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ROOT CAUSE ANALYSIS FOR

UNSATISFACTORY LICENSED OPERATOR REQUALIFICATION PROGRAM

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UNSATISFACTORY LICENSED OPERATOR REQUALIFICATION PROGRAM

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ROOT CAUSE ANALYSIS SUMMARY

TITLE: UNSATISFACTORY LICENSED OPERATOR REQUALIFICATION PROGRAM

PROBLEM STATEMENT: Operator Performance in Severe Accident Conditions Less than Adequate

METHODOLOGY:

The scope of this report is to analyze the programmatic failure and continued operator performance issue, determine the causes of these problems, and propose corrective actions regarding the Supply System Operator Requalification Program. With regard to the previous Root Cause Analysis on this topic (root cause dated 15 April 1991), this report addresses the reasons why the identified causes and corrective actions failed to ameliorate the program.

The Root Cause Analysis team members consisted of three principal engineers from the Operating Experience Assessment Department. The investigation process involved a review of exam evaluators' notes, interviews with operators, evaluators and all levels of management, and extensive research into the events that preceded less than adequate performance in severe accident conditions.

Evaluation records from the simulator scenarios were analyzed and compared with the NRC evaluations to determine causes of individual and crew failures. Interviews with all operators were conducted to further develop the specifics and the sequence of events. Event and Causal Factors Flow Charts were subsequently developed and are located in Appendix 1.

Following development of the Flow Charts, an in-depth analysis using Management Oversight and Risk Tree (MORT) analysis was initiated. This analysis considered the following subsystems:

- Barrier Failure Analysis
- Control Failure Analysis
- Management System Analysis
- Hazard Analysis

Concurrent with these efforts, interviews with personnel involved in the examination process and all levels of management were conducted to ensure the accuracy of the root cause determination.

SUMMARY OF CAUSES:

The major causes of the operator's continued inability to respond to severe accident conditions are:

Management standards, expectations, and leadership were less than adequate in that they allowed the training, performance, and procedural deficiencies to develop and persist through the requalification and remediation time periods.

Training was less than adequate in that the remediation process was not comprehensive enough to cover all facets of the procedures and the policies required to fully support operator performance in severe accident conditions.

EOPs were less than adequate in that human factors and technical improvements were needed to facilitate the use of these procedures during severe accident conditions.

1. Licensed Operator Requalification Training Deficiencies

The licensed operator remediation process had several deficiencies which are summarized below as program scope and content issues.

1.1 The retraining program was less than comprehensive in that selected legs of the EOPs and Emergency Support Procedures (ESPs) were only presented in classroom discussions. The decision to limit the scope of the program was based on scenario credibility relative to real time development, and schedule limitations.

1.2 Use of Procedures and Technical Specifications were deficient. Examples are:

- o Improper use of the EPIPs resulted in an incorrect event classification

- o Not entering the Technical Specifications requirement of 3.0.3 resulted in untimely shutdown of the plant as required by Limiting Condition for Operation.

1.3 The exam analysis indicated lack of required knowledge in several areas.

- o Slow or inaccurate diagnosis of electrical malfunctions and the degraded system configuration resulting from these malfunctions was apparent during several scenarios.

- o Problems in recognizing and diagnosing level instrumentation failures were evident in more than one crew.

- o There was a failure to completely understand plant and systems response during plant electrical malfunctions.

- o Improper operation of equipment and instances of lack of awareness concerning system status were evident during complicated and involved scenarios.

- o Confusion existed in the prioritization of reactor pressure vessel (RPV) versus containment recovery with only one injection system available.

1.4 Command, control and communications were noted in multiple evaluations as unsatisfactory regarding effective performance in rapidly developing emergency events. The evaluations were included in Quality Assurance (QA) Surveillances, peer utility review, and analysis from requalification, operational evaluation and re-examination.

Trainer evaluation techniques and critique practices proved to be less than adequate.

1.5 Increase objectivity is required in making readiness determinations and management needs to set proper standards and appropriate thresholds for such determinations. This was evident in the lack of specific guidance for the management oversight of the remediation process.

1.6 Instructor skills and training methods were less than adequate prior to re-exam on the 5,6 June 1991 when compared to the industry "best" practices. Likewise, their knowledge level in the bases of the EOPs required enhancement, as indicated by contractor and utility observations. This area has seen improvement but needs continued upgrade.

1.7 Comments and recommendations of peer evaluators showed that trainers should have been more critical of Operators. Management has the responsibility to set clear expectations of performance, Operations should transmit these to the crews and Training needs to enforce the same. This disconnect was made evident by the difference in evaluation of the Z crew between the NRC and the Supply Systems evaluators in the competencies.

2. Human Factors and Technical Deficiencies in EOPs

Previously noted upgrades to the Emergency Operating Procedures and program maintenance could have facilitated improved performance in the operators' handling of severe accident conditions.

2.1 Implementation of the EOP program from development of the Plant Specific Technical Guides (PSTG), to compliance with the Writer's Guide, has received critical review from internal and external auditors. Outside consultants have been retained to review and upgrade the EOPs and provide objective and impartial assessment of the EOP program. Ceil·Consultants, General Physics, FRG Corp., and Operations Engineering have made note of programmatic disparities which must be addressed to sustain a quality EOP program. Specific comments are in Appendix 2 and Section 5.0 References.

Operators' lack of confidence in the viability and veracity of the EOPs has been demonstrated in resistance to literal compliance and deviations taken during examinations.

2.2 Policy changes with respect to compliance and deviation requirements for the EOPs may have eroded operator confidence and understanding in EOP usage. Attempts were made to justify these deviations with the exception provided in 10 CFR 50.54 (x). This issue was adequately addressed in a memorandum issued by S.L. McKay, Operations Manager, J.W. Baker, WNP-2 Operations Manager, and A.L. Oxsen, Assistant Managing Director for Operations (Acting) "Procedural Usage." Deviations from required procedures on the re-exam (June 1991) were determined to be inadvertent oversights or incorrect judgements.

Failure to incorporate corrective actions into the EOPs when deficiencies were noted, has exacerbated the disparity between the Supply System's procedures and industry standards.

2.3 NRC inspection of the EOPs in Oct 1990, resulted in Open Items and Concerns which the Supply System did not fully heed. Instead, the Supply System's response was to consider existing procedures adequate or to discuss these concerns with the BWR Owner's group.

2.4 Peer evaluation by multi-utility experts in May 1991, noted problems with the EOPs, both in human factors and technical adequacy. Select recommendations from these evaluators were incorporated, while some specific recommendations were not. For complete development on this issue, refer to Appendix 3 of this document.

2.5 Requalification examination, Operational Evaluation, and remediation training resulted in questions/concerns about use of the EOPs. While a memorandum from S.L. McKay, Operations Manager, was issued to address the concerns, the disparities were not all fully resolved prior to re-examination in June.

3. Management Issues

The root cause investigation (See Appendix 1 & 2) identified four major management related factors which allowed the emergency procedure and licensed operator training deficiencies to develop initially and persist, ultimately leading to the requalification examination failures. These factors were:

- o Expectations and leadership less than adequate
- o Failure of oversight activities to identify problems
- o Corrective action plan was not comprehensive enough
- o Use of industry experience less than adequate

Each of these factors is discussed in more detail below.

3.1 Expectations/Leadership Issues

Management expectations, day-to-day involvement, and overall leadership in the areas of EOP development and operator performance on severe accident scenarios were not sufficient to prevent the operator performance deficiencies evidenced in the examination failures. Management was over-confident in the quality of the EOPs and the operator's ability to execute them. As evidence of problems in these areas began to appear, there was a lack of responsiveness to "critical" inputs. Examples include the Supply System response to the NRC EOP inspection in Oct 1990, and initial management reaction to the operator requalification examination in 1991. Control room communications standards, command and control standards, training scenario difficulty, training evaluation standards and methods, EOP human factor practices, and EOP verification and validation implementation, are examples of areas where management expectation fell behind emerging industry standards.

In the EOP development area the Supply System management placed excessive reliance on a small number of highly technical experts. Well defined program plans and program control were not in place. There were not sufficient checks and balances, bench-marking against industry practices, independent oversight, and management involvement to avoid the technical and human factors deficiencies that were observed in the EOPs and that impacted the operator's ability to respond to severe accident conditions during requalification examinations.

Management has recognized the weaknesses described above and aggressive measures have been or are being implemented to strengthen management involvement in all aspects of the Operator Requalification Training Program and Emergency Operating Procedure upgrades. A memorandum dealing with EOP development was issued by A. L. Oxsen, Assistant Managing Director for Operations (Acting) dated 8 July 1991. It states, "Because of the critical nature of the EOP rework program, I feel it necessary to provide senior management oversight of the effort. Effective immediately, C.M. Powers, Director of Engineering, is assigned overall responsibility for the completion of Phase I and Phase II of the project and will provide direction to all personnel." Additionally nationally recognized consultants have been retained to ensure the technical adequacy of our EOP upgrade program and management involvement has increased dramatically in this area.

With respect to performance issues several instances of unsatisfactory performance led management to increased involvement in the remediations process. They were:

- o EOP requirements to inject Standby Liquid Control (Re: PPM 5.1.1)
- o Initiate CAC as required by PPM 5.2.1.
- o Not consulting the ARPs led to a failure to restore the RHR water leg pump to service

In each of these instances, deviations were taken from the EOPs, and these resulted in failure of Individual Simulator Critical Task (ISCTs) and ultimately crew failures.

The main root cause recommendation in the area of management expectation is to take steps to avoid the potential for similar problems of overconfidence, lack of involvement, resistance to criticism etc. in program areas other than licensed operator training and EOP development.

3.2 Failure of Oversight to Identify Problems

Internal oversight by quality and nuclear safety organizations failed to identify significant issues in the areas of EOP adequacy and licensed operator requalification training. Lessons learned were evaluated and documented in an internal memorandum from G.D. Bouchey, Licensing and Assurance Director to D.W. Mazur, Managing Director, "QA Oversight of Licensed Operator Training" dated 17 May 1991. In summary, the major issues were:

3.2.1 The QA oversight organizations had conducted assessments of training, however, the expectations were short of emerging industry standards so as to be unsuccessful in identifying the EOP or Operator Requalification Training deficiencies. The evaluations also did not include a sufficient assessment of industry experience. More in-depth oversight of training programs on an on-going basis is needed.

3.2.2 The assessments may have been overly influenced by positive prior assessments such as the INPO review of operator crew simulator performance in Dec 1990.

3.2.3 The major recommendations from the root cause in this area include:

- Increased oversight in the training area,
- Improved use of industry bench-marking data in all oversight assessments
- Increased QA expertise in the EOP area through use of expert consultants

3.3 Corrective Action Processes Less Than Adequate

Corrective action programs failed to achieve the desired results. The two major opportunities for success were the previous Root Cause Analysis (and associated corrective actions) and the multi-utility peer team.

3.3.1 Since the corrective action plan was developed from the Root Cause Analysis, the logical basis is to ascertain the failure of the previously performed root cause and identify actions that preclude recurrence. The previous root cause was focused on test behavior and performance, and did not recognize the implications for operator performance in the plant and specifically the EOPs. Therefore the objective of the root cause was to establish what it takes to pass the test as opposed to addressing the broader implications. An individual assigned to the team who is more familiar with the philosophy of the EOPs may have recognized the broader implications and therefore focused the program on the importance of a more comprehensive approach as opposed to merely an improvement in depth. This can be seen by the magnitude of the Corrective Action Plan Rev 7 dated 6 Aug 1991 as compared with the Corrective Action Plan dated 16 May 1991.

3.3.2 Schedule pressure caused the operators to perform four (4) hours of training followed by normal eight (8) hour shift rotation. This may have provided a less than optimal environment for effective training.

3.3.3 Although assessed for impact, a large number of significant changes were introduced in the remediation process, mitigating effective implementation. Among these are:

- Revision to the EOP flow charts
- Revision to "Conduct of Operations" procedure
- Change in the communications policy
- Recently qualified reactor operators were requested to staff one of the re-exam crews

3.3.4 The Supply System requested the multi-utility peer team to evaluate the training process and individuals/crew performance, and determine if the exam crews were ready to take an NRC administered simulator exam and provide recommendations to improve performance.

Four of the peer group's recommendations; to train operators on the new revisions, to retain consultants to perform human factors upgrade, to publish a communications policy, and to upgrade evaluation techniques were incorporated. In particular the peer group's recommendations on control room communications triggered vigorous management action. Management's response to this recommendation appears to be the "turning point" in achieving a significant improvement in crew acceptance of improved communications practices.

The peer group's fifth recommendation, relative to exam preparation, was that it was a risk decision to examine the crews before the current EOPs were revised and the crews retrained. The problems noted were: deviations from the Emergency Procedure Guidelines (EPGs), non-user friendly conventions and unincorporated changes previously presented in training. Short term corrective actions which resulted in minor EOP changes, written clarification of policies and the associated training was accomplished. In light of the 5,6 June examination failures and subsequent program to upgrade EOPs, the management decision to not significantly revise the EOPs in late May based upon this input in conjunction with other data on EOP adequacy was flawed.

3.4 Use of Industry Experience Less Than Adequate

Prior to the initial Requalification exam and the follow on Operational Evaluation, the ability of the Supply System to synthesize other utilities' problems in the area of requalification programs and to incorporate these into the training process has not been successful. There were many meetings held prior to the implementation of Revision six (6) of NUREG 1021 "Examiners Standards" and subsequently, requalification failures for other utilities; both of these items failed to heighten sensitivity and prompt anticipation of problems during re-examination.

3.4.1 As discussed in the previous root cause for the program failure, research indicated that several other utilities had experienced the same licensed operator requalification program failure as WNP-2. A compilation of identified root causes from other failed programs duplicated items discussed in that report. Failure to network directly with other plants to recover intelligence on requalification program failures, program successes and examination standards were concluded to be missed opportunities.

