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SUBJECT: Application for amend 148a to license DPR-43,revising ten second MSIV closure time assumption for MSLB accident stated in basis for TS 4.7,MSIVs.

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September 25, 1997

10 CFR 50.90

U.S. Nuclear Regulatory Commission
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Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Proposed Amendment 148a to the Kewaunee Nuclear Power Plant Operating License

Reference: 1) Letter from Clark R. Steinhardt (WPSC) to US NRC Document Control Desk, dated May 2, 1997

On May 2, 1997, Wisconsin Public Service Corporation (WPSC) submitted Proposed Amendment 148 to the Kewaunee Nuclear Power Plant (KNPP) operating license. The proposed amendment was submitted to revise the ten second main steam isolation valve closure time assumption for the Main Steam Line Break accident stated in the basis for Technical Specification (TS) 4.7, Main Steam Isolation Valves.

Subsequent discussions with Mr. Rich Laufer, NRC Kewaunee Project Manager, revealed the need to submit additional information to support the amendment request. WPSC is also proposing to make a modification to the basis for TS 4.7 from our original submittal. This submittal contains the additional information requested by NRC staff and supersedes Proposed Amendment 148, dated May 2, 1997, in its entirety.

By this submittal, WPSC requests NRC approval to revise a design basis assumption in Kewaunee's Main Steam Line Break accident analysis for the main steam isolation valve closure time. Upon approval of this change, WPSC will revise the basis for TS 4.7 as presented in this submittal (Attachment 5).

If you have any questions regarding this submittal, please contact Mr. Rick Pulec of my staff at (920) 388-8376.

Sincerely,

Mark L. Marchi for
Clark R. Steinhardt
Senior Vice President - Nuclear Power

LAS

Attach.

cc - US NRC - Region III
US NRC Senior Resident Inspector
Electric Division - PSCW

Subscribed and Sworn to
Before Me This 25th Day
of September 1997

Jeanne M. Ferris
Notary Public, State of Wisconsin

My Commission Expires:
June 13, 1999

ATTACHMENT 1

Letter from C.R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

September 25, 1997

Proposed Amendment 148a

Description of Proposed Change
Safety Evaluation
Significant Hazards Determination
Environmental Considerations

Introduction

Kewaunee Nuclear Power Plant (KNPP) Technical Specification (TS) 4.7 states that the main steam isolation valves (MSIV) shall be tested once per operating cycle and a closure time of five seconds or less shall be verified. The basis for the TS contains a statement that a ten second closure time is assumed for the MSIV in the Main Steam Line Break (MSLB) accident analysis. This ten second MSIV closure assumption refers to a statement found in earlier revisions of KNPP's Updated Safety Analysis Report (USAR). The following is the statement which appeared in the discussion of the MSLB accident analysis in earlier versions of the USAR:

> Moreover, for the purposes of these calculations, the stop and check valves' closure was conservatively delayed such that steam flow from both steam generators existed for the first 10 seconds.

In 1995, extensive revisions were made to USAR Section 14.2.5 to describe the changes to the MSLB containment response analysis, following approval of technical specification amendment 116 in support of the boric acid reduction project. During this revision, the statement shown above was eliminated from the USAR. However, KNPP's MSLB accident analysis continues to use the ten second MSIV closure assumption as described in the basis for TS 4.7.

WPSC is proposing to revise the ten second MSIV closure time assumption used in the MSLB accident analysis to allow more plant operational flexibility. The ten second closure assumption is an overly conservative value. In accordance with WPSC's safety evaluation procedure, this change was determined to require prior NRC approval because it decreases the margin of safety as defined in the basis for a TS.

By this submittal, WPSC requests NRC approval to revise the main steam isolation assumption in KNPP's MSLB aecident analysis to allow an assumption of five seconds for the MSIV closure. An assumed time for MSIV closure signal receipt and instrumentation delays, as appropriate to the accident sequence analyzed, will be added to the five second MSIV closure time. This request is further explained in Attachment 3. Upon approval of this request, WPSC intends to revise the basis for TS 4.7 as described in this submittal.

To support this request, the following information is provided:

Attachment 2 — Describes KNPP's MSLB accident scenario, major assumptions, and consequences of the event analyzed. It also describes how KNPP's current MSLB accident analysis methods compare to the original analysis methods documented in earlier versions of KNPP's USAR.

Attachment 3 — Describes the MSIV desigu, the current MSIV timing sequence assumption used in the MSLB and the proposed new assumption, and how the assumed timing sequence compares to actual timing that would be anticipated during a real event. It also includes a brief discussion of MSIV surveillance testing.

Attachment 4 — Provides the results of the MSLB accident analysis using a value of five seconds for MSIV closure as described in Attachment 3.

Attachment 5 — Provides the revised basis for TS 4.7 (page TS B4.7-1).

The following information supports the revision to the basis for TS 4.7:

Description of Proposed Changes to Basis for Technical Specification (TS) 4.7, "Main Steam Isolation Valves"

The Basis for TS 4.7 currently reads:

> The main steam isolation valves (MSIVs) serve to limit the cooldown rate of the Reactor Coolant System and the reactivity insertion that could result from a main steam break incident. Their ability to close upon signal should be verified at each major REFUELING outage. The USAR assumes a MSIV closure time of 10[(1)] seconds for a steamline break accident scenario. However, a closure time of 5 seconds is selected for the TS requirements, since it is more consistent with the expected response time for instrumentation as detailed in the steam line break[(1)] incident analysis.

Upon approval of the MSIV closure time revision, WPSC will revise the Basis for TS 4.7 to read:

> The main steam isolation valves (MSIVs) serve to limit the cooldown rate of the Reactor Coolant System and the reactivity insertion that could result from a main steam line break incident. They also serve to limit the amount of mass and energy released into containment from the unfaulted steam generator during a main steam line break incident. Their ability to close upon signal should be verified at each REFUELING outage. The MSIV closure time assumption used in the main steam line break incident analysis can be found in Section 14.2.5 of the USAR.

Accordingly, KNPP proposes to include a description of the MSIV closure time assumption in Section 14.2.5 of the USAR, following NRC approval of this change. The proposed wording will be similar to the following:

MSIV failure is modeled as a failure of the nonreturn check valve in the faulted loop. Steam flow from the unfaulted loop will continue until the MSIV in the unfaulted main steam line closes. A closure assumption of five seconds will be used for the MSIV. The time from the event initiation until MSIV closure signal receipt, plus signal instrumentation delays as applicable to the accident sequence analyzed, will be added to the five second MSIV closure time assumption.

Safety Evaluation for Proposed Change to Basis for Technical Specification (TS) 4.7, "Main Steam Isolation Valves"

The ten second closure assumption for the MSIVs in the MSLB accident analysis was chosen to ensure the analysis results bounded both the physical plant limitatious, as well as calculational capabilities of the computer models used in the early 1970's. The advances in computational technology since that time no longer require such gross conservatisms to ensure that the analysis results are sufficiently bounding to ensure plant operation will not pose an undue risk to the public health and safety. Using a value less than ten seconds for main steam isolation in the accident analysis will allow some desired flexibility in margin for other parameters without compromising the acceptance criteria for the results. In this particular instance, KNPP desires more operational flexibility in the range of control of steam generator water level during startup. Allowing more water inventory increases the severity of the accident analysis results (all other parameters equal). A MSIV closure assumption less than ten seconds will provide some margin to offset the consequences of increased inventory which will result in an accident analysis result with no increase in consequences. KNPP's request to use a MSIV closure value of five seconds is consistent with the MSIV closure assumptions docketed for other two loop Westinghouse plants.

