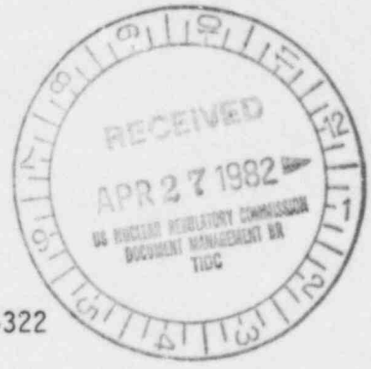
04/23/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322
	)	(OL)
(Shoreham Nuclear Power Station Unit 1)	)	

NRC STAFF'S ANSWERS TO SUFFOLK COUNTY DISCOVERY REQUESTS TO THE NRC STAFF ON CONTENTIONS 16 AND 20

In order to expedite this proceeding and to continue the cooperative efforts between the NRC Staff (Staff) and Intervenor Suffolk County with respect to discovery matters, the NRC Staff has determined to treat the above-captioned County Interrogatories and Requests for the production of documents dated April 1, 1982 as an informal discovery request. The Staff's voluntary response to the County's request should not be construed as a Staff acknowledgement that the County discovery requests comply with the provisions of 10 C.F.R. § 2.720(h)(2)(ii) or § 2.744 as regards discovery against the Staff.

Contention 16

1 and 2. The review criteria for the ATWS procedures is provided in IE Bulletin 80-17, "Failure of 76 of 185 Control Rods To Fully Insert During a Scram at a BWR," item 4.a), b), c), and d) (Enclosure 1), and a June 23, 1980 memo from F. Schroeder to R. L. Tedesco and V. Moore (Enclosure 2).

DESIGNATED ORIGINAL

Certified By

The form of our review is described in Shoreham SSER #2 Section 13.5.2C (Enclosure 7). Enclosure 3 is the procedure originally submitted, in draft, to the NRC for review. Enclosure 4 provides the questions asked by NRC during the review, and Enclosure 5 is the revised procedure after discussions with the NRC. Enclosure 6 is a copy of the original SER for ATWS, outlining the requirements and the LILCO commitment to address the issue. The findings of the NRC Staff are included in Section 15.3 of Enclosure 7.

3. The NRC Staff has not verified the adequacy of the Recirculation Pump Trip System at Shoreham. LILCO has not submitted the Recirculation Pump Trip System design for Staff review. Therefore, details of the verification review are not available at present. LILCO has been requested to submit the system design for Staff review.

4. A complete listing of ATWS related modifications that LILCO has committed to complete at Shoreham is identified in Enclosure 8. (Letter SNRC-437 dated October 19, 1979 from J. P. Novarro (LILCO) to H. Denton (NRC)). ATWS related modifications committed by LILCO are the following:

a. A Reactor Recirculation Pump Trip System

Reactor recirculation pump trip is already installed at Shoreham according to the Resident Inspector.

b. Emergency Procedures Will Be Developed for ATWS Events

See Response to Interrogatories 1 and 2, above.

c. Operators Will Be Trained to Perform the Proper Actions for ATWS Events

See Response to Interrogatories 1 and 2, above.

5. A complete description of NRC Staff recommendations on plant modifications made to the Commission is given in SECY 80-409, September 4, 1980, and in final form in SECY 80-409C, November 7, 1980.

Alternatives proposed by the Staff have been superceded by the proposed rules published by the Commission on November 24, 1981. The present NRC position on ATWS modifications required during the interim period is given in the proposed rules published by the Commission on November 24, 1981 and is as follows:

> The Commission believes that the likelihood of severe consequences arising from an ATWS event during the two to four year period required to implement a rule is acceptably small. This judgment is based on (a) the favorable experience with the operating reactors, (b) the limited number of operating nuclear power reactors, (c) the inherent capability of some of the operating PWRs to partially or fully mitigate the consequences of ATWS events, (d) the partial capability of the recirculation pump trip feature to mitigate ATWS events that has been implemented on all BWRs of high power level, and (e) the interim steps taken to develop procedures and train operators to further reduce the risk from some ATWS events. On the basis of these considerations, the Commission believes that there is reasonable assurance of safety for continued operation until implementation of a rule is complete. The implementation schedule contained in this rule balances the need for careful analysis and plant modifications with the desire to carry out the objections of the rule as soon as possible.

LILCO has committed to items (d) and (e). See response to Item 4.

6. The proposed rule gives the criteria required to mitigate ATWS. Automatic SLCS is one of the modifications which could result from the proposed rule to mitigate ATWS, published in the Federal Register on

November 24, 1981. SLCS equipment requirements suggested by the Staff are given in Appendix C, Volume 3 of NUREG-0460.