All of the following were indicators of industry concerns with the requalification program and a flag to the real issue of the accident management program. A review of the industry events file, to support the initial root cause report, found three entries regarding requalification examinations. These were:

- o Generic Letter 89-017: Planned Administrative Changes to the NRC Operator Licensing Written Examination Process
- o IE Notice 88-078: Implementation of Revised NRC Administered Requalification Examinations
- o IE Notice 89-040: Unsatisfactory Test Results and their effect on the Operator Requalification Program

The first two documents addressed administrative guidelines for changes in the examination process. Based on the conduct of the 1989 and 1990 examinations, the appropriate guidelines were incorporated. The third item contained information regarding shutdown of another plant as the result of an unsatisfactory requalification program evaluation. The review indicated that there was no explanation for the high failure rate, but speculated that it was due to operator attitudes or new exam format. No further action was required because Training was aware of the high failure rate but did not anticipate a similar problem due to the success of the pilot program (for the new exam format).

3.4.2 The initial root cause report discussed NRC Information Notice 90-54 "Summary of Requalification Program Deficiencies" dated 28 Aug 1990. This document listed examples of specific problem areas evident during facility exams. One item specifically identified was that the ability of some crews to execute the EOPs changed dramatically depending on which Senior Reactor Operator was rotated into the Shift Supervisor or Control Room Supervisor positions.

3.4.3 In the internal area, the Training department evaluates the operators' performance during each requalification week. But, as discussed in the initial root cause report, since the past test content was limited and/or of insufficient depth, the value of these evaluations as a measure of effectiveness was compromised.

4. Recommendations:

The following recommendations are a comprehensive list of those items which, if fully implemented and supported by all levels of management, will correct all the deficiencies identified in this Root Cause Analysis. Some of these recommendations are paralleled by the "Licensed Operator Requalification Program Corrective Action Plan" Rev 7 dated 6 Aug 1991. However, due to the expansive nature of this report additional and supplementary recommendations have been delineated to address those enhancements above the commitments of the "Corrective Action Plan."

4.1 Conduct simulator training for the operators on all legs of the EOPs.

4.2 Establish in the EOP revision process an EOP program coordinator, other than the implementer, to review the change for editorial/technical designation and to conduct the Validation and Verification. This method will introduce a measure of independence into the process, currently centralized with the individual responsible for implementation. Further recommendations to the program are provided in Licensing & Assurance oversight reports; OR91-002, SS91-001, SS91-002.

4.3 Revise the process to coordinate the EOP revisions with the Plant Specific Technical Guidelines (PSTGs).

4.4 Establish a formal feedback process in the EOP revision program which includes a formal mechanism to inform the originator about the resolution of the proposed change.

4.5 Revise the EOPs to comply with the rules of the Writer's Guide.

4.6 Incorporate Operations into active participation and responsibility within the scope of the training curriculum. This function can be provided by a proactive more effective utilization of the Operations Liaison position to ensure that operators, through their communications channels, provide input to the Requalification Training Program.

4.7 Provide for appropriately scoped L & A oversight efforts in the area of licensed operator requalification. This effort should include evaluation of operator readiness prior to plant restart as well as continued broad based evaluation of training program effectiveness and EOP adequacy.

4.8 Evaluate plant design changes to eliminate obstacles to operator's performance by adding readable containment/drywell parameters, a means of preventing injection from low pressure ECCS systems during Emergency Depressurization, and a capability to silence alarms. Another recommendation is the placement of ARPs convenient to the control panels which is presently being implemented. Further development on these plant modifications is found in QASR 2-91-048.

4.9 Allow crews in training to be exempt from watch standing to promote maximum effort in the training cycle prior to requalification exam.

4.10 Review all known EOP discrepancies (human factor related or technical). Correct those which could have an impact on safety and crew performance.

4.11 Continue to train the operators on the changes to the EOPs as they are evaluated.

4.12 Conduct additional EOP training (including bases) with the remaining crews which have not had the benefit of the intensive training that crews X, Y, and Z have had.

4.13 Conduct additional EOP training (including bases) for the simulator training staff. This should include dynamic training for the staff in the simulator. This training should also provide all staff with the Simulator Instructor Training Course.

4.14 Incorporate additional emphasis on Transient Management training (to provide conditioning for the operators to handle a more complex scenario environment).

4.15 Enhance the tools and criteria used by management when conducting oversite in accordance with the Observation Evaluation Program to ensure it satisfies Plant Management's needs.

4.16 Ensure the operators are exposed to a wide variety of AC and DC electrical malfunctions during simulator training:

4.17 Ensure the operators are exposed to a wide variety of simulator scenarios that will allow them to maintain proficiency in the use of ARPs and Technical Specifications.

4.18 Review the necessary criteria that will be used by management to determine whether the operating crews are consistently and effectively meeting management expectations in the conduct of plant and simulator operations.

4.19 Review the need to have Requalification Crews complete audit exams prior to being examined by the NRC. This should be directed to management with due consideration of the degree of training provided with explanation of the basis.

4.20 Establish an Operations/Training Committee to monitor effectiveness of operator training.

4.21 Conduct a formal evaluation of the performance of each simulator instructor.

4.22 Establish specific feedback criteria on communication performance to instill consistent performance.

4.23 Increase the involvement of other utilities in training, operations and maintenance on a cooperative basis to benchmark our standards and to prevent unjustifiable misalignment with industry practices.

5.0 REFERENCES

1. Letter dated 24 May 1991, From: Multi-Utility Peer Team To: Bob Barmettlor

2. IOM From: R.B. Quay, To: R.B. Barmettlor dated 5 June 1991, "Evaluation Report For: Industry Task Force Report on Operations Requalification Training."

3. IOM From: D.F. Topley, To: R.B. Quay dated 21 June 1991, "RESPONSE TO OPERATION REQUALIFICATION TRAINING PROGRAM EVALUATION TASK FORCE REPORT."

4. IOM From: S.L. McKay, To: All Operations and Training Department Personnel, and STAs dated 24 May 1991, "OPERATIONS DEPARTMENT POLICY ON ACCEPTED VERBAL COMMUNICATIONS."

5. IOM From: S.L. McKay, J.W. Baker, A.L. Oxsen, To: Licensed Personnel, STAs, L.O. Training, TSC Directors/Mgrs., NSAG dated 17 May 1991, "Procedure Usage."

6. IOM From: S.L. McKay, To: R.B. Barmettlor dated 29 May 1991, "Response to Recent EOP Issues and Concerns."

7. Inspection Report 90-20, NRC EOP Team Inspection at WNP-2 dated 23 Oct 1990

8. "NUCLEAR PLANT NO. 2, OPERATING LICENSE NPF-21 NRC INSPECTION REPORT 90-20 RESPONSE TO EOP INSPECTION TEAM ISSUES" dated 26 Nov 1990, From: G.C. Sorensen, To: NRC Region V

9. Letter, dated 11 July 1991, Subject: "WNP-2 Requalification Examination Report 50-397/OL-91-02, From: Region V NRC, To: Washington Public Power Supply System.

APPENDIX 1
JUNE 5,6 EXAMINATION ANALYSIS

A.1.1 Summary of Examination Results

On the 5th and 6th of June 1991, The Nuclear Regulatory Commission (NRC) re-evaluated three crews from the previous Requal/OPEVAL of the 8th and 15th of May 1991. The results were that WNP-2 Requal program continues to be UNSATISFACTORY due to the failure to meet the guidelines in NUREG 1021 Revision 6 Criterion ES-601 C.2.b(1)c. Specifically the criteria, with supporting data from evaluation results, are:

(c) "No more than one third of the crews evaluated fail the simulator examinations."

Supporting Data: The NRC failed 2 of 3 crews for a 66.7% failure rate.

Three crews were presented to the NRC for re-examination on the 5,6 June 1991. The overall results were that thirteen (13) of sixteen (16) operators passed individually and (1) of three (3) crews evaluated passed. The re-exam process differed from the requalification process in that the scope of the exam was narrowed to the simulator portion of the exam only. The narrowing of the scope is an option of the NRC Regional Administrator referenced in ES-601 "Examiners Standards." The same criteria for pass and fail based on Individual Simulator Critical Tasks (ISCTs) applies as described in root cause "Unsatisfactory Licensed Operator Requalification Program" (PDR 291-175). However differing from aforementioned document, the Re-exam used only the simulator portion of the exam to make judgements on the performance of the crews.

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Interviews with the Technical Training Manager, Manager Nuclear License Training, Supervisor of Requal Training and several of the staff evaluators involved with 5, 6 June 1991, exams reveals the following information. Crew Z was graded by the NRC as a failure and by the Supply System evaluators as a pass. There are two different means for a crew to fail in the simulator portion of the examination process. The first is for an operator to not complete an Individual Simulator Critical Task (ISCT) as defined by NUREG 1021 Revision 6 Section 601. The second means is for a crew to receive a 1.0 in any of all the competencies. In this case the Crew Z passed all the observed ISCTs by both the NRC and the evaluators, but the NRC failed the Z crew on competencies, whereas the evaluators passed the crew on competencies. This disparity in competencies bears further explanation. In NUREG 1021 Rev 6, the competencies assigned to a crew address multiple areas, e.g. 1. Communication, 2. Diagnosis of event/conditions, 3. Understanding of plant and systems response, 4. Compliance/use of procedures and Tech Specs, 5. Control board operation/awareness, 6. Command and control. Each one of these areas has several specific performance attributes that are graded from THREE (3) to ONE (1) with ONE (1) being the lowest performance level and THREE (3) being the highest performance level. Supply System evaluators chose a performance level of TWO (2) for the crew Z in many of the competencies; the NRC chose ONE (1) for some competencies. Based on a review of the NRC examination report (dated 7/11/91) and the utility evaluation sheets both teams identified the pertinent circumstances. Although the disparity resulted in a pass by the WNP-2 evaluators versus a failure, the overall evaluation by the WNP-2 evaluators saw a great deal of improvement in areas of:

- Agreement in performance between the NRC and WNP-2
- Independence and critical evaluation of the individuals
- Adherence to the standards set forth in NUREG 1021 Rev 6

These points were collaborated by comments received from the NRC in the exit meeting from the 5, 6 June 1991 Re-exam as well as from comparison of the grading results from the Requal and OPEVAL.

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A.1.2 Analysis of Examination Performance

From the standpoint of operator performance, the Training Staff with assistance from the Licensing and Assurance directorate, conducted an examination analysis of the June 5 and 6 results. The analysis consisted of a review of the individual and crew competency forms and interviews with evaluators and crew members to catalogue all deficiencies. Interoffice memorandum "Subject: Exam Analysis for June 5, 6 1991, Licensed Operator Requalification Re-exam" lists the individual deficiencies. Summarized below from that same document are the general deficiencies and weaknesses exhibited by crews during performance of the re-exam.

- Crew communications, although improved since the February 1991 exam failure, were not in compliance with the expectations set forth by Operations Management.
- Slow or inaccurate diagnosis of electrical malfunctions and the degraded system configuration resulting from these malfunctions was apparent during several scenarios.
- Failure to completely understand plant and systems response concerning plant electrical malfunctions.
- Compliance and use of procedures and technical specifications accounted for the majority of the noted deficiencies.
- Improper operation of equipment and instances of lack of awareness concerning system status were evident during complicated and involved scenarios.
- Some CRSs and Shift Managers provided inadequate command and control during simulator casualties.

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The analysis also indicated the following recurring deficiencies (relative to the February/March examinations):

- o Inadequate communications within the crew in that proper briefing of event mitigation strategies and aggressive communication of degraded or unexpected plant conditions did not occur.
- o Misdiagnosis of RCIC system trips and isolations.
- o Improper application of Technical Specifications and emergency event classification and use of Alarm Response procedures and EOPs.
- o Incorrect priority for restoration of important out-of-service plant equipment.

A.1.3 <u>Summary of Examination Scenarios</u>

The following is a narrative summary of each examination scenario with a list of the designated Individual Skill Critical Tasks (ISCTs) followed by a description of crew performance during that sequence.

Summary for Scenario One: LOSS OF DP-S1-1A, EARTHQUAKE WITH LOSS OF OFFSITE POWER, LOCA W/LOSS OF LEVEL INST., RPV FLOODING

The scenario starts with a ground and trip on DP-S1-1A that results in a loss of RCIC and a loss of indication and operability of the SRV's from P601. The SRV's will be controlled from P631.

The second event is an earthquake with a loss of offsite power. SM-8 will re-power from DG-2. SM-7 will not run due to the loss of control power to SM-7. The running CRD pump will trip on overload when the reactor scrams. The HPCS DG will fail on over-current when it auto-starts on the loss of power.

The third event will be two RPV penetration weld failures due to an after-shock from the earthquake. These two failures will leave the crew with the "A" wide range level indication and the fuel zone level indication. The resulting containment challenge will require the use of containment sprays.

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The crew will Emergency Depressurize when the level reaches the top of active fuel.

During Emergency Depressurization, the remaining wide range level instrument and fuel zone instrument will fail off scale high. The Upset range will fail at +60" and the shutdown range will fail at +30".

The crew will then be required to perform RPV flooding. They will flood the vessel up until the RPV pressure is ~50# (the simulator will not support 60# as required by the procedure) greater than suppression chamber pressure.

The scenario will be terminated when the crew has emergency depressurized and reactor pressure is being controlled ~50# greater than suppression pool pressure, as required by the flooding procedure.

ISCT's assignments:

1. Maintain core cooling when submergence is not possible.
   - Responsible individuals...(CRS/CRO1)

2. Cool the core when RPV level cannot be determined by executing RPV Flooding or Primary Containment Flooding.
   - Responsible individuals...(CRS/CRO2)

3. Maintain D/W pressure below PSPL.
   - Responsible individuals...(CRS/CRO2)

4. Implement Emergency Plan actions based on plant conditions.
   - Responsible individuals...(SM)

5. Control the RPV cool-down rate below 100F in any one hour period.
   - Responsible individuals...(CRS/CRO2)

Both Crew X and Crew Y were administered this scenario. The following is a narrative summary of each crew response.

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Crew X

After the trip of DP-S1-1A the CRS requests investigation by the electrical shop of the ground. Recognizing the Technical Specification implications, the CRS directs a reactor shutdown. Prior to completion of the shutdown an earthquake results in an automatic scram and LOOP. The HPCS DG fails to start due to over-current. This development, coupled with the previous loss of RCIC (due to the unresolved ground on DP-S1-1A), results in an absence of high pressure feed systems. The CRS briefs the crew on this situation. A subsequent after-shock causes the failure of two RPV level instrumentation lines and leaves only one channel of wide range and the fuel zone indication. As containment pressure increases due to the instrument line break the CRS initiates containment and drywell sprays. RPV level is approximately at the TAF when the remaining RPV level indications are lost. The CRS redirects the sprays to flood the RPV and directs throttling to maintain the RPV pressure 60# above the wetwell. The scenario then terminates.