This license amendment does not include a change to any TS. KNPP's MSIVs will continue to be tested according to the requirements of TS 4.7.

The wording in the basis for TS 4.7 has been slightly modified to improve its content. A statement has been added to more completely describe the functions of the MSIVs during a MSLB accident. The statement added describes the function to limit the amount of mass and energy released into containment from the unfaulted steam generator. The testing interval for the MSIVs is also described as during each refueling outage, eliminating the word "major." These changes are simply administrative in nature. The basis for TS 4.7 also refers the reader to Section 14.2.5 of the USAR to obtain the MSIV closure assumption used in the MSLB accident analysis. This change is considered administrative in nature since this is a relocation of an aceident analysis assumption. The analysis assumption will be maintained in the USAR.

The revision to the basis for TS 4.7 will not affect the health and safety of the public for the following reasous:

1) the specification for testing and verifying the closure time of the MSIVs (TS 4.7) will not change, and

2) the closure assumption for the MSIVs used in the MSLB accident analysis will not be less than the value required by TS 4.7. Five seconds for MSIV closure has been determined to be a conservative value when compared to closure time expectations during an actual MSLB event (refer to Attachment 3). The MSLB accident analyses have been shown to have acceptable results using five seconds for the assumed closure of the MSIV.

Significant Hazards Determination for Proposed Change to Basis for Technical Specification (TS) 4.7, "Main Steam Isolation Valves"

The proposed changes were reviewed in accordance with the provisions of 10 CFR 50.92 to determine that no significant hazards exist. The proposed changes will not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated.

   The closure time for the MSIVs is not an accident initiator. The surveillance requirement for the MSIVs will remain unchanged. Therefore, this change will not increase the probability of occurrence of an accident previously evaluated.

   The MSLB accident analysis has many conservative input assumptions. The ten second value for main steam isolation is one of those assumptions. This value can be reduced to a value no less than the value required by TS 4.7 and will still allow margin when compared to actual MSIV closure times expected. Changing the analysis input assumption will result in less severe analytical consequences, but does not change the underlying accident progression. Therefore, this change will not increase the consequences of an accident previously analyzed.

2. Create the possibility of a new or different kind of accident from any accident previously evaluated.

   This change revises a specific analysis assumption for the MSLB accident analysis. Changing the MSIV closure time assumption for analysis purposes will not create a new or different kind of accident from any accident previously evaluated.

3. Involve a significant reduction in the margin of safety.

   The MSLB accident analysis employs several conservative input assumptions. The revised assumption for the MSIVs continues to provide margin when compared to actual valve performance. The surveillance test results for the MSIVs over the past ten years, a total of 53 tests, revealed that the MSIVs close within 3-4 seconds, with them closing between 4-5 seconds on ouly four occasions. There is negligible flow through the main steam lines during surveillance testing. During an actual MSLB accident, the valves would be expected to close much more quickly due to the force of the steam upon the valve disc from the high steam velocity (refer to Attachment 3). In the past ten years, one MSIV failed to meet its surveillance timing test on one occasion, and the other MSIV failed to meet its timing test on two occasions. The cause of two of the three failures was attributed to sticking limit switches, which were valve indication problems, not valve performance problems. The cause of the remaining failure was not explicitly identified. The MSIVs have been very reliable in meeting their surveillance test requirements. The surveillance timing tests include signal delays and valve instrumentation delays, which were factored as separate values in the MSLB analysis, thus, making the main steam isolation analysis assumption greater (more conservative) than the technical specification acceptance criteria. Using a closure assumption of five seconds for the MSIV, in addition to signal and instrumentation delay time, will continue to provide conservatism in the MSLB accident analysis.

   The MSLB accident was reanalyzed using a value of five seconds for the MSIV, plus an assumed time for MSIV closure sigual and instrumentation delays. The analysis results met the acceptance criteria required by Kewaunee's USAR, and thereby, demonstrated that an adequate margin of safety is being maintained.

Environmental Considerations

This proposed amendment involves a change to the basis for a technical specification. It does not modify any facility components located within the restricted area, as defined in 10 CFR 20, or change any surveillance requirements. WPSC has determined that the proposed amendment involves no significant hazards considerations and no significant change in the types of any effiuents that may be released offsite and that there is no significant increase in the individual or cumulative occupational radiation exposure. Accordingly, this proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or enviroumental assessment need be prepared in connection with this proposed amendment.

ATTACHMENT 2

Letter from C.R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

September 25, 1997

<u>Proposed Amendment 148a</u>

Main Steam Line Break Analysis:

Description of Accident Scenario
Major Assumptions
Consequences of the Accident
Accident Analysis Comparison to Original Analysis

MSLB Accident Scenario

The MSLB accident scenario is a break in the main steam line inside containment that results in an uncontrolled steam release from a steam generator. The steam pipe break results in an initial increase in steam flow which decreases during the accident as the steam pressure falls. The steam flow out of the break removes energy from the Reactor Coolant System and causes a corresponding reduction of coolant temperature and pressure. In the presence of a negative coolant temperature coefficient, the cooldown results in a reduction of core shutdown margin. If the most reactive Rod Cluster Control Assembly (RCCA) is assumed stuck in its fully withdrawn position, there is an increased possibility that the core will become critical and return to power. A return to power following a steam line break is a potential problem mainly because of the high hot channel factors which exist when the most reactive RCCA is assumed stuck in its fully withdrawn position. Assuming the most pessimistic combination of circumstances which could lead to power generation following a steam line break, the core is ultimately shutdown by boric acid injection delivered by the Emergency Core Cooling System.

The analysis of a steam line break is performed to demonstrate that: 1) assuming a stuck RCCA, with or without offsite power, and assuming a single failure in the engineered safety features, there is no consequential damage to the primary system and the core remains in place and intact, 2) energy release to the containment from the worst steam line break does not exceed the containment design pressure, and 3) there will be no return to criticality after the reactor trips for an analyzed steam line break equivalent to the spurious opening, with failure to close, of the largest of any single steam bypass, relief or safety valve.

The following systems and components provide the necessary protection against steam line breaks:

1. Safety Injection System actuation from any of the following:

    a. Two-out-of-three low pressurizer pressure signals.
    b. Two-out-of-three low pressure signals in either steam line.
    c. Two-out-of-three high containment pressure signals.

2. The overpower reactor trips (neutron flux and ΔT) and the reactor trip occurring in conjunction with receipt of the Safety Injection Signal.

3. Redundant isolation of the main feedwater lines: sustained high feedwater flow would cause additional cooldown of the Reactor Coolant System. Therefore, in addition to the normal control action which will close the main feedwater valves, a safety injection signal will rapidly close all feedwater control valves, trip the main feedwater pumps, and close the feedwater pump discharge valves.

4. Trip of the fast-acting MSIVs. These valves are designed to close in less than five seconds on:

   a. The coincidence of a Safety Injection Signal with either Hi-Hi steam flow from the respective steam line (one-out-of-two per line) or Hi steam flow from the respective steam line (one-out-of-two per line) in coincidence with Reactor Coolant System Lo-Lo T_{avg} (two-out-of-four).

   b. Two-out-of-three Hi containment pressure signals.

   Each steam line has a fast-closing MSIV with a downstream nonreturn check valve. These four valves prevent blowdown of more than one steam generator for any break location, even if one valve fails to close. For example, in the case of a break upstream of the MSIV in one line, closure of either the nonreturn check valve in that line or the MSIV in the other line will prevent blowdown of the other steam generator. This arrangement precludes blowdown of more than one steam generator inside the containment and thus prevents exceeding the containment design pressure.