Contention 20

1. The NRC Staff has performed no reviews and analyses of the type described in the interrogatory.

2. The exercise conducted on October 16, 1981 is described on page 8 of Enclosure 9. These exercises were performed to aid in the review of Shoreham procedures.

Respectfully submitted,

David A. Repka

David A. Repka
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 23rd day of April, 1982.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322
	)	(OL)
(Shoreham Nuclear Power Station, Unit 1)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S ANSWERS TO SUFFOLK COUNTY DISCOVERY REQUESTS TO THE NRC STAFF ON CONTENTIONS 16 AND 20" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 23rd day of April, 1982:

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Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docketing and Service Section*
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322
	)	(OL)
(Shoreham Nuclear Power Station Unit 1)	)	

AFFIDAVIT OF MARVIN W. HODGES

Now comes Marvin W. Hodges, and being duly sworn, deposes and says as follows:

1. I am presently employed by the U.S. Nuclear Regulatory Commission as a Section Leader in the Reactor Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation.

2. I am duly authorized to answer the following Interrogatories submitted to the NRC Staff by Suffolk County on April 1, 1982: Suffolk County Contention 16, Interrogatories 3-6.

3. I hereby certify that the answers given are true and correct to the best of my knowledge and belief.

Marvin W. Hodges
Marvin W. Hodges

Subscribed and sworn to before me
this 23 day of April, 1982.

Notary Public

Commission expires: 7/11/83.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322
	)	(OL)
(Shoreham Nuclear Power Station Unit 1)	)	

AFFIDAVIT OF ROBERT J. CAMPBELL

Now comes Robert J. Campbell, and being duly sworn, deposes and says as follows:

1. I am presently employed by the U.S. Nuclear Regulatory Commission as Acting Section Leader, Boiling Water Reactors, in the Operating Licensing Branch, Office of Nuclear Reactor Regulation.

2. I am duly authorized to answer the following Interrogatories submitted to the NRC Staff by Suffolk County on April 1, 1982: Suffolk County Contention 20, Interrogatories 1-2.

3. I hereby certify that the answers given are true and correct to the best of my knowledge and belief.

Robert J. Campbell

Subscribed and sworn to before me
this 23 day of April, 1982

Notary Public

My Commission expires: 2/1/85.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322 (OL)
	)	
(Shoreham Nuclear Power Station Unit 1)	)	

AFFIDAVIT OF JAMES W. CLIFFORD

Now comes James W. Clifford, and being duly sworn, deposes and says as follows:

1. I am presently employed by the U.S. Nuclear Regulatory Commission as an Operational Safety Engineer in the Procedures and Test Review Branch, Division of Human Factors Safety, Office of Nuclear Reactor Regulation.

2. I am duly authorized to answer the following Interrogatories submitted to the NRC Staff by Suffolk County on April 1, 1982: Suffolk County Contention 16, Interrogatories 1-2.

3. I hereby certify that the answers given are true and correct to the best of my knowledge and belief.

James W. Clifford

Subscribed and sworn to before me
this 23 day of April, 1982.

Notary Public

My Commission expires: 7/1/85.

ENCLOSURE 1

SSINS No.: 6820
Accession No.:
8005050076

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

JULY 3, 1980

IE BULLETIN NO. 80-17

FAILURE OF 76 OF 185 CONTROL RODS TO FULLY INSERT DURING A SCRAM AT A BWR

Description of Circumstances:

On June 28, 1980, 76 of the 185 control rods failed to fully insert during a routine shutdown at TVA's Browns Ferry Unit No. 3 located at Athens, Alabama. The reactor was manually scrammed from about 30 percent power in accordance with routine shutdown procedures. The shutdown was initiated to repair the feedwater system. The 76 control rods that failed to fully insert were all on the east side of the core.

Following scram discharge volume (SDV) high level bypass and a short drain period of the SDV, a second manual scram was initiated and all partially inserted rods were observed to drive inward, but 59 remained partially withdrawn. A third manual scram was made, again following high level in the SDV and bypassing for another short drain of the SDV, with the result that 47 rods remained partially withdrawn. Following a longer drain of the SDV, an automatic scram occurred that was initiated by a scram discharge volume tank high water level signal when the scram reset switch was placed in "Normal"; with this scram all remaining rods fully inserted. The total time elapse from the initial scram to the time that all rods were inserted was approximately 15 minutes. Core coolant flow, temperature and pressure remained normal for plant conditions. The unit is now shutdown and additional testing indicates that a possible cause of the malfunction was the retention of a significant amount of water in the east bank scram discharge volume. In view of these interim findings and pending results of continued investigation, the following actions are to be taken.