The NRC and the Supply System passed the X crew on this scenario in their respective evaluations.

Crew Y

After the trip of DP-S1-1A the alarm response procedure was consulted and the crew reviews the equipment/indication implications. The CRS and the Shift Manager discuss the possibility of a shutdown based on the out-of-service equipment. Subsequently an earthquake results in an automatic scram and a LOOP. The HPCS diesel is reported to be tripped. Due to the absence of high pressure systems and the instrument line failures, RPV level drops to the TAF. At TAF the CRS directs emergency depressurization but does not proceed into RPV flooding as the crew has not discerned the loss of all level indication. Standby Liquid Control system is not employed for level addition but the low pressure systems re-flood the core as a result of the depressurization. The scenario then terminates.

The NRC and the Supply System passed Y crew in their respective evaluations.

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Summary for Scenario #2: SORV, HYD ATWS, MSIV ISOLATION DUE TO HIGH MSL RAD, EMERG DEPRESSURIZATION ON HCTL.

This scenario begins with the "A" loop of RHR in suppression pool cooling. There is a known leaking SRV. Suppression pool temp is ~88F and decreasing slowly with the "A" loop on. The "B" loop of RHR is out of service due to a breaker problem encountered during a start to place the system in suppression pool cooling.

The first event of the scenario is an over-current trip of SM-7. The Div I DG auto starts but will not close on to the faulted bus.

The second event is a relief valve that fails open. This is the same valve that was weeping at the start of the scenario. A manual scram will be inserted before suppression pool temperature exceeds 110F.

When the manual scram is inserted either by the 4 push buttons or the mode switch, there will be no rod motion. When ARI is initiated, enough rods will insert to reduce reactor power to ~90%. The partial rod insertion will result in enough failed fuel to cause a spike on the MSL monitors and a resultant MSIV isolation.

The only remaining SLC pump will not start due to a bad breaker. Power will be reduced with alternate boron injection and manual control rod insertion.

Suppression pool temperature may require Emergency Depressurization with the reactor at power if it exceeds the Heat Capacity Temperature Limit (HCTL).

The scenario will be terminated when alternate boron injection has been initiated, control rods are being driven manually, the reactor has been depressurized (if necessary) and the level has been recovered above TAF.

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ISCT's Assignments:

1. Shut down the reactor during an ATWS.
   - Responsible individuals (CRS/CRO1)

2. During an ATWS condition, prevent core damage due to rapid cold water injection into the RPV and subsequent power excursion.
   - Responsible individuals (CRS)

3. Restore and maintain core cooling by submergence.
   - Responsible individuals (CRS/CRO2)

4. Maintain S.P. Temperature below HCTL.
   - Responsible individuals (CRS/CRO1)

5. Implement Emergency plan actions based on plant conditions.
   - Responsible individuals (SM)

Only Crew Z was administered this scenario. The following is a narrative summary of the crew response.

Distribution bus SM-7 receives an over-current trip. DG1 starts but fails to close onto the bus. Without consulting the alarm response procedure for the loss of SM-7, the crew takes several actions in accordance with PPM 4.7.1.8, but fails to restart the RCIC water leg pump. A weeping Main Steam Safety Relief Valve fails open and the CRS directs a manual scram due to increasing wetwell temperature. The crew recognizes that there is no rod motion and initiates Alternate Rod Insertion (ARI). The resulting partial rod insertion causes fuel failure that leads to an MSIV isolation on high radiation. The CRS directs that the remaining SLC pump be initiated but the breaker fails. The CRS then directs alternate boron injection with the RCIC system. The CRO places RCIC into service and maintains RPV level at -60 inches. With the APRMs reading downscale the CRS directs RPV level to be maintained at -80 inches.

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The crew observes the absence of blue lights on the full core display and attempts to diagnose the cause of the ATWS but appears confused over the significance of the white light/blue light indications. A high drywell pressure signal is received and the CRS directs that RPV pressure be maintained at 500-600 psig to preclude an inadvertent rapid cold water injection. A CRO leaves an SRV open until RPV pressure is at 440 psig resulting in a feed flow addition and power to cycle between 4 and 7%. A manual scram is attempted with no rod motion. The Rod Worth Minimizer and Rod Sequence Control System are bypassed and the crew initiates manual rod insertion. With power in the 1% region the CRS directs that RPV level be maintained at -150 inches. The scenario then terminates.

The NRC and the Supply System passed Z crew in their respective evaluations.

Summary for Scenario #3: LOSS OF OFF-SITE POWER/DG #1 FAILURE/LOCA/HYDROGEN GENERATION

This session begins with the reactor at approximately 85% power and a controlled shutdown in progress. The reactor plant shutdown has been ordered by Plant Management to repair RHR-V-41C and RHR-V-42C when a review of the LLRT data revealed leakage rates beyond the allowed limit. The crew will be directed to continue the controlled plant shutdown currently in progress.

When the reactor power has been reduced to approximately 80%, a Loss of all off-site electrical power (LOOP) will occur with a failure of the DIV 1 D/G to auto start and energize SM-7. The consequences of the LOOP result in a reactor scram. Concurrent with the above LOOP, a Large Break LOCA will be initiated. RHR loop B and HPCS will automatically start and begin to recover RPV level. Two minutes after the LOCA, the HPCS pump will trip on over-current. The B RHR pump will operate to restore and maintain RPV level at approximately -210" (2/3 core height.) The shift manager should classify this event as a Site Area Emergency.

RPV level will be maintained at about -210" (without any core spray flow) for approximately 15 to 20 minutes to allow hydrogen generation and some fuel failure due to inadequate core cooling.

The generation of hydrogen (with an already partially de-inerted primary containment) will cause the operators to take these actions. The crew will elect to spray the wetwell regardless of adequate core cooling to reduce the flammable mixture of hydrogen and oxygen inside the primary containment.

At this point, the DIV 1 D/G will be returned to service and will energize the SM-7 bus. With the restoration of electrical power to SM-7, RHR and LPCS pumps will be used to restore RPV level above -161" (TAF).

The scenario will be terminated when the reactor level has been returned to greater than TAF and containment sprays are in-service.

ISCT Assignments:

1. Restore and maintain core cooling by submergence.
   - Responsible individuals (CRS/CRO2/CRO3)

2. Maintain core cooling when submergence is not possible.
   - Responsible individual (CRS)

3. Maintain primary containment hydrogen and oxygen levels below the flammability limits.
   - Responsible individuals (CRS/CRO2/CRO3)

4. Initiate appropriate action to implement the EPIPs.
   - Responsible individual (SM)

Both Crew X and Crew Y were administered this scenario. The following is a narrative summary of each crew response.

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Crew X

The crew is in process of a plant shutdown when a LOOP occurs. The reactor automatically scrams, MSIVs isolate and DG1 fails to start, leaving bus SM7 without power. The CRS directs the lineup of RHR "B" for Suppression Pool cooling and initiation of RCIC for level control. Drywell pressure reaches 1.68 psig and HPCS injects into the RPV. RCIC trips. With RPV level below the TAF and PSPL exceeded the CRS initiates emergency depressurization. As the vessel depressurizes, HPCS and RHR "B" operate to restore level when HPCS trips. The CRS then directs employment of SLC, Service water to RHR and firewater to condensate cross ties to recover level. Subsequently the CRS cancels the Service water to RHR cross tie order. The CRO reports a 3.5% Hydrogen concentration in the drywell and the CRS directs the initiation of the Containment Atmospheric Control system. When the reported concentration is at 7% the CRS directs that CAC and CRA fans be secured. The Shift Manager informs the CRS that venting of the wetwell is needed (due to the high Hydrogen concentration).

The Shift Manager briefs the crew and then lineup for venting is initiated. The CRS declares a general emergency. In an attempt to restore level to the TAF the CRS initiates containment flooding. Unable to vent (due to the power loss on SM7) the Shift Manager and CRS confer on the use of spray. The CRS initiates wetwell spray via RHR "B". When DG1 is returned to service, the CRS lines up RHR "A" and LPCS for RPV injection. RPV level recovers to the TAF and the scenario terminates.

The NRC and the Supply System passed crew X in their respective evaluation.

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Crew Y

While implementing a controlled shutdown the crew receives a LOOP. The reactor automatically scrams, the MSIVs isolate and DG1 fails to start. A CRO fails in an attempt to restart DG1 and the CRS dispatches an EO to investigate. To control level RCIC is initiated. A high drywell pressure signal initiates HPCS injection into the RPV. With vessel level at -210 inches the CRS directs initiation of emergency depressurization. HPCS trips and the CRS directs actions to line up alternate sources of injection to the RPV (Service water to RHR cross tie, "B" CRD and SLC pumps) to recover RPV level to the TAF. The CRS receives a series of reports that the Hydrogen concentration is at 3%, 3.5%, 5% and then 7%. There is no direction to initiate CAC. At the 7% level the CRS directs that the CRA fans be secured. A CRO goes to the H13-P813 panel and secures all the CRA fans in operation. After consultations the CRS and Shift Manager decide to initiate containment flooding. RHR "B" is secured to prepare for the Service water to RHR cross connect. The crew also lines up to vent the wetwell but due to the loss of SM7 that evolution is not possible. A CRO also shut down an in-service CRA fan that was overlooked initially. Unable to vent the wetwell, the CRS and Shift Manager discuss the priority of venting the wetwell or flooding the containment via RHR "B". RHR "B" is lined up to spray and the CRS initiates wetwell and then drywell sprays. When DG1 is restored, the CRS directs that LPCS and RHR "A" line up for RPV injection and RHR "B" align for drywell spray. Wetwell spray is terminated. Additionally on the return of DG1, a CRA fan is automatically restarted. When RPV level is restored to the TAF, RHR "B" is aligned to the RPV. Since SM7 is now in-service, the CRS is preparing to line up to vent when the scenario terminates.

The NRC and the Supply System failed crew Y in their respective evaluations.

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Summary for Scenario #4: A RHR OOS, HPCS SHAFT SHEAR, LOSS OF CONDENSER VACUUM, MT TRIP, MSIV ISOLATION, RCIC MECHANICAL OS TRIP, RPV COND POT 4A RUPTURE ON MSIV ISOL, 20% MS LINE BREAK, MC-8B OL TRIP, WW/P APPROACHES PSPL WITH SUBSEQUENT EMERGENCY DEPRESSURIZATION

This scenario begins with the reactor plant operating at 100% power at EOL with equilibrium xenon. The A RHR loop is out of service with a clearance order hung to repair the RHR-P-2A shaft seal. The pump has been inoperable for one day.

A HPCS-P-1 operability surveillance is ongoing with all actions completed prior to running the full flow test of HPCS-P-1. When HPCS-P-1 is started for the full flow test at approximately FIVE (5) minutes into the scenario, the pump shaft will shear. The crew will reference the applicable Tech Specs and enter appropriate action statement LCO.

At approximately TEN (10) minutes into the scenario a Loss of Vacuum is initiated which will result in a main turbine trip, followed shortly by a MSIV isolation. The loss of vacuum will be of such severity to result in MSIV isolation at approximately FIFTEEN (15) minutes. The MSIV isolation will initiate a MS leak in the drywell via a line rupture between the reactor and the condensate pot 4A. The magnitude of the steam leak will subsequently be increased to ~20% severity. The size of the steam leak will cause Wetwell Pressure increase which will dictate initiation of containment sprays.

MC-88 OL/GD occurs at approximately ONE (1) minute after the MS leak is activated. This in conjunction with RHR A being out of service will prohibit the crew from being able to initiate containment sprays as WW/P increases due to the MS leak. The steam leak will be small enough that RPV/P will remain Greater Than 600#. RPV/L control will be complicated with HPCS OOS and a RCIC mechanical over-speed trip FIVE (5) minutes after it is started to control RPV/L.

Primary containment pressure will continue to increase with the absence of containment sprays until the pressure suppression pressure limit (PSPL) is challenged at which time the crew will emergency depressurize to protect the primary containment boundary.

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ISCT Assignments:

1. Restore and maintain core cooling by submergence.
   - Responsible individuals (CRS/CRO1/CRO2)

2. Maintain D/W pressure below PSPL.
   - Responsible individuals (CRS/CRO2)

3. Implement Emergency Plan actions based on plant conditions.
   - Responsible individual (SM)

Only Crew Z was administered this scenario. The following is a narrative summary of the crew response.

The crew secures pump HPCS-P-1 after failure of the full flow test portion of the surveillance. With RHR "A" already out-of-service the CRS consults Technical Specifications for the proper resolution. After some delay the CRS orders the shutdown of the plant. During the shutdown the crew observes a degrading vacuum in the main condenser. The CRS orders a commensurate reduction of power within turbine limits. Subsequently, the CRS directs a manual scram. (Note: A simulator computer problem suspended the scenario at this point for about 44 minutes). The CRS and Shift Manager conclude that the use of the condensate system is the best option for level control, since they suffered a loss of RCIC on over-speed, the CRS directs that RPV pressure be maintained in the 500-600 psig band. The degraded main condenser vacuum condition causes an MSIV isolation. An instrument line failure as a result of the MSIV isolation causes a loss of one channel each of narrow range and wide range level indication. Additionally the steam leak due to the line failure becomes more severe and results in an increasing wetwell pressure. Due to RHR "A" out-of-service and the loss of MC-8B caused by an over-current trip, the crew is unable to operate containment sprays and initiates emergency depressurization to preserve containment integrity (PSPL). Having concluded that all RPV level indication is lost, the crew then commences RPV flooding using the condensate system. After requesting support to investigate the earlier trip of motor control center (MC-8B) that center is restored and the CRS places RHR "B" in Suppression Pool cooling versus the spray mode. The CRS then lines up LPCS and RHR "C" for RPV injection, although RHR "C" has been in a dead head condition since the crew commenced containment flood. The scenario then terminates.

