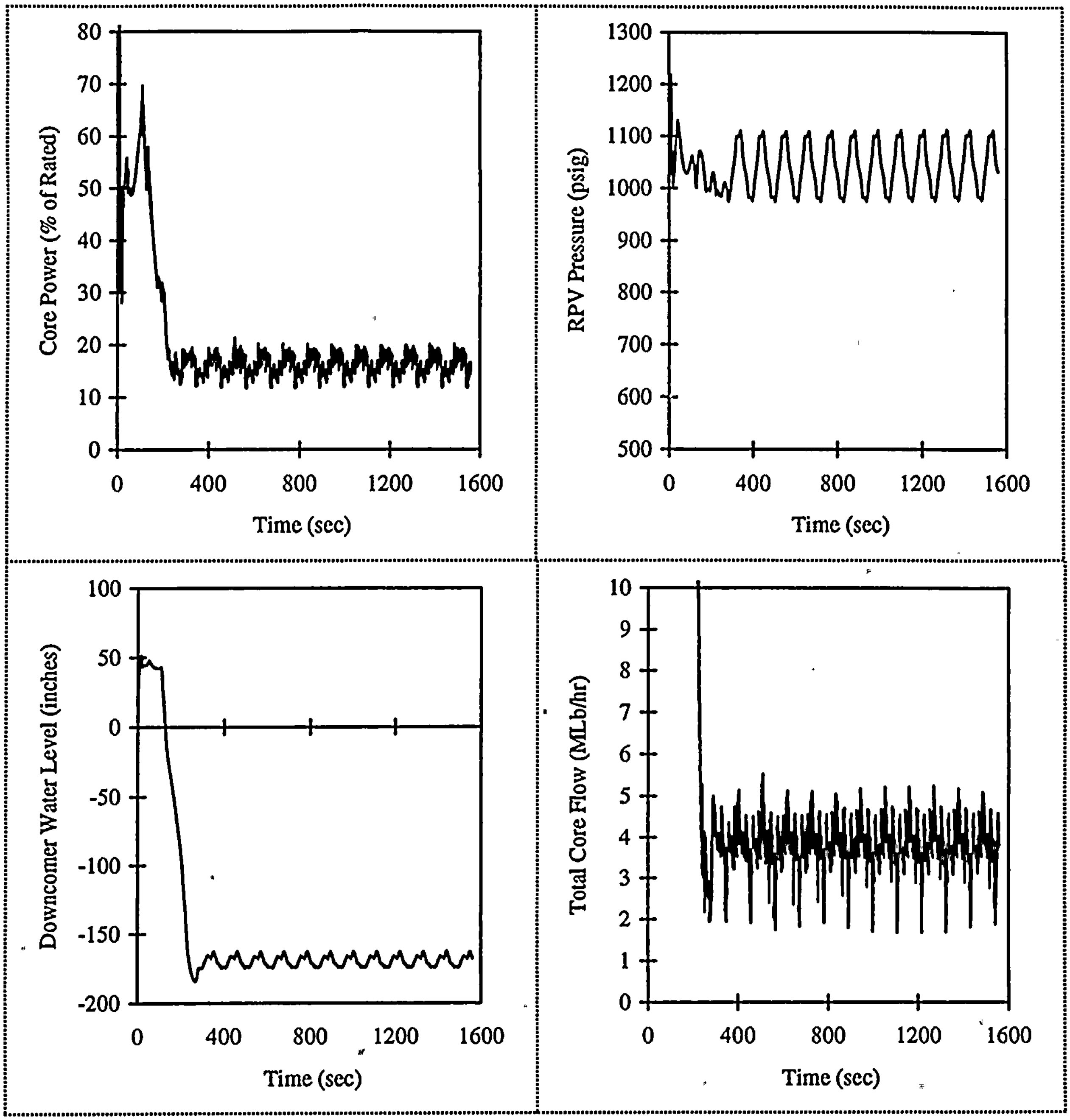

Figure Q3-1 SABRE calculation for MSIV closure ATWS with level control near TAF. HPCI and RCIC are used to control RPV water level. There is no boron injection or manual control rod insertion. SRVs actuate on individual setpoints which account for instrument drift.