Actions To Be Taken By Licensees:

All General Electric Boiling Water Reactors with operating licenses which are operating at any power on the date of this Bulletin shall perform the following steps in the time stated. Those that are presently shutdown shall perform the following steps prior to operating at power.

1. Within 3 days from the date of this Bulletin, perform surveillance tests to verify that there is no significant amount of water in the Scram Discharge Volume (SDV) and associated piping and that the SDV vent valves are operable and vent system is free of obstruction.

2. Within the next 20 days, perform one manual and one automatic scram in that order at normal operating temperature and pressure and with more than 50 percent of the rods fully withdrawn, and obtain the following information on each scram:

   a) All rod insert times and as many individual rod scram times as practicable.

   b) Voltage at the scram solenoid valve buses to verify that these solenoids are de-energized upon receipt of scram signal.

   c) Verify that scram valve air is relieved through the backup valves and that the backup valves are fully open and remain open during the presence of a scram signal.

   d) Measure fill time of the instrument volume from scram initiation to closure of the scram instrument volume high level alarm switch, to closure of the rod withdraw block switch on the instrument volume and to the closure of the scram instrument volume reactor scram switch.

   e) Measure vent and drain valves opening and closing times utilizing the valve stem mounted switches. This measurement may be made independent of the scrams.

   f) Measure the delay time from scram initiation to closure of the SDV vent and drain valves utilizing the stem mounted position switches.

   g) Sample water from the instrument volume discharge after each scram for particulates.

   h) Measure the time to drain the SDV down to a repeatable reference level.

   i) Monitor the SDV and associated piping for residual water.

   j) Verify that the ten (10) second delay on scram reset is functioning properly to prevent resets of momentary scram signals.

   k) Compare the results of the two sets of data taken above with each other and with any previously obtained data.

3. At the conclusion of the scram tests and all other scrams, verify that all vent lines on the SDV are functional. Verify that there is no significant amount of water in the SDV and associated piping.

4. Within 10 days, complete a review of emergency operating procedures by the licensee and the NSSS vendor to assure that, for scram, operator actions include:

a) Place the reactor mode switch in a position other than RUN.

b) Determine whether either of the two conditions below exist:

(1) Five (5) or more adjacent rods not inserted below the 06 position.
(2) Thirty (30) or more rods not inserted below the 06 position.

c) If either condition 4.b.(1) or 4.b.(2) exists:

(1) Trip the recirculation pumps.
(2) Insert rods manually. If rods cannot be inserted manually, alternately reset the RPS and scram the reactor until all rods are fully inserted.
(3) Vent the scram air header.
(4) Manually open or bypass the scram instrument volume drain and vent valves, if possible.

d) If, at any time, either condition 4.b.(1) or 4.b.(2) exists and either RPV water level cannot be maintained or suppression pool water temperature cannot be maintained below the suppression pool water temperature scram limit, initiate the SLCS.

e) Review the Browns Ferry occurrence with all licensed operators and train them in the procedures to recognize and mitigate the event. Verify that preliminary training of operators is completed within 10 days of the date of this Bulletin and that full training is completed within 30 days of the date of this Bulletin.

5. Review and develop surveillance procedures such that scram discharge volume is monitored daily for residue water for 6 days and, if results are acceptable the interval may be extended to 7 days.

6. In order to mitigate the consequences of an ATWS event, enhanced operability of HPCI, RCIC, SLCS, RPT/RHR/pool cooling and main steam bypass is essential. Accordingly, the following actions are requested:

a) Prompt notification (within 24 hours) of any of the above systems when it is less than fully operable and when it is restored to service. Operability of both pumps in the SLCS is required for full operability. Surveillance tests and preventive maintenance less than 24 hours need not be reported.

b) Operate all the available suppression pool cooling whenever the suppression pool exceeds the normal operating temperature limit.

c) Perform a 50.59 review to increase SLCS flow to the maximum consistent with safety (2 pumps, unless unsafe).

7. For plants without ATWS related RPT, perform an analysis of the net safety of derating such that, in the event of an ATWS, calculated peak pressures do not exceed the service Level "C" limit (~/1500 psig) by taking into consideration the heat removal capability of safety valves, isolation condenser, bypass to the main condenser and other available heat removal systems.