The NRC and the Supply System both passed crew Z in their respective evaluations.

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Summary for Scenario #5: INADVERTENT HPCS INITIATION, SMALL RRC LOOP BREAK THAT STABILIZES AT ~5 GPM, TRIP OF ALL CONDENSATE PUMPS, REACTOR SCRAM, LEAK SIZE INCREASES TO GREATER THAN THE CAPACITY OF TWO CRD PUMPS, RCIC-V-13 FAILS CLOSED, HPCS-V-4 FAILS CLOSED, RPV/L DECREASE TO TAF AND SUBSEQUENT EMERGENCY DEPRESSURIZATION FOR RPV/L RESTORATION.

The first event of this scenario is an inadvertent initiation of HPCS-P-1 due to a failure of the auto-start circuit which will be activated at FIVE (5) minutes.

At TEN (10) minutes the second event is a small RRC loop break that stabilizes at approximately 5 GPM.

The THIRD (3) event is a loss of all condensate and feed-water due to condensate pumps tripping which will be initiated prior to the CRS direction to manually scram due to high unidentified leakage.

The FOURTH (4) event is a second small leak which will be initiated when the reactor is tripped, with a severity that ramps to greater than the capacity of both CRD pumps causing RPV/L to decrease to TAF in TWENTY (20) minutes.

The final events occur when the crew attempts to use HP injection sources following a loss of Condensate and Feed-water. When RCIC is started for RPV/L control RCIC-V-13 fails to open and attempts by operators to open locally also fail. HPCS-P-1 is started but the injection valve HPCS-V-4 also fails to open and local attempts to open the valve fail.

When RPV/L decreases to TAF, the crew will emergency depressurize and restore RPV/L utilizing Low Pressure Injection systems.

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ISCT Assignments:

1. Restore and maintain core cooling by submergence.
   - Responsible individuals (CRS/CRO2/CRO3)

2. Maintain core cooling when submergence is not possible.
   - Responsible individuals (CRS/CRO2/CRO3)

3. Maintain D/W pressure below PSPL.
   - Responsible individuals (CRS/CRO2/CRO3)

4. Implement emergency plant actions based on plant conditions.
   - Responsible individual (SM)

Only Crew Y was administered this scenario. The following is a narrative summary of the crew response.

HPCS automatically actuates for reasons unknown. The crew consults the abnormal operating procedure and resets the seal-in logic. The crew detects drywell pressure increase and identified leakage indications due to the break of a small Recirculation line. The CRS directs a power decrease via Reactor Recirculation in preparation for shutdown. A trip of the condensate pumps results in a loss of all feed-water and automatic scram. Simultaneously, the crew receives indications of an increase in identified leakage. The crew initiates first RCIC then HPCS but both systems fail leaving no high pressure source of feed-water to the RPV. When a high drywell pressure signal due to the aggravated leakage isolates the MSIVs, the CRS directs RPV pressure be maintained at 800-1000 psig. When RPV level reaches the TAF the CRS directs emergency depressurization to recover level to the TAF via the low pressure ECCS systems. With the RPV level at the TAF, the scenario terminates.

The NRC and the Supply System passed crew Y in their respective evaluations.

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A.1.4 Scenario Time-lines

The following is a sequence of event time-line for each scenario by crew. Inappropriate actions are in BOLD type.

Crew X scenarios

Scenario #1

10.29.00	Start of scenario
10.33.34	Breaker trip on DP-S1-1A
10.42.34	CRS directs a reactor shutdown
10.43.30	Rx automatically scrams due to earthquake and LOOP
10.47.50	SM's classifies the earthquake and LOOP as an ALERT
10.49.47	CRS receives report that SM-4 will not reset
10.53.15	CRS briefs the crew on the lack of any High Pressure feed
10.57.50	Small LOCA on the D004c and D004b instrument lines
10.59.00	Wetwell sprays initiated
11.00.12	Wetwell sprays secured and drywell sprays initiated
11.03.36	Emergency Depressurization due to loss of all level indication and TAF
11.04.47	CRS redirected drywell sprays to Re flood the RPV
11.13.14	Discharge pressure is 100 psig above wetwell pressure
11.14.08	Scenario terminated

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Scenario #2

08.07.00	Crew initiates shutdown due to repair of RHR-V-41C and 42C
08.09.00	Crew receives LOOP, DG1 fails to auto start
08.13.28	CRO initiates RCIC, drywell pressure is 1.68#
08.13.36	HPCS injects into the RPV
08.14.17	RCIC trips on high back pressure
08.14.35	CRS emergency depressurizes, level below TAF and PSPL exceeded
08.15.51	HPCS trips on over-current
08.24.00	CRO reports 3.5% H2 in the drywell
08.24.15	CRS directs initiation of CAC
08.28.00	CRO reports H2 concentration at 7%
08.28.30	CRS directs CRO to secure CAC
08.29.30	CRS directs CRO to secure CRA fans
08.39.30	Crew aligns to vent wetwell
08.42.40	SM declares General Emergency due to core damage
08.52.22	CRS initiates containment flood
08.53.52	CRO reports unable to vent the wetwell due to loss of power

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09.05.11	CRO initiates wetwell spray
09.07.17	DG-1 is in service with LPCS/A RHR injecting into the RPV
09.08.10	RPV level is at TAF...Scenario terminated

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Crew Y Scenarios

Scenario #1

18.07.00	Scenario start
18.10.10	Trip on DP-SP-1
18.19.12	Earthquake with LOOP and associated SCRAM
18.21.19	Pressure control band 800-1000 with SRV operation from the P631 panel
18.38.19	RPV level -150" and decreasing
18.38.39	CRS directs Emergency Depressurization
18.40.30	Loss of level indication, CRO did not adequately tell CRS of this info, conditions requiring flooding met
18.41.30	Event classified as SAE
18.42.00	Conditions requiring SLC injection met
18.43.01	Re flood with LP core systems
18.48.41	Discharge pressure on LP systems is 105#, Scenario terminated

Scenario #2

13.16.06	HPCS automatic actuation
13.18.30	HPCS seal in logic reset
13.24.04	Small LOCA on RR loop
13.28.00	Drywell pressure increase, 2.75 GPM identified leakage, CRS direct power decrease with recirc
13.31.06	Condensate pumps trip, HPCS V-4 fails.

13.32.00	Identified leakage GT 5 GPM
13.33.09	RCIC V-13 fails to open...Loss of all high pressure feed
13.34.40	1.68# in the drywell
13.38.39	MSIV isolation
13.44.58	TAF and decreasing
13.45.36	ED required, CRS directs the opening of 7 SRVs
13.46.34	SAE declared
13.46.56	RPV flooding with RHR C
13.47.57	TAF and increasing
13.52.40	Scenario terminated

Scenario #3

14.53.00	Crew initiates a controlled shutdown to repair RHR V-41C and 42C. Wetwell de-inerted, drywell is 10% O2
14.56.29	Crew receives LOOP, SCRAM, MSIV closure, DG1 fails to starts
14.58.49	CRO2 initiates RCIC
14.59.43	SM declares a UE
15.00.00	Drywell pressure 1.68#
15.00.15	HPCS injects into the RPV
15.01.01	RPV level is at -210"
15.01.30	CRS initiates ED

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15.02.00	HPCS trips on over-current
15.02.50	SM declares SAE
15.04.40	CRS directs alignment of service water to RHR via cross tie
15.05.00	STA reports indications of fuel damage
15.06.10	CRO3 starts CRD pump
15.07.55	CRO3 starts B SLC pump
15.08.06	STA reports DW O2 at 10% and H2 at 3.5%
15.09.00	CRS fails to direct the initiation of CAC or verify CRA fans running
15.18.41	DW H2 at 7%
15.19.43	CRS directs CRA fans off (EOPs require to secure and prevent CRA fans from operating)
15.20.20	ARM monitor inside containment alarms at 100 mR/hr
15.23.35	SM directs initiation of containment flooding 5.5.17
15.24.00	CRS initiates line up for containment venting
15.25.00	CRO reports no power to drywell vent valves due to loss of SM-7
15.28.45	CRO shut down CRA fan that was missed upon initial order
15.30.17	Flooding of containment initiated
15.30.37	CRS directs shutdown RHR B in preparation for containment flooding

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15.33.50	Service water injection secured to initiate sprays
15.34.34	CRO initiates wetwell sprays
15.35.38	CRO secures wetwell spray and initiates drywell spray
15.39.30	CRO restarts DG1
15.40.42	CRS directs RHR 2B to drywell spray
15.42.03	Wetwell spray secured
15.42.51	RPV level at TAF and increasing
15.46.29	RHR 2B injects into the RPV
15.49.06	CRS initiates lineup to vent, Scenario terminated

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Crew Z Scenarios

Scenario #1

12.33.12	Scenario started, over-current trip of SM-7, DG1 starts but will not close on a faulted bus
12.42.20	Manual SCRAM attempted due to increasing wetwell...no rod movement, ARI initiated with some rod movement
12.42.55	MSIVs isolate on high RAD
12.43.15	Initiation of SLC failed
12.43.50	CRS directs Alt boron injection with RCIC
12.45.13	HI HI rad on SJAE outlet monitors
12.46.00	CRS directs maintain -80" in the RPV, APRM down-scales occurred at -60"
12:48.14	High drywell pressure 1.68#
12.29.33	CRS directs pressure band of 500 to 600#, CRO leaves SRV open until 440#
12.53.53	Feed flow is being maintained at .5 to 1 Mlb/hr causing power cycling between 4 and 7%
12.56.41	Manual Scram again with no movement
13.02.54	CRO drives rods in
13.05.25	CRS directs level to -150" with power at 1%
13.09.47	SAE was declared but not announced on the PA...Scenario terminated

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Scenario 2

07.57.00	Scenario start
07.59.00	Secured HPCS due to failing Surveillance
08.05.00	CRS directs plant shutdown
08.06.00	SM declares UE
08.07.38	Decreasing Cond Vacuum
08.08.09	CRS directs manual Scram
08.08.11	Simulator computer problem...scenario delayed
08.54.00	Scenario restarted
08.57.40	CRS directs pressure band-500-600#
08.59.49	MSIVs close on low cond vacuum
09.03.30	ED...approaching PSPL
09.10.26	RPV flooding using condensate
09.16.52	Fuse replaced and breaker MC-8B shut, from time 08.59.49
09.18.55	RHR-B placed in SP cooling vice containment spray
09.20.55	Line up for injection is LPCS and C RHR
09.22.00	Scenario terminated

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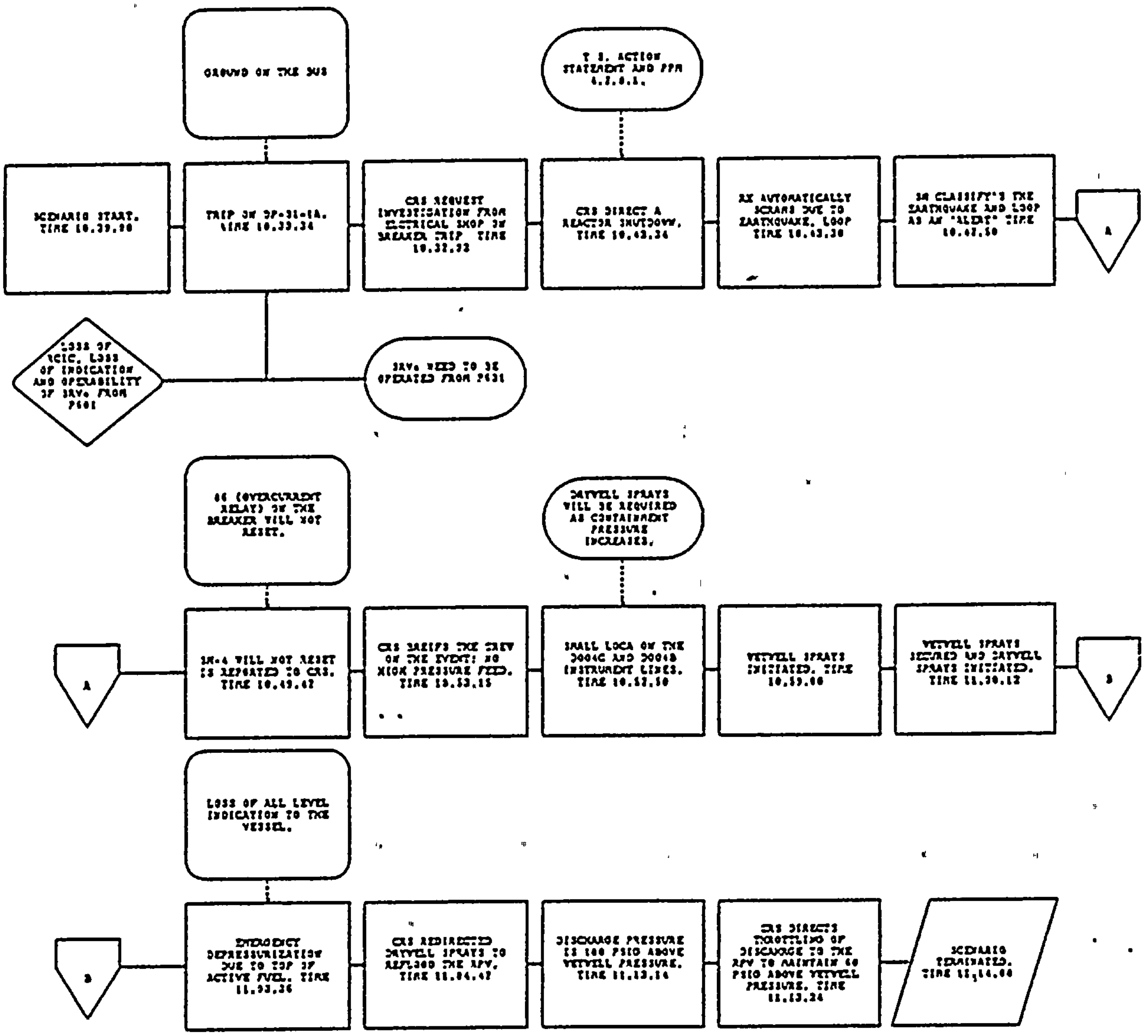
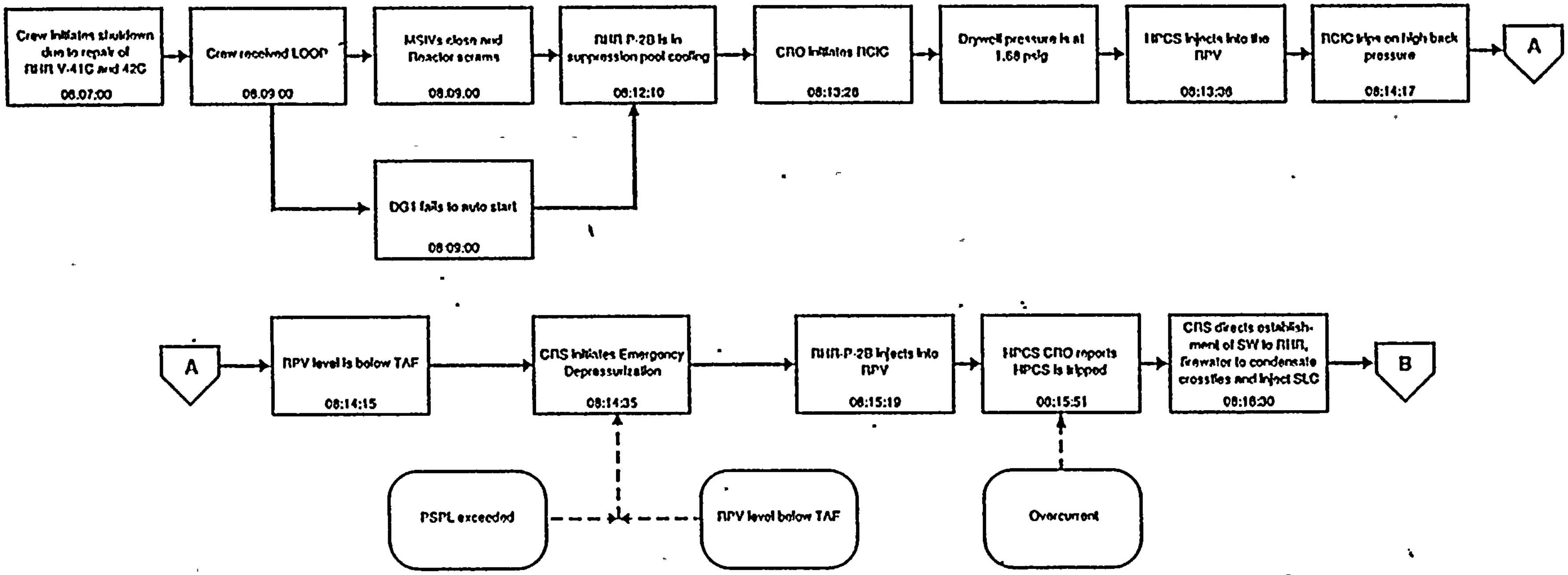
A.1.5 Event and Causal Factors Charts