5. Each main steam line incorporates a 16-inch diameter venturi type flow restrictor which is located inside the containment. The venturi flow restrictors serve to limit the rate of release of steam for downstream breaks.

MSLB Major Assumptions

The following are the major assumptions used in the MSLB accident analysis:

1. Initial power levels of 0%, 30%, 70%, and 102% of rated power are analyzed.

2. The break location is either upstream or downstream of the steam line flow restrictor. The upstream case is a large (4.29 ft^2) break; downstream cases are 1.4 ft^2 (the area of the flow restrictor) or less.

3. Single failures of safeguards systems are analyzed.

4. Analyses are performed with and without the availability of offsite power.

5. The quality of steam exiting the break is explicitly modeled and is dependent on break size and power level.

6. Main feedwater (FW) flow is isolated by FW isolation or closure of the FW regulating valve.

7. The auxiliary feedwater (AFW) flow split between the two steam generators is modeled. All three AFW pumps are assumed to be operating.

8. The core physics parameters are based on a bounding set corresponding to end of cycle conditions and minimum technical specifieation shutdown requirements. The most reactive RCCA is stuck out of the core.

9. The main steam pressure balancing line is modeled to allow communication between the steam lines in an unrestricted manner. The steam release from the unfaulted steam generator is terminated by closure of the MSIV nonreturn check valve in the faulted main steam line or by closure of the MSIV in the unfaulted main steam line.

10. Initial steam generator water level is at 50.0% of the narrow range level span.

11. Emergency core cooling flow is delivered by one high head Safety Injection Pump. Boric acid concentration delivered to the reactor coolant loops corresponds to the minimum concentration of the refueling water storage tank which is 2400 ppm.

12. To maximize the reactor cooldown, steam generator tube plugging is at 0% and a conservatively high reactor coolant system flow is assumed.

13. The initial containment pressure is 16.85 psia.

MSLB Accident Consequences

An uncontrolled release of steam in containment from a steam generator will cause a cooldown and depressurization of the Reactor Coolant System and the Main Steam System, and a heatup and pressurization of the containment. The Reactor Coolant System's response to the event could potentially result in fuel failure. The containment's response to the event could potentially result in challenging the containment's structural integrity by exceeding the containment's design pressure and temperature. To prevent these consequences from oecurring, a Minimum Departure from Nucleate Boiling Ratio (MDNBR) limit is imposed and containment pressure and temperature must remain below their design limitations.

Comparison of Current MSLB Analysis to Original FSAR Analyses

Kewaunee's MSLB analysis methodology consists of analyzing core response and containment response. Core respouse analyzes for fuel integrity and predicts core MDNBR to prevent fuel failures and radiation releases. Assumptions are made and conservatisms are applied to maximize the Reactor Coolant System cooldown to predict the highest return to power with the largest peaking factors. Kewaunee's MSLB core response methods are consistent with the original Final Safety Analysis Report MSLB analysis.

Containment response analyzes containment pressure and temperature to eusure design limitatious are not exceeded to prevent challenging the containment's structural integrity and to prevent failure of safety related equipment due to extreme environmental conditions. Kewaunee's original licensing basis analysis for containment overpressurization was a simplified model, essentially performed using core response methods to predict the mass and energy releases to the containment. Assumptions were made and conservatisms were applied to maximize the mass and energy of the steam release into containment, which were known to potentially conflict with maximizing the return to power modeled in the core reponse. Entrainment was taken into account by multiplying the mass and energy releases by a constant adjustment factor. Only zero power level occurrence and full double-ended ruptures were considered.

In 1994, Kewaunee's containment respouse analysis methods were upgraded to support Proposed Technical Specification 131, elimination of high concentration boric acid in the boric acid storage tanks, boric acid transfer pumps, and boric acid heat tracing from the technical specifications. This proposed amendment was subsequently approved by NRC staff on March 28, 1995. The updated containment response analysis required a more sophisticated model which introduced additional, detailed assumptions. The updated analysis included: accounting for entrainment, complete power level spectrums, and break size and break location spectrums. Additional mass and energy sources were also taken into account, such as Feedwater line water, Reactor Coolant System and Main Steam metal structures, and reverse heat transfer from the intact steam generator. Although different from the original MSLB containment response analysis due to the increased complexity of the model, the current containment response model is consistent with the model developed in 1994 in support of the boric acid reduction project.

The following attachment describes the design of the MSIVs and details the assumptions used in modeling MSIV closure in the accident analysis. It also includes a comparison of the MSLB MSIV closure assumption to expectations during an actual MSLB event.

ATTACHMENT 3

Letter from C.R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

September 25, 1997

Proposed Amendment 148a

Main Steam Isolation Valves:

MSIV Design
MSLB MSIV Assumptions
MSIV Actual Response Expectations
MSIV Surveillance Testing

MSIV Design

Kewaunee's MSIVs are manufactured by Schutte & Koerting Company, model number 828-ADC. The design is a check valve assembly consisting of an air-operated MSIV butt welded to a free swinging nonreturn check valve. The MSIV is installed upstream of the nonreturn check valve and resembles a reverse installed check valve. The MSIV's disc is held open by an air operator and is designed to close in five seconds or less, as stated by the valve manufacturer. The MSIV assembly, both MSIV and noureturn check valve, is designed to be able to isolate flow and to prevent reverse flow.

The downstream, conventional nonreturn check valve, by manufacturer design, will close instantly upon experiencing reverse flow. Reverse flow would be seen in the event of a rupture between the steam generator and the MSIV causing steam flow from the opposite steam generator to work its way through the main steam header balancing line towards the break location.

The MSIV is capable of isolating flow in five seconds or less to prevent damage from a rupture downstream of the valve or to prevent feeding flow into a faulted opposite main steam line.

MSIV Timing Sequence Assumption in MSLB Analysis

Kewaunee's original Final Safety Analysis Report (FSAR) included a statement that the steam flow from both steam generators was assumed to exist for the first 10 seconds after the main steam line break. This statement was carried over into the basis for TS 4.7 and was repeated as "The USAR assumes a MSIV closure time of 10 seconds for a steamline break accident scenario." Due to the unclear content of the wording in the basis for TS 4.7, KNPP used a ten second value for the MSIV closure time, not including time for instrumentation delays. The current MSLB analysis MSIV closure assumption is greater (more conservative) than the ten seconds required by the orginal FSAR analysis by assuming that main steam flow exists for 12.5 seconds after adding instrumentation delays (see table below). However, the ten second MSIV closure time (or, main steam isolation time), as well as the 12.5 seconds currently being used, is considered to be overly conservative. A value of five seconds for the actual MSIV valve closure, plus time for instrumentation delays, is desired, which will reduce the time for main steam isolation to occur to a value less than ten seconds.

Kewaunee proposes to reloeate the MSIV closure assumption from the basis for TS 4.7 to USAR Section 14.2.5. The USAR will include a five second closure time assumption for the MSIV, plus an assumed time for MSIV closure signal receipt and instrumentation delays as appropriate to the details of the accident being analyzed.

The following is a description of the assumptions in KNPP's current MSLB analysis, from MSLB accident initiation to MSIV closure. Conservative values were chosen for the assumptions. Also, included is the new time sequence proposed for the MSLB analysis.