8. Report in writing within 5 days of the performance of each of the tests results (except for the daily tests) and the results of your review and include a list of all devices which respond as discussed above, actions taken or planned to assure adequate equipment control, and a schedule for implementation of corrective action. Report in writing within 10 days, the analyses specified by Item 7 above. This information is requested under the provisions of 10 CFR 50.54 (f). Accordingly, you are requested to provide within the time periods specified above, written statements of the above information signed under oath or affirmation. Reports shall be submitted to the Director of the appropriate NRC Regional Office and a copy shall be forwarded to the NRC Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, DC 20555.

For all boiling water power reactor facilities with a construction perm this Bulletin is for information only and no written response is required.

Approved by GAO, B180225 (R0072); clearance expires 7-31-80. Approval was given under a blanket clearance specifically for identified generic problems.

ENCLOSURE 2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUN 23 1980

MEMORANDUM FOR: Robert L. Tedesco, Assistant Director
for Licensing,
Division of Operating Reactors

Voss Moore, Acting Deputy Director,
Division of Human Factors Safety

FROM: Frank Schroeder, Assistant Director
for Generic Projects,
Division of Safety Technology

SUBJECT: ATWS REVIEW FOR NEAR TERM OLS

In a memorandum dated June 9, 1980, addressed to R.L. Tedesco, I committed DST to prepare written guidance to be used by DHFS/PTRB in reviewing and evaluating the applicant's proposed ATWS procedures. The enclosed instructions provide the necessary guidance for this evaluation.

Frank Schroeder, Assistant Director
for Generic Projects,
Division of Safety Technology

Enclosure: Instructions for Reviewing Interim
Emergency Operating Procedures for ATWS

cc: D. Eisenhut
V. Moore
D. Ziemann
T. Speis
P. Check
R. Mattson
L. Kintner
T. Novak
J. Youngblood
A. Schwencer
K. Parczewski
K. Kniel
A. Thadani

INSTRUCTION FOR REVIEWING INTERIM EMERGENCY

PROCEDURES FOR ATWS

Purpose of Emergency Operating Procedures

ATWS concerns will be resolved in the future by requiring the plants to make the appropriate modifications in order to reduce the probability of occurrence of ATWS events and/or to mitigate their effects. The Commission will, by rulemaking or other means, determine the required modifications and the schedule for the implementation of such modifications. In the interim period, while final resolution of ATWS is before the Commission, the plants will be required to provide certain precautions. The decision for permitting the plant to operate is based on the staff's conviction that the present likelihood of severe consequences arising from an ATWS event is acceptably small and presently there is no undue risk to the public from ATWS. This conclusion is based on engineering judgment in view of: (a) the estimated arrival rate at anticipated transients with potentially severe consequences in the event of scram failure; (b) the favorable operating experience with current scram systems; and (c) the limited number of operating reactors. However, as a prudent course, in order to further reduce the risk from ATWS events during the interim period before completing the plant modifications determined by the Commission to be necessary, the staff believes the following steps should be taken:

PWRs

1. Emergency procedures be developed to train operators to recognize an ATWS event, including consideration of scram indicators, rod position indicators, flux monitors, pressurizer level and pressure indicators, pressurizer relief valve and safety valve indicators, coolant average temperature, containment temperature and pressure indicators, steam generator level, pressure and flow indicators, and any other alarms annunciated in the control room with emphasis on alarms not processed through the electrical portion of the reactor scram system.

2. Operators be trained to take actions in the event of an ATWS including consideration of manually scramming the reactor by using the manual scram buttons, prompt actuation of the auxiliary feedwater system to assure delivery of the full capacity of this system, and initiation of turbine trip. The operator should also be trained to initiate boration by actuation of the high pressure safety injection system to bring the plant to a safe shutdown condition.

   Early operator action as described above would provide significant protection for all ATWS events which occur (1) as a result of common mode failure in the electrical portion of the scram system and (2) those which occur due to a common mode failure in the scram breakers or the rod drive system for which excessive primary pressures are prevented by actuation of turbine trip.

BWRs

1. Develop emergency procedures to train operators to recognize an ATWS event, including consideration of scram indicators, rod position indicators, flux monitors, vessel level and pressure indicators, relief valve and isolation valve indicators, and containment temperature, pressure, and radiation indicators.

2. Train operators to take actions in the event of an ATWS including consideration of immediately manual scramming the reactor by using the manual scram buttons followed by changing rod scram switches to the scram position, stripping the feeder breakers on the reactor protection system power distribution buses, opening the scram discharge volume drain valve, prompt actuation of the standby liquid control system, and prompt placement of the RHR in the pool cooling mode to reduce the severity of the containment conditions.