The following pages contain Event and Causal Factors charts for each of the examination scenarios. These charts are used to pictorially represent actions by the crew during the development of the scenario. A representation of the sequence allows a clear indication of the inappropriate actions and therefore provides a point of departure to examine the reasons for the inappropriate action.

ED ON LOSS OF LEVEL INDICATION
CREW X, SCENARIO 1



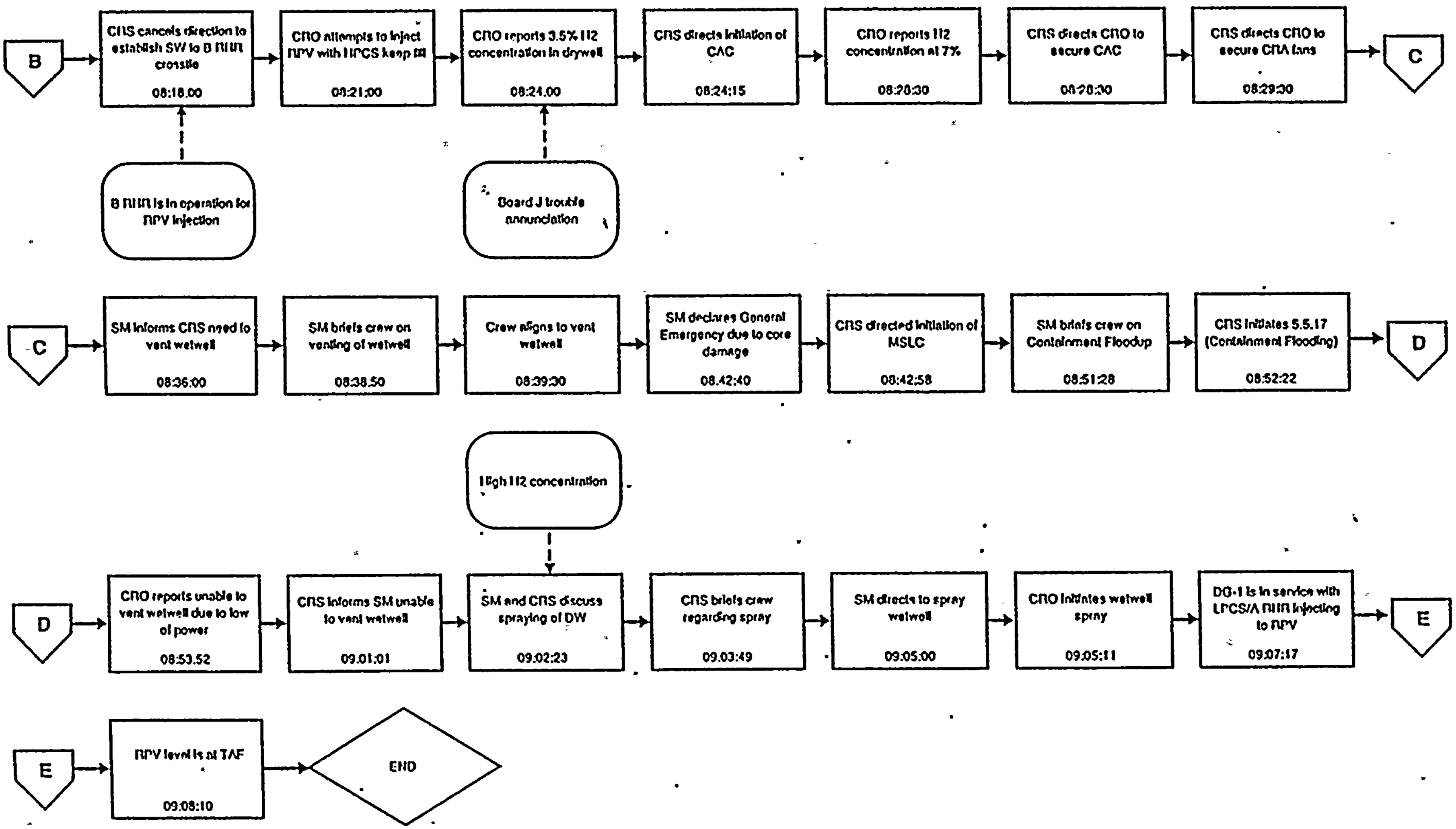
Crew X/Scenario 3
LOOP/DG1 Failure/LOCA/H2



43b

910505.1

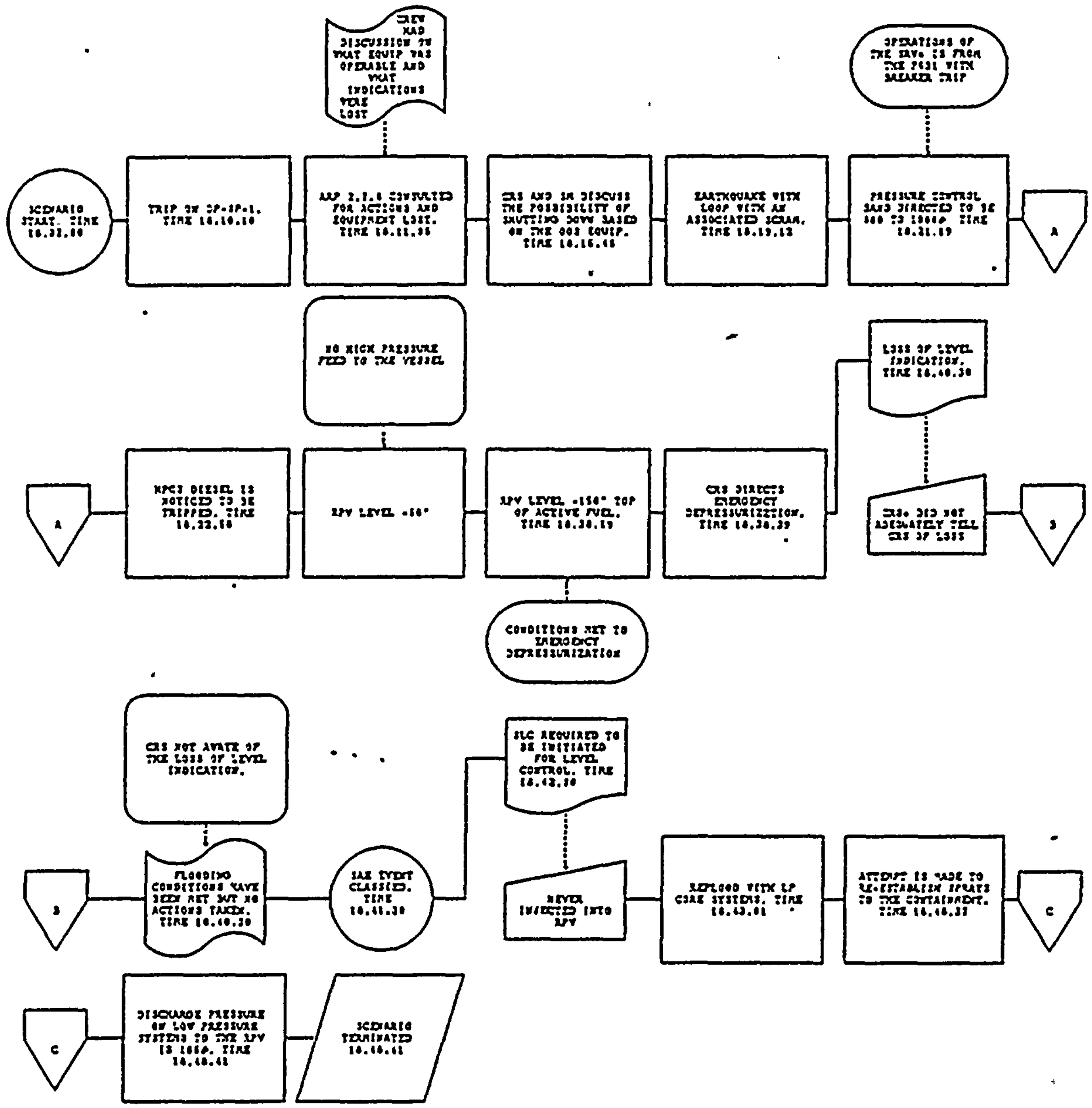
Crew X/Scenario 3
Loop/DG1 Failure/LOCA/ H2