	Current (seconds)	Proposed (seconds)
Safety Injection (S) Signal on Hi Containment Pressure	1.5	1.5
S Signal Delay	0.5	0.5
MSIV Signal Delay (MSIV Signal on Hi Hi Steam Flow Coincident with S)	0.5	0.5
MSIV Closure Time	**10.0**	**5.0**
Total Time to MSIV Closure from Accident Initiation	12.5	7.5

The above MSIV timing sequence is a typical MSLB assumption taken from the most limiting containment response ease, that is, the event scenario resulting in the least margin when compared to the analysis acceptance criteria. The time sequence assumption for the safety injection signal will vary slightly depending on the accident sequence analyzed. The example shown is a typical case where the MSIV in the unfaulted steam generator is relied upon to isolate the main steam flow to the faulted main steam line. KNPP's current analysis uses ten seconds for the MSIV closure time. WPSC is proposing to change this value to five seconds for the MSIV closure, with additional signal delays as used before. Although the analysis assumption for main steam isolation would be reduced from 12.5 seconds to 7.5 seconds in this example, the assumption remains conservative with respect to an expected main steam isolation time of 4.49 seconds during a real event, as shown in the table below.

MSIV Actual Response Expectations

The following table displays a conservative, expected time for the MSIVs to close during an actual MSLB accident.

	Seconds
Safety Injection (S) Signal on Hi Containment Pressure	0.8
S Signal delay	0.35
MSIV signal delay	0.1
MSIV closure	3.24
Anticipated Actual Time to MSIV Closure from Accident Initiation	4.49

The following paragraphs provide some additional details about the values presented in the above table.

1. The Safety Injection signal on Hi containment pressure is ealculated as the approximate time for containment pressure to reach 4 psig.

2. The Safety Injection and MSIV signal delays have been calculated by reviewing the actuation circuitry. For those transmitters, bistables and relays where actual vendor data for response time is not available, conservative assumptions are used.

3. The MSIV closure time is estimated using the valve manufacturer's test data on file. The manufacturer test data does not include signal delays and circuit delays. The tests were performed at main steam design pressure and temperature, with no main steam flow present. The valves would close more quickly in a real event with steam flow present.

MSIV Surveillance Closure Time Tests

The MSIVs are tested at hot or intermediate shutdown to ensure timely closure in accordance with TS 4.7, Main Steam Isolation Valves. TS 4.7 requires a closnre time of five seconds or less. The velocity of the main steam at hot or intermediate shutdown has been calculated to be approximately 0.8 ft/sec. With this test condition, historical surveillance test results demonstrate that the valves are capable of reliably meeting the five second closure requirement.

Valve closure during an accident would be much faster than the closure which occurs during surveillance testing because of the significantly higher main steam velocity, which will cause the disc to seat more rapidly. The velocity of the main steam during the MSLB analysis's most limiting case, at 0% power operation with flow from the intact steam generator and a fault in the opposite main steam line, has been calculated to be approximately 329 ft/sec. Once the MSIV's disc enters the flow stream, it will immediately close due to the steam force on the disc, thus improving the response time of the valve when compared to the response time seen during testing.

Another important factor is that the five second closure time requirement for the surveillance test includes more than the MSIV closure time. Signal delays and circuit delays are included in the timed value, as are human respouse delays associated with stopwatch timing. The signal delays and circuit delays are accounted for with separate assumptions in the MSLB analysis, which increases the total time for main steam flow. Use of a larger main steam isolation time delay in the analysis is more conservative in that it allows more time for main steam to discharge into the containment, thus reaching a higher peak containment pressure and temperature.

The MSLB core response and containment response cases with the least margin when compared to the analysis acceptance criteria (limiting cases) were reanalyzed using the proposed five second assumption for the MSIV closure as described above. The results of the reanalysis are presented in the following attachment.

ATTACHMENT 4

Letter from C.R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

September 25, 1997

Proposed Amendment 148a

MSLB Analysis Results

MSLB Analysis Results Using Proposed Five Second MSIV Closure Time

The MSLB accident is analyzed for containment response and core response as described in Attachment 2. The core response and containment response cases with the least margin when compared to the analysis acceptance criteria (limiting cases) were reanalyzed using the proposed five second assumption for the MSIV as described in Attachment 3. The results show that KNPP continues to meet the MSLB acceptance criteria using the five second MSIV closure assumption as explained in Attachment 3. The following table shows the MSLB acceptance criteria and the results of the reanalysis for the limiting cases.

	Acceptance Criteria	Reanalysis Result
Containment design pressure	60.7 psia	60.7 psia
MDNBR	> 1.45	1.94

More detailed results of the limiting case containment response and core response analysis are included as Figures 1 and 6. Figures 2-5 and 7-11 provide additional transient curves for the limiting cases. The following figures are enclosed:

In conclusion, the proposed MSIV closure time assumption is a conservative value with respect to the MSIV closure expected during a real event. The results of the MSLB reanalysis using the new MSIV closure assumption show that acceptable analysis results are achieved and demonstrates that an adequate margin of safety is being maintained.

FIGURE 1

MAIN STEAM LINE BREAK

CONTAINMENT RESPONSE RESULTS

Break Area (ft^2)	Power Level (%)	Single Active Failure	Offsite Power Available	Peak Pressure (psia)	Time (sec)	Peak Temp (°F)	Time (sec)
1.4	0	MSIV	Yes	60.7	96.7	267.9	96.7