Early operator action as described above, in conjunction with a recirculation pump trip, would provide significant protection for some ATWS evnts, namely those which occur (1) as a result of common mode failure in the electrical portion of the scram system and some portions of the drive system, and (2) at low power levels where the existing standby liquid control system capability is sufficient to limit the pool temperature rise to an acceptable level.

All the licensees and the applicants should be (if they have not been) requested to develop the appropriate emergency procedures dealing with ATWS events and submit them for the staff's review.

Nature of Emergency Operating Procedures

The procedure should address the following four areas:

1. Symptoms of ATWS available to the operator in the control room.

2. Automatic Plant Actions during ATWS.

3. Immediate Operator Actions.

4. Subsequent Operator Actions.

The symptoms of ATWS as well as the automatic and operator actions will vary with the initiating transients and the procedures should take it into consideration. The transients which produce most limiting ATWS consequences should be covered by the procedures. These transients are listed together with the scram signals generated by them:

Transient	Scram Signals
PWR	
Loss of Normal Feedwater (LOFW)	Mismatch of steam/feedwater Low S/G level Overtemperature ΔT High pressurizer pressure High pressurizer level S/G low-low level Low reactor coolant flow
Loss of Offsite Power (LOOP)	Low reactor coolant flow Open RC pump breaker Overtemperature ΔT Overpower ΔT High pressurizer pressure High pressurizer level
Stuck Open Relief Valve (SORV)	Overtemperature ΔT Low pressurizer pressure High pressurizer level
BWR	
Closure of MSIV's	Isolation valves position High neutron flux High vessel pressure
Loss of Offsite Power (LOOP)	Stop valves position High neutron flux High vessel pressure
Inadvertent Opening of S/R Valve (IORV)	High Containment pressure High suppression pool temperature

Each of these transients when followed by a failure of the reactor to scram will produce the consequences which may cause serious damage. The operator should be able to recognize that an ATWS event has occurred from the symptoms available to him in the control room and to take appropriate and timely action to mitigate its effects.

1. Symptoms:

The symptoms available to the operator in the control room should provide him information that a transient requiring reactor scram had occurred and that the scram action had failed. The operator should have a clear indication that one of the auto scram parameters exceeded its trip setpoint. For example, during the loss of normal feedwater transient in a PWR the pressurizer pressure exceeded its high pressure setpoint or that a mismatch of steam and feedwater was achieved. He should also have indications of the plant's trip status. This may consist either of a direct indication of the control rod position (rod bottom lights in PWR's) or indications of core neutron flux. Lack of rapid drop in nuclear power would indicate initiation of an ATWS (e.g., less than 10% of initial power in 5 sec. as indicated by NIs readout in PWR's).

2. Automatic Actions

The automatic actions are the actions taken by the plant without the operator's intervention immediately after an ATWS has occurred. It is important for the operator to recognize them and to assure that they would have mitigating effects on ATWS consequences. The type of automatic actions will depend on a plant design and the type of initiating transient. In general, in BWR's the recirculation pumps would trip automatically unless this feature has not yet been implemented and would reduce core power to about 30 percent. The safety-relief valves would also open if reactor pressure exceeds individual valve setpoints.

In PWR's the turbine may trip for certain types of transients. However, for other types manual turbine trip would be required (especially for W-designed plants). This should be specified in the procedures. The other automatic actions which may be plant and/or transient specific are: auxiliary feedwater startup, generator breaker trip, automatic steam dump actuation, initiation of HPSI and steam generator feed water bypass regulator control. The discussion of these automatic actions should also be included in the procedures.

3. Immediate Operator Actions

The immediate operator actions are to mitigate the effects of ATWS and to bring the plant to a stable condition at which point a normal shutdown operation can be initiated. The immediate operator actions will depend on the type of initiating transient and on the automatic plant response to ATWS. The actions taken by the operator at this point can be very important and should be based on a careful analysis of all the available indications. The operator should be able to recognize that an ATWS event took place. The procedure should clearly specify the indications available to the operator during this phase of operation. If two simultaneous action by two operators are required, it should be clearly stated in the procedures. Also a time

frame for performing different operations should be specified (Enclosure 2 is an example of our recent questions on a set of procedures submitted by a PWR applicant). In general the operator actions in this phase consist of:

1. attempt to scram the reactor by manually inserting control rods.

2. attempt to scram the reactor by other means (e.g., injection of liquid poison).

3. mitigate (simultaneously) the effect of the ATWS event.

The procedure should specify which of these actions should be performed simultaneously.