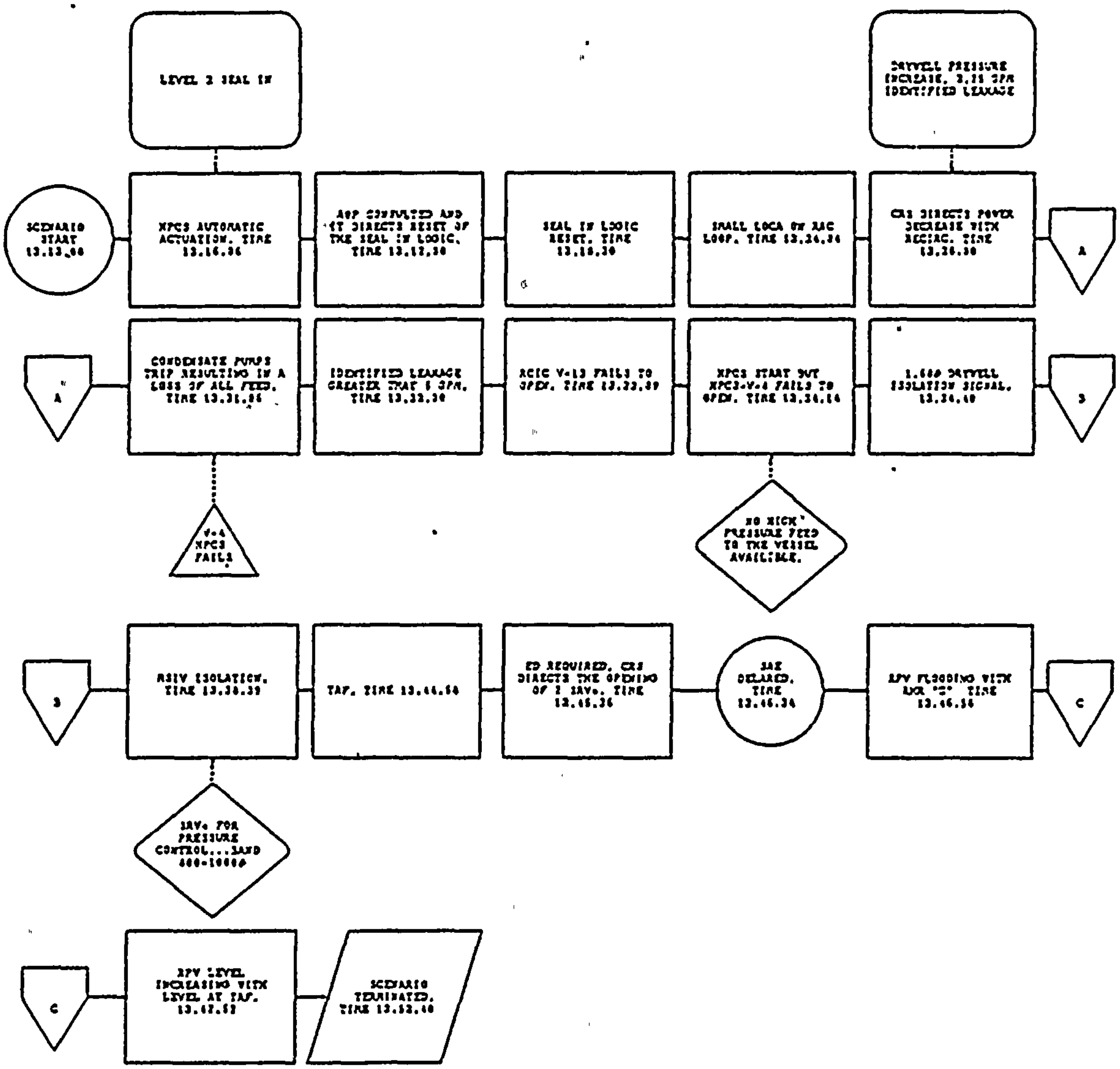
43c

910505.2

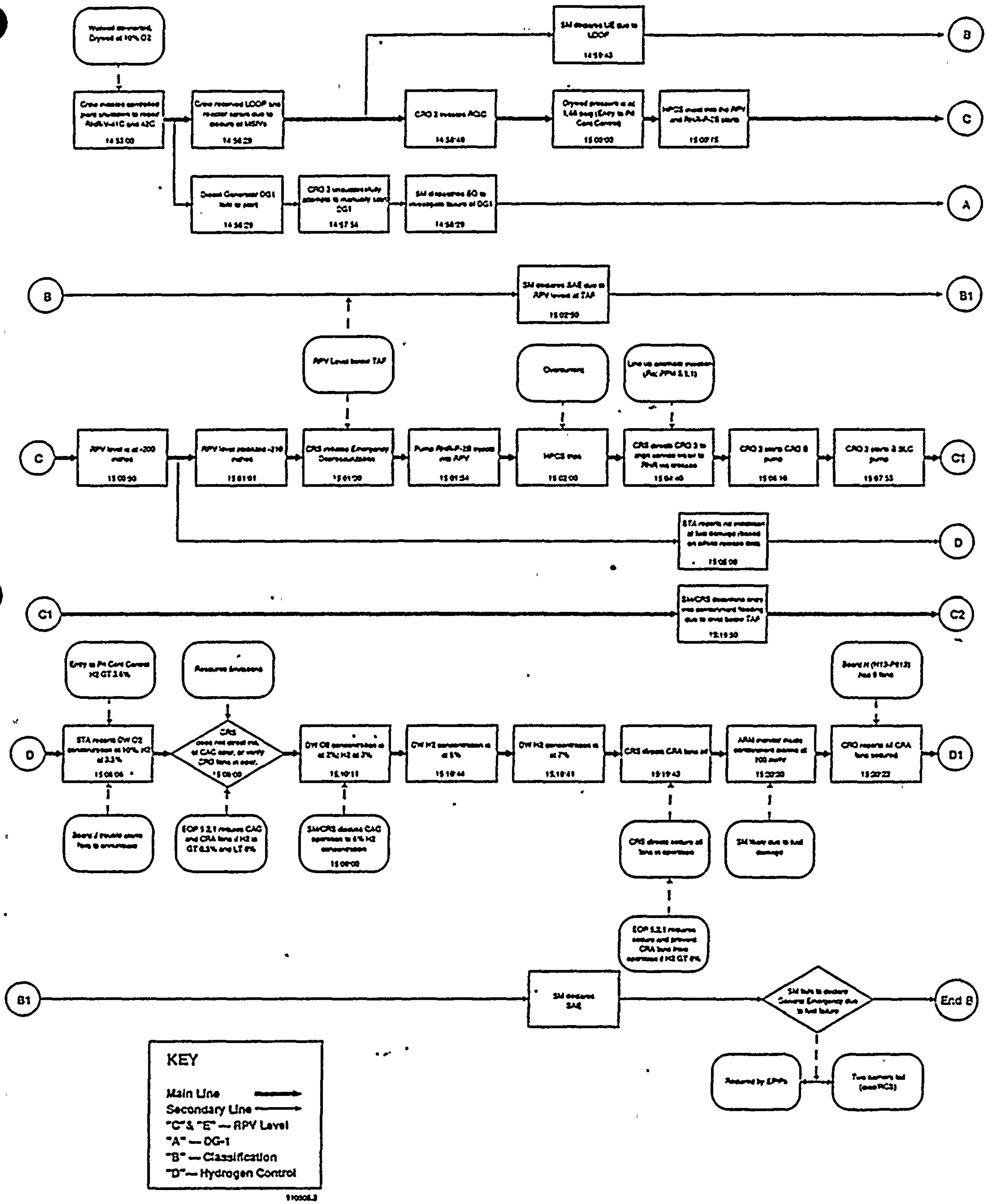
LOOP AND LEVEL INDICATION WITH RPV FLOOD
CREW Y, SCENARIO 1



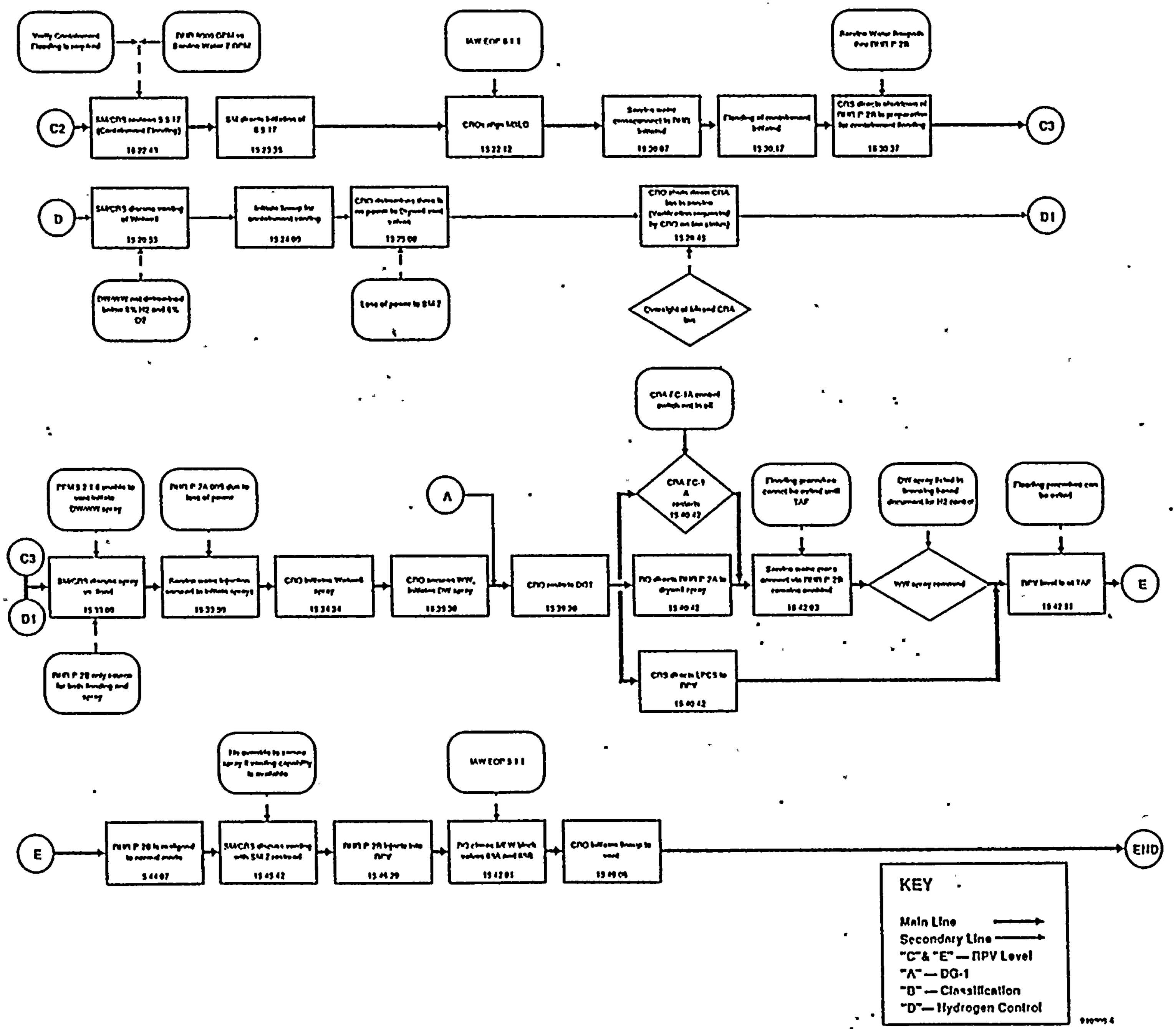
HPCS START, LOCA, LOSS OF FEED, ED AND REFLOOD
CREW Y, SCENARIO 2



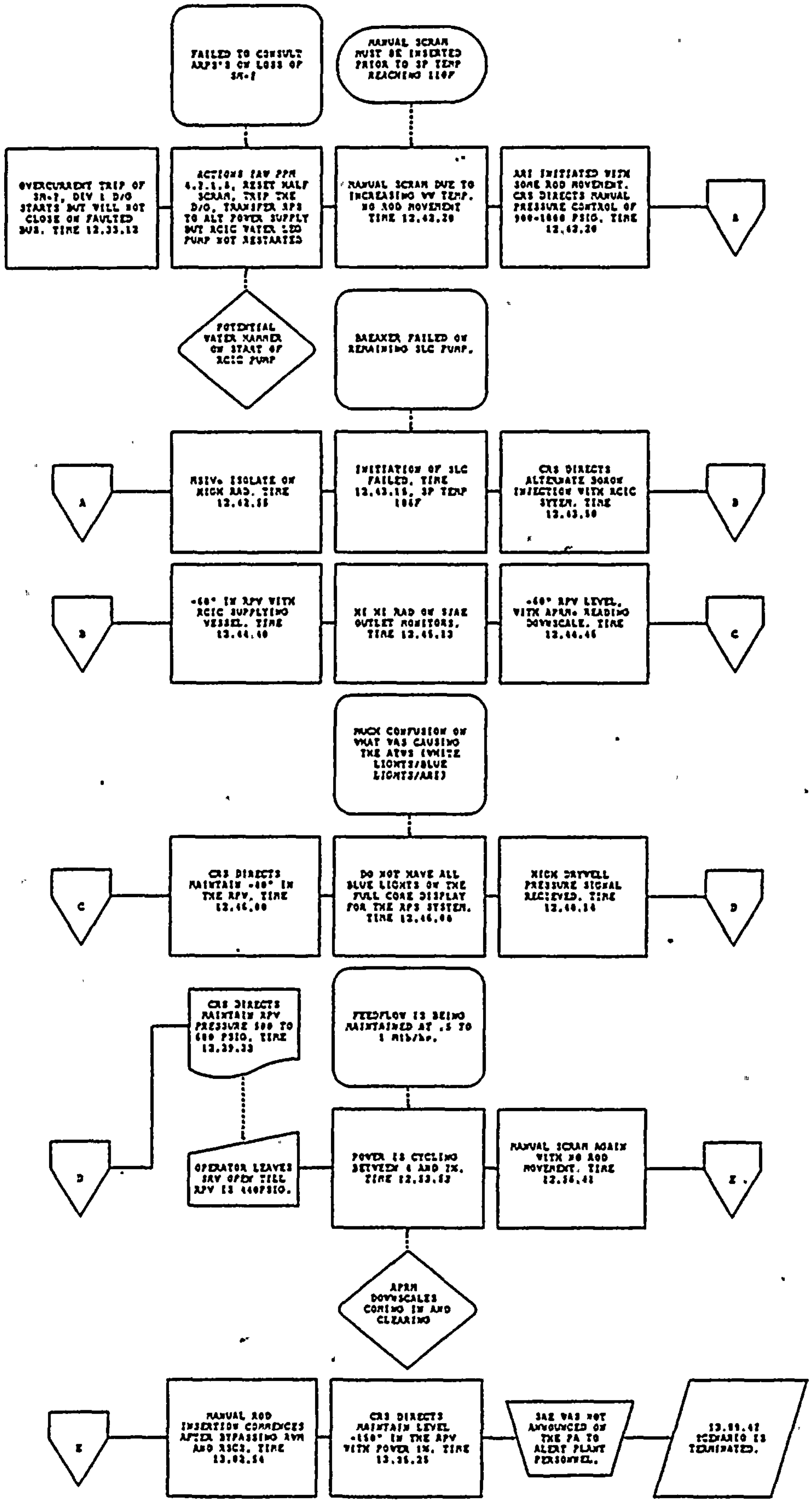
Crew Y/ Scenario 3
Loop/DG1 Failure/LOCA/H2