FIGURE 2

MAIN STEAM LINE BREAK

CONTAINMENT RESPONSE

Tave vs TIME

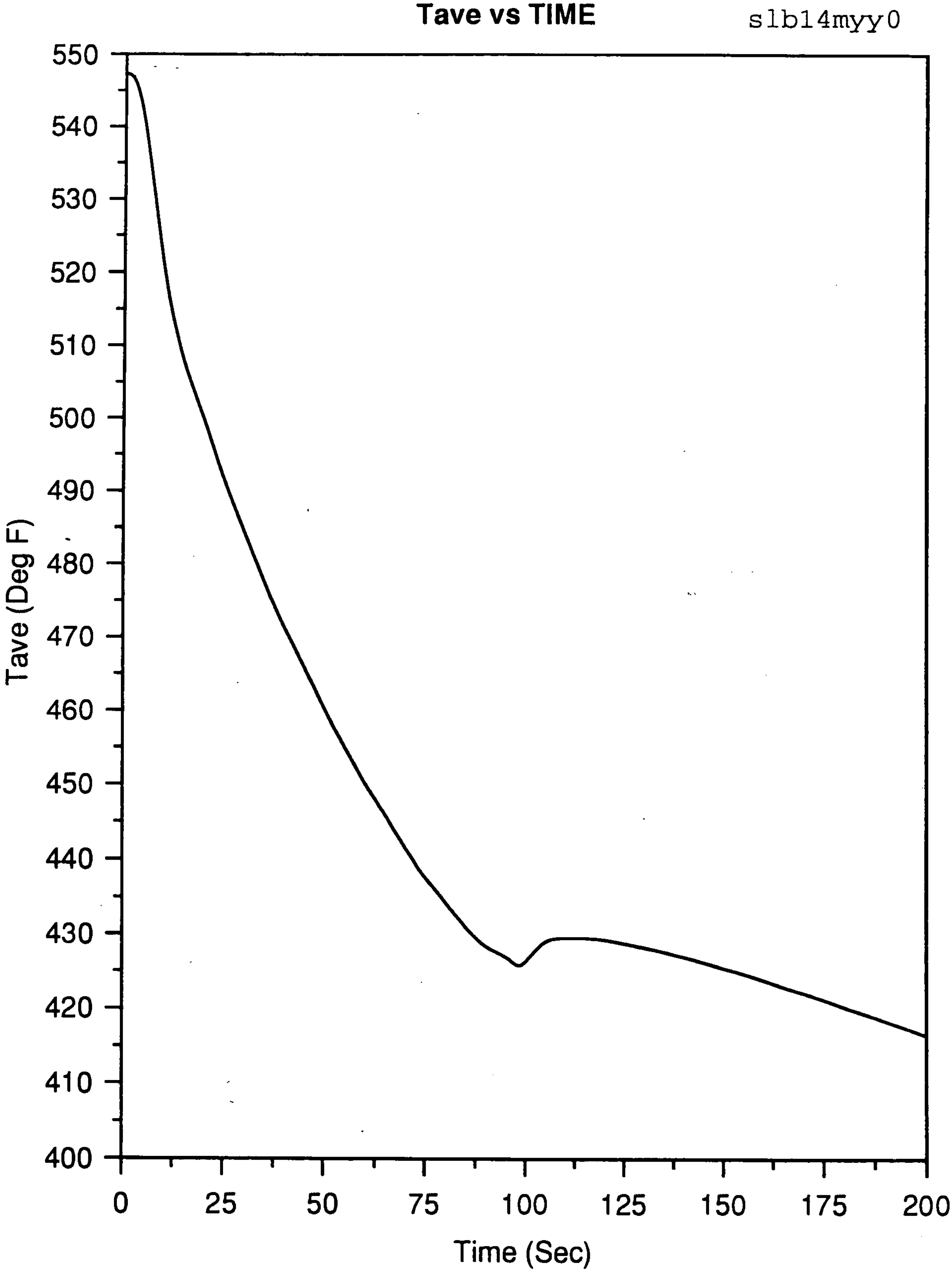

FIGURE 3

MAIN STEAM LINE BREAK

CONTAINMENT RESPONSE

SG WIDE RANGE LEVEL vs TIME slb14myy0

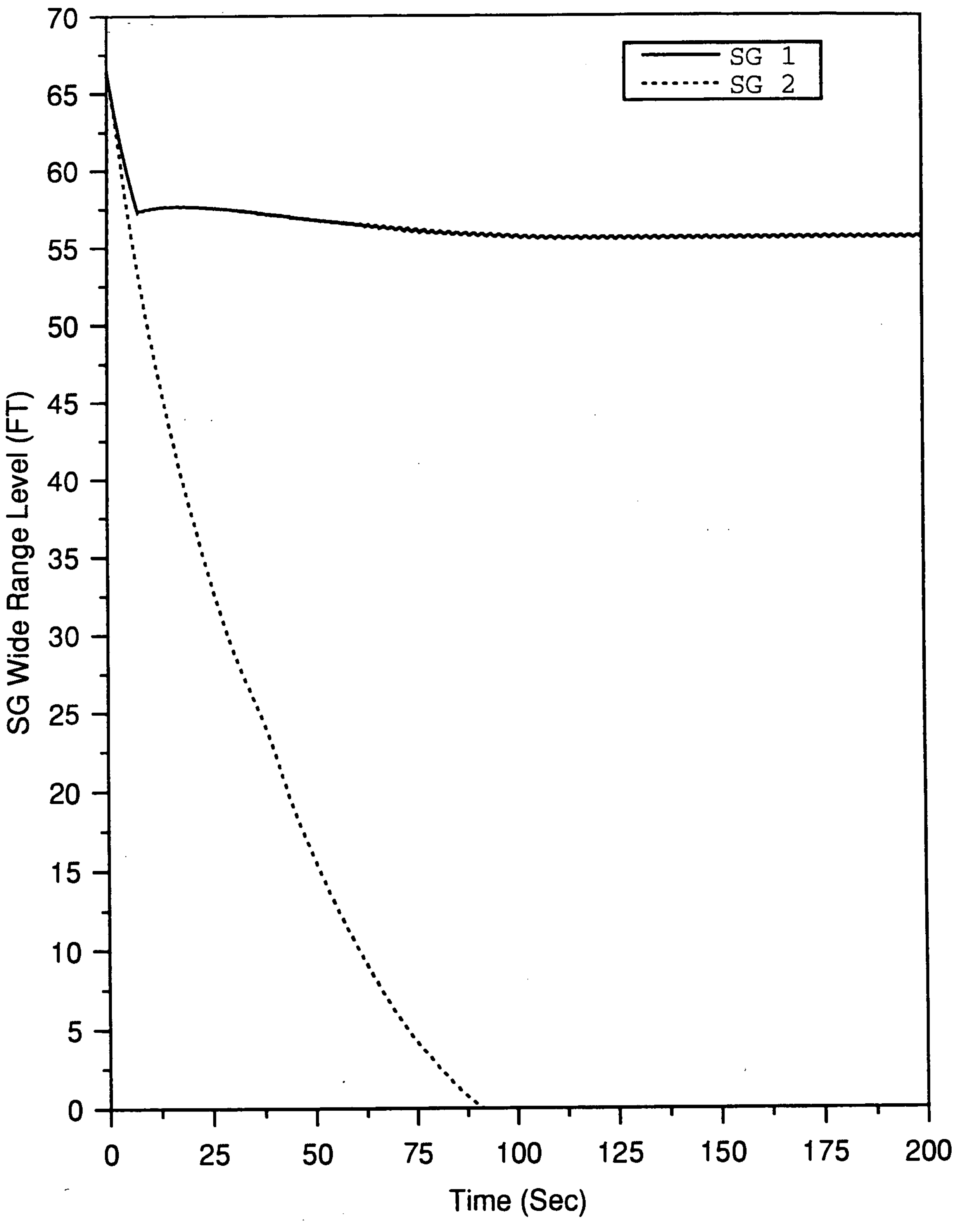

FIGURE 4

MAIN STEAM LINE BREAK

CONTAINMENT RESPONSE

SG PRESSURE vs TIME

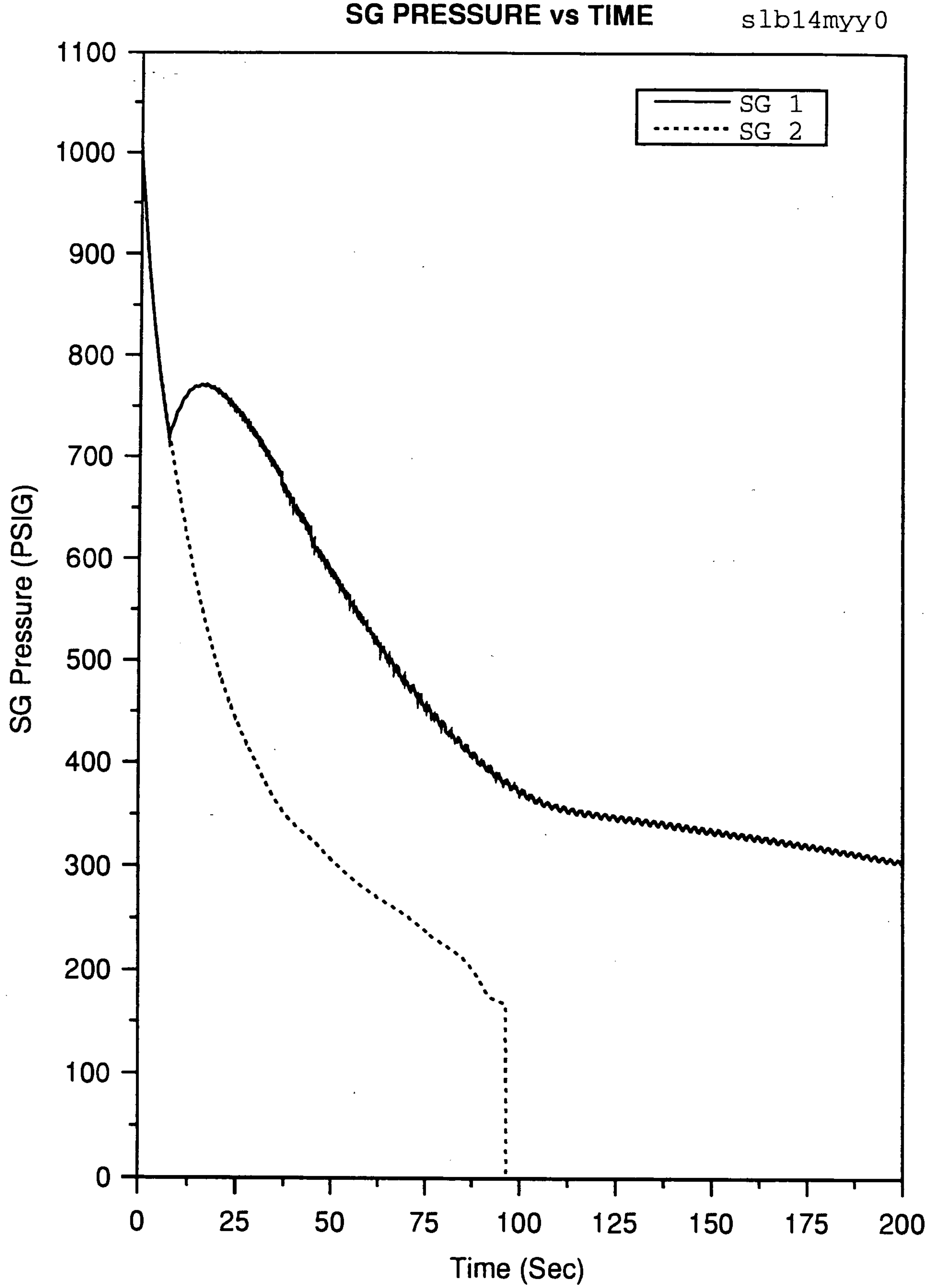