In BWR's the operator should first assure that the recirculation pumps have tripped by an automatic plant action. If they are not tripped the operator should proceed to trip them manually. He should then attempt to scram the reactor manually by using different scramming methods. Typically scramming the reactor should be attempted by: depressing scram buttons, placing the mode selector switch in shutdown position, de-energizing the power to the pilot scram valves by removing the fuses, bleeding air from the scram valve actuation lines by closing the instrument air supply valve to HCU scram valves, manually driving control rods into the core or de-energizing the individual hydraulic control unit scram pilot air valve solenoids. Reactor scram by injecting sodium pentaborate solution into the reactor by initiating the standby liquid control system (SLCS) should be attempted when the primary scram techniques cannot secure fast reactor scram. As a rule, once started SLCS should never be shut off unless neutron power is down. The operator should also ensure that the high pressure make up systems are delivering water to the reactor. Simultaneously, the operator should initiate the suppression pool cooling mode of the RHR system.

In PWR's (Westinghouse designed ones in particular), the most important immediate operator action is to trip the turbine manually if it is not already tripped by automatic plant action and ensure that all auxiliary feedwater pumps are supplying water to the steam generators. The operator should also simultaneously attempt to manually scram the reactor. This could be achieved either by tripping the breakers powering the control rod drive MG sets or by tripping the reactor trip breakers at the MG sets. If this fails, an attempt should be made to manually insert the control rods and at the same time start injecting boron into the primary coolant system. This should be followed by other actions consisting mainly of determining the status of reactor systems required for plant recovery from ATWS. If performance of any of these systems is found to be defective, an appropriate action should be taken. The procedure should be very specific about describing these corrective actions.

4. Subsequent Operator Actions

The subsequent operator actions are the actions taken after the reactor has recovered from the immediate consequences of an ATWS event, its power has been reduced to a safe level and the operator wants to start an orderly shutdown procedure. Basically, the operator should assure that the primary and secondary systems are maintained at a steady temperature and pressure condition and that all the systems needed for maintaining the plant at this condition are operating properly. The operator should also assure that enough negative reactivity has been introduced into the core to assure a sufficient cold shutdown margin. In verifying different plant systems the operator should refer to the appropriate plant operating procedures and take the corrective actions specified by these procedures. The operator should eventually bring the plant to a cold shutdown condition, consistent with the plant's technical specification.

Evaluation of Emergency Operating Procedures

Using the guidelines presented in the previous section, the reviewer should evaluate the emergency operating procedures for completeness and should assure that they provide the operator with sufficient information to enable him to perform the operations which would minimize the ATWS consequences deleterious to the plant. Since these consequences may be plant specific, the emergency ATWS procedures should be prepared individually for each plant. In reviewing these procedures their plant specific character should be taken into consideration and the reviewer should evaluate them relative to a particular plant design. In many cases he may find that the proposed procedures may not be adequate to fully protect the plant during ATWS events occurring at full power and only partial reduction of ATWS consequences was possible. However, these plants may be fully protected when operating at a reduced power (see Enclosure 3 for Sample SER for Operation at Low Powers).

ENCLOSURE 2

SAMPLE QUESTIONS ON AN ATWS PROCEDURE

A. Symptoms

1. The procedure lists the parameters which cause the reactor to scram, but does not describe the actual indications available to the operators in the control room which would make him aware that an ATWS event has occurred. These ATWS symptoms would depend on initiating event and, therefore, they ought to be evaluated for at least the following three key events:

   Loss of Main Feedwater

   Loss of Offsite Power

   Stuck Open PORV

   In making the evaluation it is important to show for each event what symptoms would indicate to the operator that scram action was called for but did not occur.

B. Automatic Action

1. This section does not address how the automatic actions relate to ATWS. Some of the automatic actions (e.g., turbine trip) may not even occur after an ATWS. This should be specified in more detail in the procedure.

2. Why is automatic actuation of HPSI not included in this section of the procedure?

C. Immediate Operator Action

1. The procedure should specify critical indications available to the operator consistent with the initiating event and assumption that the reactor trip has not occurred.

2. The immediate actions that the operators have to take after ATWS has occurred and an attempt to manually scram the reactor from the control room has failed should follow two parallel paths. While one operator should continue the operation of manually scramming the reactor by tripping the breakers powering the control rod drive MG sets, the other

operator should initiate the other actions heading to safe shutdown of the plant. The procedure should reflect that the actions described in sections A.2.b and A.2.c and those described in sections B.1 and B.2 are to be performed simultaneously. Section B should require sequential actuation of turbine trip, all auxiliary feedwater pumps, and high pressure safety injection system. (See Figure 1).