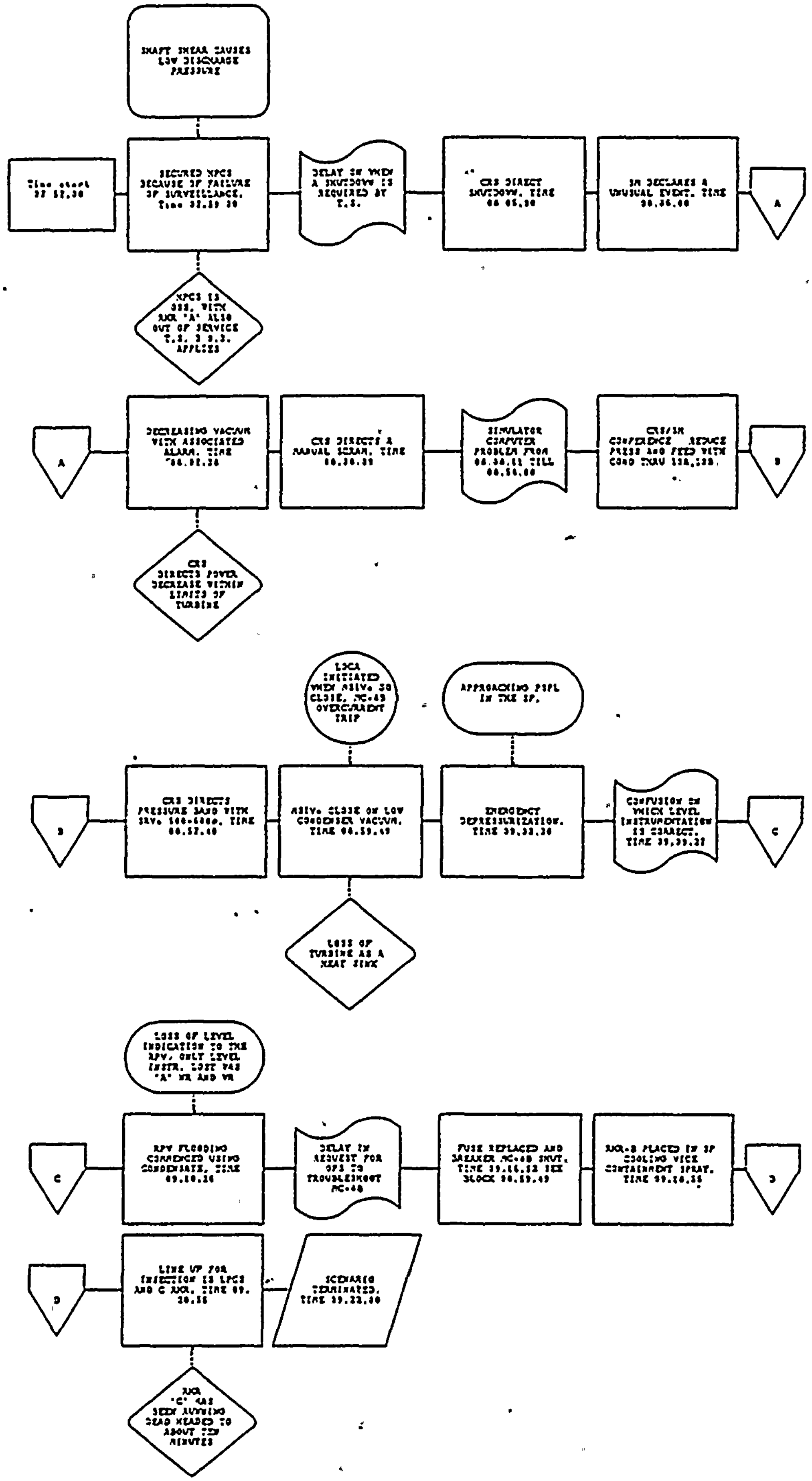
Crew Y/ Scenario 3
Loop/DG1 Failure/LOCA/H2



ATWS WITH A FUEL FAILURE
CREW Z, SCENARIO 1



LOOP AND VACUUM WITH RPV FLOOD
CREW Z, SCENARIO 2



APPENDIX 2
MANAGEMENT OVERSITE AND RISK TREE (MORT) ANALYSIS

MORT RESULTS SUMMARY

A.2.0 The following Root Cause Analysis was initiated to address the Operator Failure of the 5,6 June 1991, Requalification Exams. This analysis was prepared using the Management Oversight and Risk Tree (MORT) Analysis.

A.2.1 MORT analysis is a systematic process of determining what barriers did not stand the challenge presented by a hazard. For purposes of clarity, the definition of hazard is Operators ability to respond to severe accident conditions less that adequate and the symptoms of the "problem" are the continued "UNSATISFACTORY" Requal program and the Operator's failure on the Re-exam of 5,6 June 1991. The following is a listing of the specific deficiencies that led up to the "problem." These deficiencies will be classified using MORT analysis terms followed by examples uncovered by the root cause search. This analysis considers the following subsystems; Barrier Failure Analysis, Control Failure Analysis, Management Systems Analysis, and Hazards Analysis.

A.2.2 Investigative Basis:

The basis of the investigative conclusions reached in the following section are extensive and eclectic sampling of data available as a result of the 5, 6 - June examined the information available prior to this date. These included, but not limited to, the review of all of the exam evaluation forms, time lines generated by each of the evaluators, interviews with all of the crews appearing in the exam process, interviews with all management staff involved with the exam, research into previous reports concerning this exam, and events that led up to its results.

A.2.3 Mort Results:

A.2.3.1 Failed Barriers

The barriers considered which would have prevented the "problem" from occurring were; Procedures, Personnel, and Training. The Procedure barrier failed on use when the operators failed to:

- Correctly classify the accident using the EPIPs

  Source: Evaluators' competency forms, ISCT failure. In that the SM classified scenario #3 as a SAE when in fact it was a GE

- Inject SLC when required by the EOPs

  Source: Evaluators' competency forms, ISCT failure. In that the CRS failed to inject SLC for RPV flood as required by 5.1.1 on scenario #1

- Secure all CRA fans

  Source: Evaluators' competency forms, ISCT failure. In that the CRO failed to secure all running CRA fans as required by 5.2.1 on scenario #3.

- Initiate CAC units when required by procedures

  Source: Evaluators' competency forms, ISCT failure. In that the CRS failed to direct the initiation of CAC units when required by 5.2.1 on scenario #3

A.2.3.2 The Personnel barrier failed on task performance errors caused by Procedures which did not agree with the functional situation.

- Prioritization on the use of drywell versus wetwell sprays when only one pump is available in the H2 control section of the EOPs

  Source: Interviews with CRS, SM and Training Management Staff, Evaluators' competency forms, Event and Causal time lines. In that the CRS was unsure how to use the only operable RHR pump when in EOP 5.2.1 Primary Containment Hydrogen in scenario #3.

- Prioritization of the RPV versus containment when recovery resources are limited.

  Source: Interviews with CRS, SM, Crew Y, and Training Department Management Staff. In that the CRS did not know what was the priority for recovery when in EOP 5.2.1 and EOP 5.1.1. in scenario #3

A.2.3.3 The Personnel barrier also failed on task performance errors caused by Personnel Performance Discrepancies caused by Training. Specifically;

- Training methods were less than adequate when specific legs of the EOPs were "table topped" rather than run as simulator scenarios.

  Source: Interviews with CRSs, SM, all crews, and Training department management staff. Noteworthy of mention is that Training management staff concurred on the need for operators to "see" all areas of the EOPs in dynamic simulator format rather than in the classroom or "table topped" in static simulator. Training management staff indicated that they previously did not do this because they believed that these areas of the EOPs could not be examined in a dynamic simulator format.

- Additionally, the need for Contractors to assist in the training process may indicate a resource limitation in the training department.

  Source: L & A oversight report OR91-002, Training Department Corrective Action Plan dated 16 May 1991.

- There was no objective criteria used to determine the readiness of the operators for the Re-exam.

  Source: Remediation program for licensed operator annual requal program 29 June 1991, rev 4, Interviews with Training department management staff. In that the readiness of the crews was verified interviews-with senior management and senior crew members.

A.2.3.4 Employee motivation also was considered less than adequate due to Obstacles Preventing Operator performance. These factors were:

- No readable displays for critical containment parameters

  Source: QASR 2-91-048, Crew interviews. In that critical plant parameter displays readable by the CRS from the EOP boards are not available. Thus the CRS is required to repeatedly solicit this information from the CROs.

- Human factors enhancement to the EOPs

  Source: "HUMAN FACTORS REVIEW OF, WNP-2 SYMPTOMATIC OPERATING PROCEDURES WRITERS GUIDE AND SAMPLE EMERGENCY OPERATING PROCEDURES FLOW CHARTS" June 1991 by Ceil Consultants Inc., QASR 2-91-048, Crew interviews. In that specified improvements in the aforementioned documents would make the flow-charts more conducive to effective crew performance.

- Pull-to-lock for ECCS pumps to reduce chances of an inadvertent injection to the RPV during Emergency Depressurization.

  Source: QASR 2-91-048, Crew interviews. In that under present plant arrangement, Emergency Depressurization requires two CROs (one to open SRVs and prevent injection from DIV I low pressure source and one to prevent injection from DIV II low pressure sources). This could be reduced to a one-man operation with the installation of this or similar modification.

- Placement of the Alarm Response procedures below their respective alarm panel.

  Source: QASR 2-91-048, Crew Interviews. In that the location of the ARP has affected their use in the simulator environment and the control room (e.g. NCR 291-487) and placement of the ARPs below their respective panel would facilitate their use.

- Silence capability for the alarms that actuate en masse during emergency situations

  Source: Multi-Utility Peer Team Evaluation report 24 May 1991, QASR 2-91-048, Crew Interviews. In that other utilities have incorporated a silence capability for alarms that reduces the noise level in the control room during emergency events.

- The schedule caused pressure to meet the 5,6 June Re-exam date. In that the impact of having the operators in four (4) hours of training followed by eight (8) hours of shift rotation may have been detrimental to the learning process.

  Source: Interviews with X, Y, and Z crews, Corrective action plan 17 June 1991

A.2.3.5 The Training barrier that failed was demonstrated by the retraining program not being comprehensive enough to cover all legs of the EOPs and the ESPs with simulator training.

Source: Interviews with Training Department Staff and operating crews. In that the Training Department Management Staff said that they did not train the Operators in the Dynamic environment for all areas of the EOP flow chart because of simulator limitations, credibility of scenario, and time restraints.

A.2.4.1 Failed Controls

The Controls that were in place that demonstrated themselves to be less than adequate were Facility Functional Operability, Inspection Plan, Supervision and Detection/Correction of Hazards.

A.2.4.2 Facility Functional Operability Less than Adequate;

- WNP-2 response to NRC findings. See A.2.5.2 Independent Audit and Appraisal of this report for complete development.

  Source: NRC EOP Team Inspection report 23 Oct 1990, Response to EOP Inspection Team Issues 26 Nov 1990

- General Design of the EOP Program implementation is less than adequate to track and maintain the Emergency Procedures program as demonstrated by the findings of the Ceil Corp., General Physics Corp., Operations Engineering.

  Source: License & Assurance Report SS91-002 delineates those specific areas of program improvement needed to enhance the performance of this highly visible endeavor.

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A.2.4.3 Inspection plan was less than adequate

- Inspection/Evaluation by Peer Utility Experts recommendations were not fully incorporated.

  Source: EOP revisions made prior to 5,6 June 1991, IOMs From Training Department to Technical Training Support Services, Ltr From Industry Peer Task Force To R. Barmettlor dated 24 May 1991. See Appendix 3 of this document for complete development.

- The Scope of the Quality Assurance Surveillance was too narrow in that it was not tasked with making a readiness evaluation.

  Source: QASR 2-91-048. In that the scope of this surveillance was "Quality of communications, Attitude toward EOPs, Adequacy of EOPs, Complexity of Training scenarios" and did not address the issue of Operator readiness.

A.2.4.4 Supervision was Less than Adequate

- Remediation training in Simulator environment for Shift Managers, CRSs and CROs was not sufficient to have simulator training on each and every leg of the EOPs as well as training in the ESPs.

  Source: Corrective Action Plan dated 17 June 1991, Crew interviews. See Section 1.1 Training of this document for complete development of this issue.

- Training time was given prior to a normal eight (8) hour shift. This placed inordinate amount of stress on the operators' learning environment.

  Source: Corrective Action Plan dated 17 June 1991, Crew Interviews

A.2.4.5 Detection/Correction of Hazards to achieve a successful retraining of the operators was less than adequate in that:

- The Shift Managers and CRSs felt there were inadequate opportunities to input their recommendations for retraining of their crews prior to being retested by the NRC.

  Source: Corrective Action Plan dated 16 May 1991, Crew Interviews. In that training requirements and the needs of the operation personnel are both fulfilled in the Requal training cycle. More effective utilization of the Ops Liaison position will do much to mitigate this finding.

A.2.4.6 The amelioration efforts were less than adequate for prevention of a second accident (Requal Exam failure).

- The execution of the remediation plan was less than adequate in that changes were made in the retraining program that were too large and introduced too late to be fully implemented. Examples of the changes made between the OPEVAL and the Re-Exam were:

  o Revision to the EOPs

  o Changes to "Conduct of Operations"

  o Communications Policy change

  o Recently qualified operators on a newly formed shift

  o new highly complex scenarios

  Source: Revision 7 to the EOP 5.1.2 Failure to Scram made 29 May 1991, ltrs from McKay to Operators and Training dated 17, 24, 29 May 1991.

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A.2.5. Management systems that failed

A.2.5.1 The Management Systems that were demonstrated to be less than adequate were Technical Information Systems, and Hazard and Analysis Systems.

A.2.5.2 The Technical Information systems that were less than adequate included:

- Solution research for the known precedent was inadequate in that the root cause for the Requal and OPEVAL failed to provide the necessary corrective actions to prevent recurrence of a failure.

  Source: Examination results from 5,6 June Re-Exam. In that the scope of the first root cause addressed test performance versus Accident Mitigation by our operators. Also the remediation effort focused on the depth of scenario development at the expense of a more comprehensive approach to training program improvement.

- Network operation of the external communications system was less than adequate in that the recommendations of the Multi-Utility Peer Review team recommendations were not fully implemented in a timely manner, to have significant positive effect.

  Source: EOP revisions made prior to 5,6 June 1991, IOMs From Training Department to Technical Training Support Services, ltr from Industry Peer Task Force To R. Barmettlor dated 24 May 1991. See Appendix 3 of this report for complete development of this topic.

- Data Collection and Analysis was less than adequate. The Management Oversight of the retraining had insufficient criteria for Management Surveillance program to provide policy implementation issues.

Source: WNP-2 Licensed Operator Annual R/Q Exam Remediation Program 29 June 1991, Rev 4.

In that there was no objective criteria for evaluating the readiness of the operators to be used by the Senior Management in their oversight endeavors.

- Independent Audit and Appraisal system was less than adequate. This issue addresses the NRC Inspection of the Emergency Operating Procedures dated 23 Oct 1990. In this report the comparison of the WNP-2 EOPs and the BWR Owner's Group procedure Guidelines identified three (3) deviations and one (1) deficiency. They were:

  a. Primary Containment Venting Deviation

  b. Primary Containment Flooding Deviation

  c. Steam Cooling Deviation

  d. Operability limitations of the level instrumentation due to reactor building temperature conditions

WNP-2's response to these issues was found in ltr from G.C. Sorensen to NRC dated 26 Nov 1990. It stated, "...Supply System acknowledges there is a concern with regard to these deviations. Accordingly, we have and will continue to discuss this issue with the BWR Owners group..."