FIGURE 5

MAIN STEAM LINE BREAK

CONTAINMENT RESPONSE

SG 2 BREAK FLOW vs TIME slb14myy0

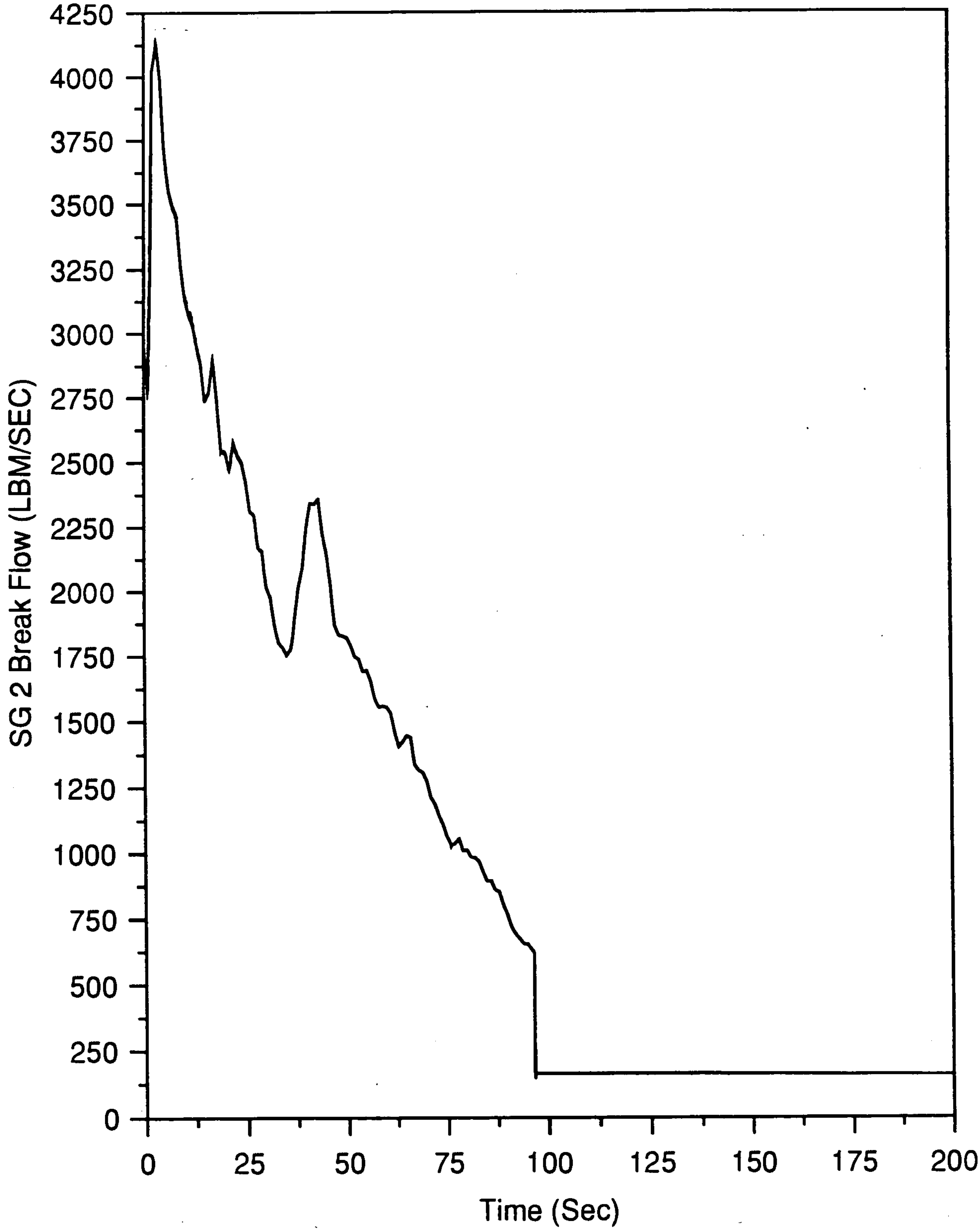

FIGURE 6

MAIN STEAM LINE BREAK

CORE RESPONSE RESULTS

Case	$F_{\Delta H}$	Tinlet °F	Pressure Psia	Heat Flux % of 1650 Mwt	Flow Mlbm/hr	MDNBR
Break Upstream of Flow Restrictor	4.40	377.0	898.9	54.1	68.4	1.94