3. Describe the actions taken by the operator when he discovers, during the verifiifation of reactor coolant system status (section C), that the conditions are not within the prescribed limits. What is the impact of loss of offsite power on availability of those signals to the operator. What is the shutoff head of the HPSI pumps? What provisions are taken to prevent pump damage when HPSI is operating against the RCS pressure which is higher than the shutoff head of the pump?

D. Subsequent Operator Action

1. What is the time frame for these actions?

2. What criteria are provided to verify that:

   a. The auxiliary feedwater system is providing the necessary flow to the steam generators.

   b. The HPSI is providing necessary flow to RCS.

   C. The containment heat removal is being accomplished, if the containment conditions are outside the normally specified valves.

3. What additional procedure does the operator have to follow in order to bring the plant to and maintain in a cold shutdown condition after an ATWS? For example, what boron concentration should be maintained in the RCS?

/ent & Action equence	Transient Initiated Symptoms	Failure to Scram Symptoms	Immediate Operator Actions Two Operators	SUBSEQUENT ACTIONS: Verify RCS, Steam Generator, Containment Parameters Values	SUBSEQUENT ACTIONS: Long Term Shutdown
eneral time equence	t_0	t_1	t_2	t_3	t_4
			Operator #1 Manual Scram Attempts	If outside specified limits, describe the operator actions.	Describe special actions to bring plant to a cold shutdown condition and maintain that condition.
			Operator #2 Assure that a) turbine tripped b) all AFWS providing flow c) HPSI providing flow (shut off head) in that order. What, if any, is the impact of stuck open PORV.		

Figure 1. Generalized Approach to be followed for writing ATWS procedure(s)

ENCLOSURE 3

SAMPLE SER FOR LOW POWER LICENSE

We have reviewed the TVA submittal of January 10, 1980 on Emergency Operating Procedures for the postulated anticipated transients without scram (ATWS) events. We provided our comments on the proposed procedures and made recommendations for changes. The proposed procedures must be modified in accordance with our comments and instructions to be acceptable for full power operation. However, the Sequoyah plant may be operated at low power (less than or equal to five percent of full power) prior to completion of procedures modifications without undue risk to the health and safety of the public. Our conclusion that low power operation is acceptable is based on our understanding of the expected plant response to the relevant ATWS events to occur under these operating conditions.

Sample of "Evaluation Findings" (Full Power License)

The reviewer should verify that the procedure contains sufficient information and his review supports the following kinds of statements and conclusions:

"The instructions provided in the procedure for _____ permit the operator to diagnose an ATWS event and take the appropriate actions required for minimizing its effects and bringing the plant to a safe shutdown condition.

The instructions include the description of the automatic responses of the plant as well as the operator's actions taken immediately after he diagnoses ATWS and later when he attempts to bring the plant to a cold shutdown condition."

TI 2515/46
Issue Date: 12/5/80

SURVEY TO DETERMINE EXISTENCE OF ADEQUATE EMERGENCY PROCEDURES FOR COPING WITH ATWS EVENTS AT OPERATING POWER REACTORS

I. Objective

To verify that licensees have emergency operating procedures adequate to respond to ATWS events.

II. Background Information

The Chairman received a letter (enclosed) from Congressman Udall, Chairman, Committee on Interior and Insular Affairs on a survey for existence of emergency procedures in the event of ATWS. The Chairman responded (enclosed) explaining NRC actions on ATWS and indicated that a survey was being conducted. This TI formalizes the actions needed to complete the survey (The survey was initiated at BWR's following the Brown's Ferry Failure to Complete Scram.).

III. Inspection Requirements

1. Resident inspectors (or others as directed by the Region) shall review licensee emergency procedures that address any or all of the following plant conditions:

   - Failure to scram when required.
   - Failure to complete scram when initiated automatically or manually.
   - Inability to move or drive control rods.
   - Failure to automatically scram when a parameter exceeds its trip value.
   - Criteria for use of Standby Liquid Control System or Emergency Boration System.
   - Reactor trip or scram.
   - Anticipated transient without scram.

2. The inspector shall also review the authorities and responsibilities of operators governing the use of the Standby Liquid Control System (BWR) or Emergency Boration System (PWR).

IV. Acceptance Criteria

The following actions should be used in judging the acceptability of a licensee's procedures for coping with ATWS:

1. For BWR's

   IE Bulletin 80-17, Action No. 4, of "Actions to be Taken by Licensees" and Guidance in TI 2515/39.

   NOTE: To be effective, if recirculation pumps do not automatically trip, the procedures must require the operator to do this quickly following an ATWS condition.