<u>THESE WERE THE AREAS WHICH WERE EXAMINED BY THE NRC AND THAT THE SPECIFIC ISCT FAILURES ON THE 5,6 JUNE WERE DUE TO OPERATOR INABILITY IN THESE PORTIONS OF THE EOP FLOW CHARTS</u>

A.2.6. Hazards Analysis Systems that failed

A.2.6.1. The Hazards and Analysis systems used to inform management of impending problems that were less than adequate were Concepts and Requirements and the Design and Development Plan.

A.2.6.2. The Concepts and Requirements that were less than adequate included:

- Procedure criteria was deficient due to the EOP deviations from the PSTGs and in turn their deviations from the BWR Owners Group Guides. For complete development of this issue see Licensing and Assurance oversight reports SS91-001, OR91-002, SS91-002, SS91-003.

- Verification of safety requirements with the Regulator's (NRC) showed significant unresolved disparity with the concerns of the NRC as demonstrated by the inspection report dated 23 Oct 1990. Reference #7

  Source: Section 2.3. of this document

A.2.6.3. The Design and Development Plan for implementing the Concepts and Requirements above was less than adequate in that:

- Human Factors Review failed to predict the man machine interface problems with implementing EOPs.

  Source: QASR 2-91-048, Crew Interviews. For specific improvements that would have facilitated improved operator performance see Section A.2.3.4. Obstacles Preventing operator performance.

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- Inspection Plan failed to provide management with the warnings needed to prevent recurrence of failure.

  Source: A.2.4.3. Inspection Plan of this document

- Emergency Provisions were less than adequate in that the EOPs were in need of a Human Factors update which is presently being addressed.

  Source: "HUMAN FACTORS REVIEW OF WNP-2 SYMPTOMATIC EMERGENCY OPERATING PROCEDURES WRITER'S GUIDE AND SAMPLE EMERGENCY OPERATING PROCEDURE FLOW CHARTS" June 1991, Ceil Consultants Inc., Licensed Operator Annual R/Q Exam Remediation Program 29 June 1990, Rev 4

- Testing and Qualifications of the program in the maintenance of the EOP program was less than adequate in that Validation and Verification program reviewed by General Physics Corp. and Operations Engineering Corp. revealed significant gaps in accountability and places for improvement. For further information see L & A Oversight Report SS91-002 and SS91-03.

APPENDIX 3
PEER REVIEW RECOMMENDATIONS' DISPOSITION

This section will address the disposition of the peer review comments. The following implicit questions were addressed:

- o What were the recommendations of the peer review team?
- o What actions did WNP-2 take predicated on these recommendations?
- o What actions did WNP-2 take independent of these recommendations?
- o Why were the recommendations not fully incorporated? Were they:
  - too large an effort to incorporate?
  - too late to incorporate?
  - wrong?

A.3.1 The recommendations from the peer evaluators is in the form of a letter dated 24 May 1991, From: Multi-Utility Peer Team To: Bob Barmettlor. WNP-2 tasked the Multi-Utility Peer Team with evaluating individual/crew simulator performance and the training process: Additionally, they were asked to provide recommendations to improve simulator exam performance and to determine if the exam crews were ready to take an NRC administered simulator exam. Their recommendation was:

"THE SELECTED EXAM CREWS SHOULD NOT BE EXAMINED BY THE NRC UNTIL THE CURRENT EMERGENCY OPERATING PROCEDURES ARE REVISED AND THE CREWS ARE RETRAINED."

The specific recommendations addressed EOPs, Communications, and Long- Term fixes.

In an IOM From: R.B. Quay, To: R.B. Barmettlor dated 5 June 1991, "Evaluation Report For: Industry Task Force Report on Operations Requalification Training" the peer review comments were reworded for comment and a final report was to follow. Again the recommendations of the Multi-Utility Peer Team were restated based upon verbal input at exit meeting and comments were requested to be in by 14 June 1991, for inclusion into the final report.

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In an IOM From: D.F. Topley, To: R.B. Quay dated 21 June 1991, "RESPONSE TO OPERATION REQUALIFICATION TRAINING PROGRAM EVALUATION TASK FORCE REPORT" Training Department responded to the Multi-Utility Peer Team recommendations. The recommendations were in the areas of:

1. Revision to the EOPs prior to re-exam, 2. Training of all crews on the revisions, 3. Long-term revisions to the EOPs, 4. Communications Policy, 5. Upgrade evaluation methods in simulator. The five recommendations that were addressed appeared in the aforementioned letter. This IOM answered the question; What was done in the area of training, communications and EOP development?

SUMMARY; The Supply System failed to incorporate the first and most emphasized recommendation, to revise EOPs and retrain operators prior to re-exam by the NRC. The Supply System did incorporate the remaining four recommendations that were to: train operators on the new revisions, retain consultants to perform human factors upgrade, publish a communications policy, and upgrade evaluation techniques. This apparently occurred due to the rephrasing of the original recommendations based on verbal input of the Peer Utility Experts.

A.3.2 The following are the recommendations of the multi-utility peer team, the response from D.F. Topley, and the root cause investigative conclusion.

RECOMMENDATION 1

Revise Emergency Operating Procedures based upon operator input to eliminate known problem areas prior to retaking the NRC examination. (Note the rephrasing of the Multi- Utility Peer evaluation)

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Response from Reference 3:

As a result of several meetings between Training and Operations department staff, changes were made to the EOPs to correct several areas that were causing confusion or were misleading. These changes were implemented and each crew trained on them prior to the (NRC) exam.

In addition to the changes made to the EOPs, policy statements were issued to clarify several other unclear areas. These policy statements were issued by the Operations Manager. Training personnel incorporated the policy statements into the simulator training curriculum.

Investigative Conclusion:

There does not appear to be any direct connection between the changes made to the EOPs and the specific EOP recommendations of the Multi-Utility Peer Team.

On 29 May 1991, Revision 7 to EOP 5.1.2 "Failure to Scram" appeared. There were three (3) discernable changes made to EOP 5.1.2. Two of them were editorial changes only and did not require verification in accordance with PPM 5.0.3. "Emergency Operating Procedures Verification" Section 4.2.2. The third change involved implementation of a new procedure PPM 5.5.22 "Defeating RPS Trips" which was in response to PER 291-0117 dated 13 FEB 1991.

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Policy Interoffice Memoranda that were issued by Operations Department during the period between the Operational Evaluation and the NRC Re-exam on June 5,6 1991 are: IOM From: S.L. McKay To: All Operations and Training Department Personnel, and STA's dated 24 May 1991, "OPERATIONS DEPARTMENT POLICY ON ACCEPTED VERBAL COMMUNICATIONS." This was issued the same day the Multi-Utility Peer Team submitted their recommendations to Training. IOM From: S.L. McKay, J.W. Baker, A.L. Oxsen To: Licensed Personnel, STA's, L.O. Training, TSC Directors/Mgrs., NSAG dated 17 May 1991, "Procedure Usage." IOM From: S.L. McKay To: R.B. Barmettlor dated 29 May 1991 "Response to Recent EOP Issues and Concerns."

A.3.3 <u>RECOMMENDATION 2:</u>

Conduct training for all Operations personnel on the above changes.

Response from Reference 3:

The changes to the EOPs and the addition of policy statements previously noted were incorporated into the requal remediation training program. Crews X, Y, and Z were provided simulator training and were evaluated on these changes and policy statements prior to the re-exam by the NRC. Each of the remaining crews were provided on-shift training by Operations Department Management.

Investigative Conclusion:

With the appearance of the EOP revision four (4) working days prior to the NRC re-exam on 5,6 June 1991, <u>the amount of effective simulator hands on training conducted was limited.</u> Again, the EOP revision did not have any connection with the recommendations of the Multi-Utility Peer Team.

APPENDIX 3
PEER REVIEW RECOMMENDATIONS' DISPOSITION

A.3.4 RECOMMENDATION 3

Perform an extensive human factors review and revision, following the current examination cycle, to upgrade the quality of emergency operating procedures and flow charts.

Response from Reference 3:

In May, 1991, Ceil Consultants, Inc. was retained by the Supply System to perform a human factors review of the WNP-2 Emergency Operating Procedures. This project is divided into two phases:

1. Phase I will provide flow charts that will have incorporate standardized symbols, simplified wording, improved print size, introduction of colors and enhanced space usage. The intent of Phase I is to provide an immediate upgrade in the usability of the EOPs.

2. Phase II will be a more far reaching effort aimed at complete review of not only the EOP flow charts, but also the EOP Writer's Guide. Areas of improvement will include redesign of the over ride symbol, consistent application of the Writer's Guide, reformatting of the flow chart sentence structure, flow chart transitions and flow chart logic terms. Phase II will provide flow charts designed to facilitate place finding and place keeping, as well as promote fast and accurate comprehension of procedural information.

EOP flow charts developed from Phase I are available. Each operating crew will be trained and evaluated on the use of these revised flow charts during the requal remediation process. These EOP flow charts will be implemented prior to plant start up from the present refueling outage.

Because of the increased scope of Phase II, the revised flow charts developed from this effort will not be available until the fourth quarter of 1991. Following verification and validation, and crew training and evaluation, these EOPs will be implemented in early 1992.

Investigative Conclusion:

This recommendation has been fully implemented and the scope of the task has been enhanced beyond the particulars of the Utility Peer Evaluators.

As a result of the outcome of 5, 6 June 1991, efforts in this area have increased tremendously, both in depth and scope. The in-house review of the human factors and technical confirmation has received a marked increase in manpower. Likewise the Licensing and Assurance oversight of these efforts has increased commensurately. In addition, several highly reputable consultants have been retained both for assistance in upgrading the EOPs and in oversight operations. Ceil Consultants has been scoped with human factors improvements and technical verification. General Physics has been asked to assist in the evaluation of the retraining of the operators and is also a second team member to provide oversight of the Verification and Validation (V&V) review of the EOPs. Operations Engineering Corporation is providing additional coverage of the connection between the BWR Owner's Guide, the Emergency Procedures Guide, the Plant Specific Technical Guides and the Emergency Operating Procedures. All these efforts have been expanded to conform with the retraining schedule for the operators. The schedule for these improvements is ambitious and has impacted the operator requalification training schedule.

A.3.5 <u>RECOMMENDATION 4</u>

Develop, publish, and enforce a comprehensive communications policy for use both in the plant and simulator.

APPENDIX 3
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Response from Reference 3:

As a result of early comments by the Utility Evaluators, WNP-2 Operations Management issued a policy statement regarding verbal communication. This statement focused on the need for repeat-backs and crew briefs by the Control Room Supervisor during conditions requiring use of EOPs.

The policy statement was put in effect, trained on, and evaluated against, prior to the 5, 6 June 1991, re-exam. Improvement in crew communications was realized as a result of issuance of this policy statement.

Following the re-exam, plant procedure PPM 1.3.1, CONDUCT OF OPERATIONS, was revised to incorporate the requirements of the above mentioned Operations Management policy statement. This revision also included further policy on accepted verbal communications. This procedure has been included in the remediation program classroom and simulator training. It policies will be strictly enforced during training and evaluated simulator scenarios.

APPENDIX 3
PEER REVIEW RECOMMENDATIONS' DISPOSITION

Investigative Conclusion:

Following the revision to PPM 1.3.1, "CONDUCT OF OPERATIONS" and the IOM From: S.L. McKay, Operations Manager, To: All Operations and Training Department Personnel STAs, dated 24 May 1991, "OPERATIONS DEPARTMENT POLICY ON ACCEPTED VERBAL COMMUNICATIONS" and the corrective action plan of 16 May 1991, significant improvement was noted in the communications for all crews being trained in the simulator and those present in the control room. However, when the examination team assembled on 5,6 June 1991, a measurable drop in performance was noted in the communications competencies. Corrective actions (Corrective Action Plan 29 June 1991) continue to stress the need for formal communications techniques. Additionally, consideration has been given to the issue of the regression of the communications performance on the day of the exam. Presently, consideration is being given to a warm-up scenario for the operators prior to the exam to facilitate optimum performance. This will also foster a more enhanced performance unincumbered by possible "stage fright" by the presence of the evaluators and the NRC. <u>We need to set a pattern of performance on shift that enforces the communications policies. This enforcement will only be effective if it is applied to daily on shift operations as well as through all levels of training.</u>

APPENDIX 3
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A.3.6 RECOMMENDATION 5

Develop and consistently apply a comprehensive simulator evaluation grading and critique system to include adequate reconstruction of event and critical discussion of less than adequate performance.

Response from Reference 3:

Through early critique and feedback by the Utility Evaluators, WNP-2 instructors were able to improve their evaluation and critique skills and increase their level of objectivity. This improvement was substantiated during the 5, 6 June 1991, re-exam. The NRC exam team made specific mention as to the level of parity between themselves and the facility evaluators during this re-exam.

During the upcoming remediation effort further enhancement in adequate event reconstruction during critiques and critical discussion of below standard performance will be made. Two contracted instructors have been retained to augment the training staff throughout the remediation effort. A side benefit of their employment will be an introduction of fresh ideas and techniques in the area of simulator instruction. Any benefits realized from these outside instructors will be captured and retained.

Due to the success of the Utility Peer Evaluators, it is again planned to involve utility representatives in the on going remediation effort.

[illegible]

APPENDIX 3
PEER REVIEW RECOMMENDATIONS' DISPOSITION

Investigative Conclusion:

As was mentioned in paragraph 3.1.2, a measurable and significant improvement was noted in the performance of the WNP-2 evaluators. In the exams that took place on the 5,6 June 1991, the agreement between the NRC and WNP-2 evaluators was NOT a cause for continued program failure. The only disagreement between the NRC and WNP-2 showed up in the evaluation of Crew Z. Again, our evaluators chose a performance level of TWO (2) for the crew Z in many of the competencies, the NRC chose ONE (1) for these competencies. Although this disparity resulted in a pass by the WNP-2 evaluators versus a failure, the overall evaluation by the WNP-2 evaluators recognized much improvement in areas of:

- Agreement in performance between the NRC and WNP-2
- Independence and critical evaluation of the individuals
- Adherence to the standards set forth in NUREG 1021 Rev 6

These points were collaborated by comments received from the NRC in the exit meeting from the 5, 6 June 1991, Re-exam as well as from comparison of the disagreement of the WNP-2 evaluators with the NRC from the Requal and OPEVAL.

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