FIGURE 7

MAIN STEAM LINE BREAK

UPSTREAM FLOW RESTRICTOR

CORE TAVE vs TIME

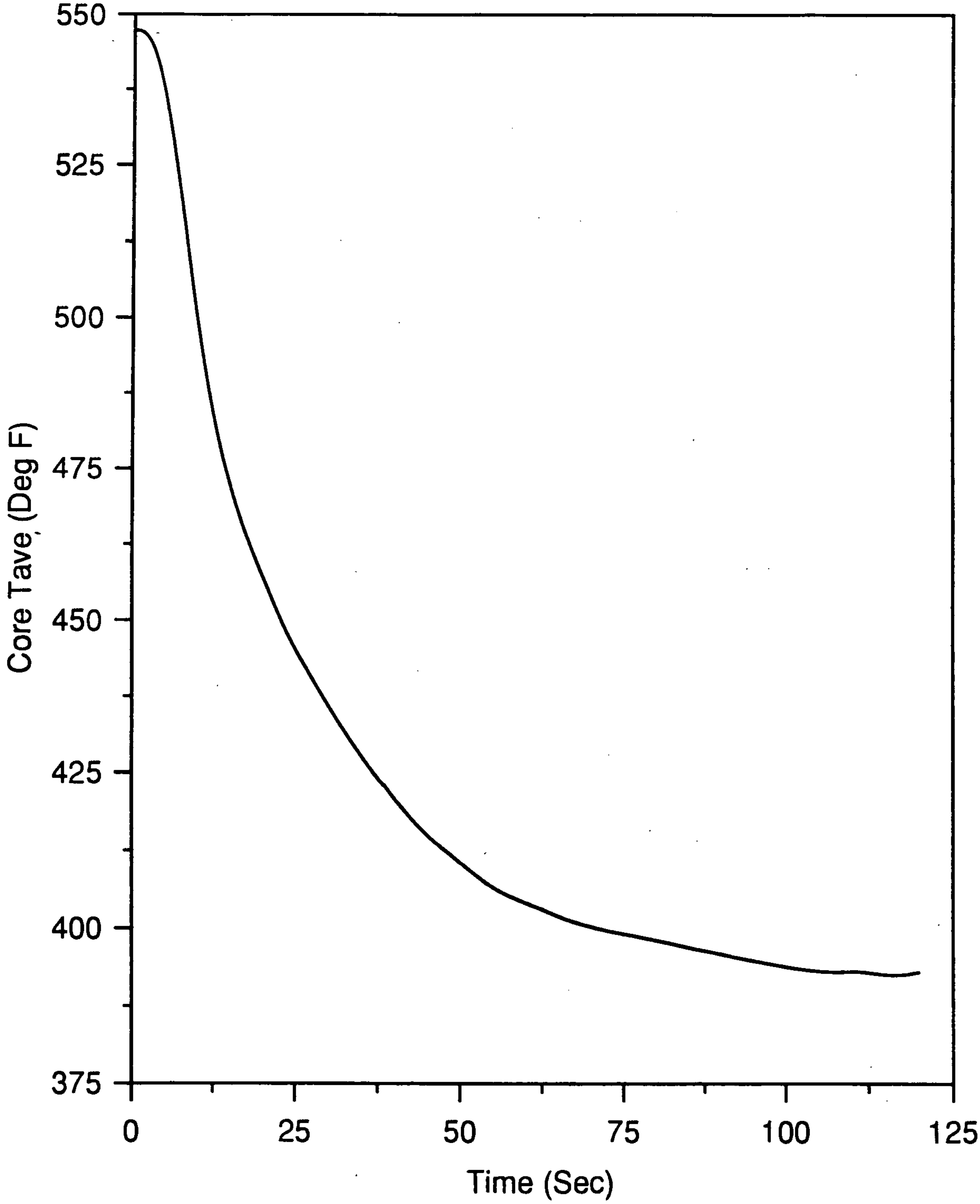

FIGURE 8

MAIN STEAM LINE BREAK

UPSTREAM FLOW RESTRICTOR

CORE HEAT FLUX vs TIME

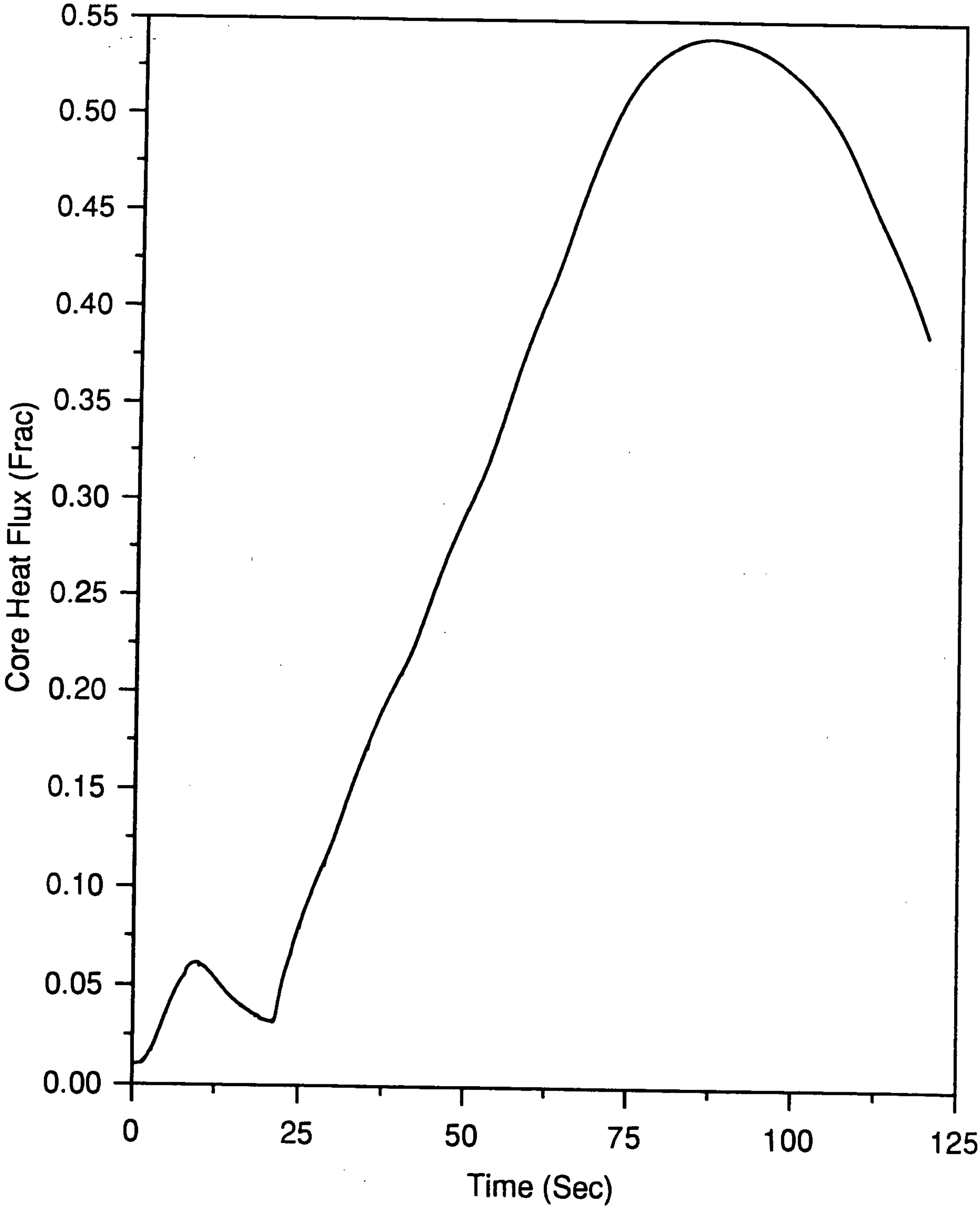

FIGURE 9

MAIN STEAM LINE BREAK

UPSTREAM FLOW RESTRICTOR

PRESSURIZER PRESSURE vs TIME

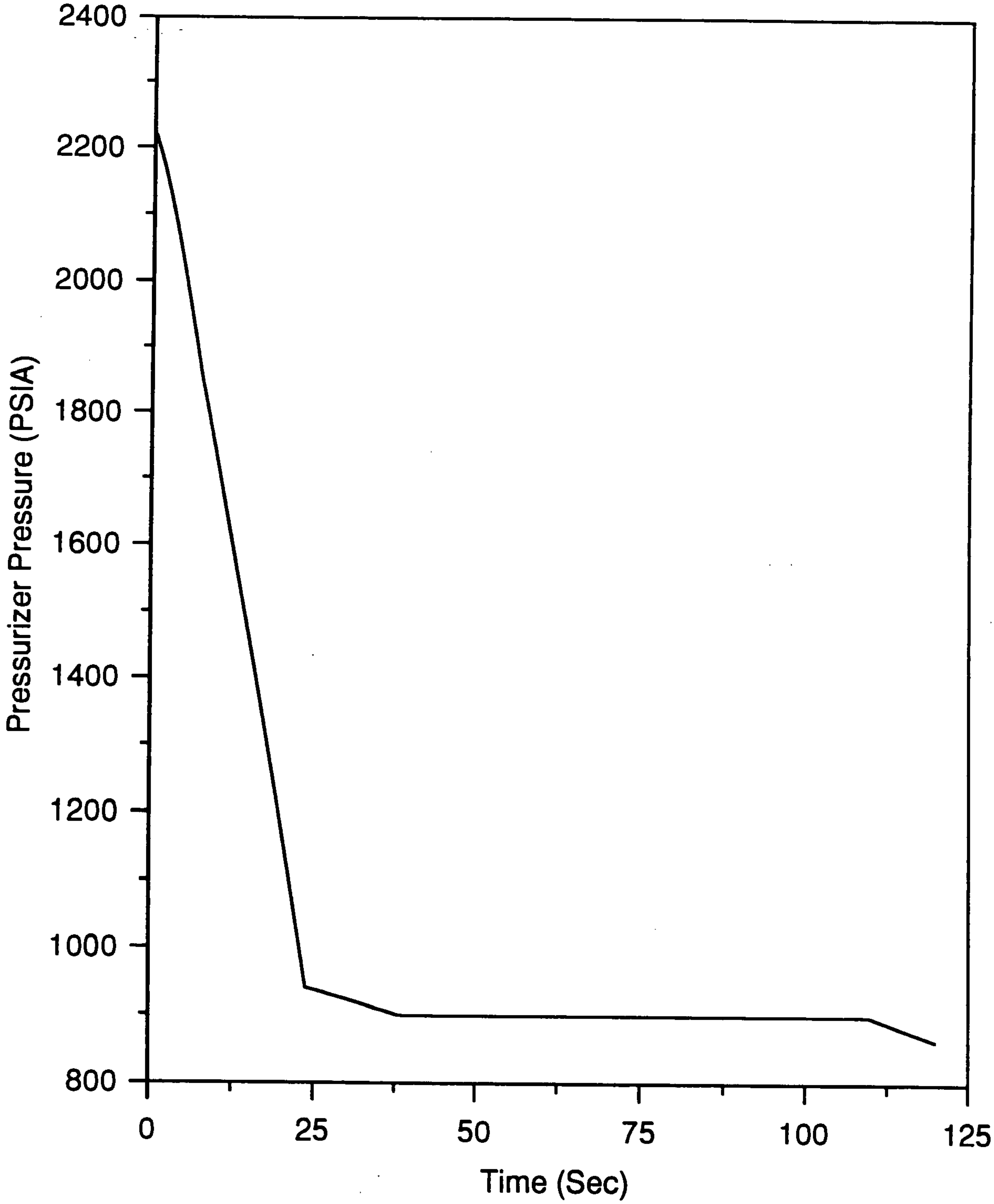

FIGURE 10

MAIN STEAM LINE BREAK

UPSTREAM FLOW RESTRICTOR

SG2 BREAK FLOW vs TIME

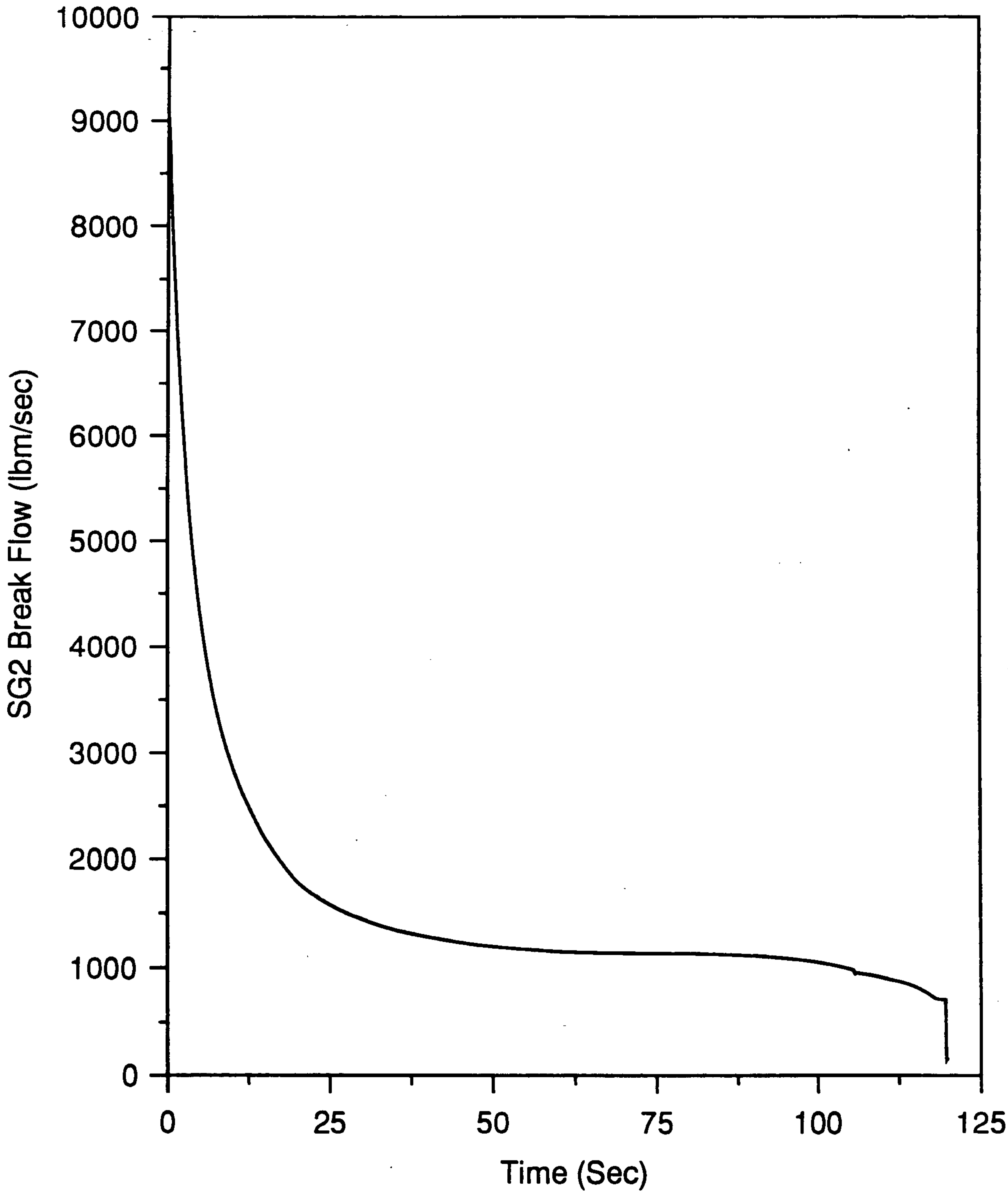

FIGURE 11

MAIN STEAM LINE BREAK

UPSTREAM FLOW RESTRICTOR

REACTIVITY vs TIME