2. For PWR's

   If an automatic scram should have occurred and has not, the licensee should:

   a. Depress manual scram button immediately.

   b. If rods still do not move, begin immediate emergency boration and attempt to drive rods in.

   c. If rods fail to move, have power disconnect switch or breaker to rod holding coils opened.

   d. Continue efforts to effect shutdown.

3. The operator should have complete authority to activate the Standby Liquid Control System (BWR) or commence emergency boration (PWR), and he should be responsible for doing this when the situation requires it. If the Standby Liquid Control System (SLCS) is key operated, the key must be readily available to the operator. Criteria for the use of SLCS and emergency boration relative to inability to insert negative reactivity by other means should be included in emergency procedures.

V. Reporting Requirements

The results of the inspections required in Section III should be sent to IE Headquarters, Attention: W. R. Mills, in memo form providing the date the inspection was completed and noting any exceptions from the acceptance criteria.

VI. Expiration

For record purposes this TI shall remain in effect until January 31, 1981.

VII. Headquarters Contact

W. R. Mills (492-8180)

VIII. Module Tracking System Input (766 Data)

For module tracking system input, record the actual inspection effort against Module No. 25546B.

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

October 3, 1980

Enclosure to TI 2515/46

The Honorable John Ahearne
Chairman, Nuclear Regulatory Commission
Washington, D.C. 20515

Dear Mr. Chairman:

In the course of the Commission's consideration of the ATWS problem, I would hope that you would determine the extent to which emergency procedures at operating reactors contain instructions for operator action in the event of a partial or full scram failure following an anticipated transient. I would appreciate being kept informed of your progress in making this determination.

Sincerely,

MORRIS K. UDALL
Chairman

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

CHAIRMAN

Enclosure to TI 2515/46

November 24, 1980

The Honorable Morris K. Udall
Chairman, Committee on Interior
and Insular Affairs
United States House of Representatives
Washington, D. C. 20515

Dear Mr. Chairman:

I am pleased to respond to your letter of October 3, 1980. In that letter you expressed interest in the NRC's review of emergency procedures at operating reactors as a part of the Commission's consideration of the ATWS problem.

We are conducting a survey of all site-assigned inspectors to confirm that each licensee has developed adequate emergency operating procedures to address the ATWS event. We will inform you of the results.

At present we are considering rulemaking proposed by the staff to amend 10 CFR 50 on ATWS (SECY-80-409). In considering the ATWS problem, we have concluded that some interim actions were necessary. An example of this is the requirement at all BWRs to install an automatic recirculation pump trip to aid in the mitigation of potential ATWS events by January 1981. However, during the interim, operating BWRs and all applicants for operating licenses have been required to develop emergency procedures that would enhance operator ability to recognize an ATWS event, as well as train operators to take immediate action to terminate the transient and minimize consequences. Further, emergency procedures for operating BWRs have been instituted in our response to the Browns Ferry Unit 3 partial scram event and are planned for operating PWRs in the TMI task action plan.

We have taken appropriate actions in areas where specific problems with the shutdown system have been identified. As mentioned above, an example is the Browns Ferry Unit No. 3 incident which occurred on June 28, 1980. Browns Ferry Unit No. 3 experienced a failure of some control rods to fully insert following a scram signal. As you know, all rods were subsequently fully inserted. Following the Browns Ferry incident, the Commission issued Bulletin IEB No. 80-17, along with three supplements, to all BWR licensees. This Bulletin required BWR licensees to perform certain tests at their plants as well as to conduct a review of their emergency operating procedures to assure that they include specific operator action for a safe shutdown for the event described in the Bulletin. Our inspectors are currently verifying that the licensees have adequately complied with the Bulletin.

Procedures to cope with failure to automatically scram and to specify the reactor operator's authority and responsibility for shutting the reactor down when operating parameters exceed any reactor protection setpoint but a scram does not occur are specified in a more general way through normal procedure requirements. The requirement for a plant to have written procedures is given in its Technical Specifications, which is a part of the plant operating license. The content and format of procedures acceptable to the NRC are identified in Regulatory Guide (RG) 1.33, "Quality Assurance Program Requirements (Operation)" to which the licensee commits in the licensing process. Included in RG 1.33 is a section entitled, "Procedures for Combating Emergencies and Other Significant Events." This section requires a licensee to develop procedures that address those actions required to be taken by plant operators during a partial or full scram failure. The procedures developed under these requirements apply both to PWRs and BWRs.

Emergency procedures are scheduled to be inspected by NRC during the preoperational testing phase of the plant. The inspection procedure calls for a review of all emergency procedures identified in RG 1.33. Our review of these procedures includes looking at the technical adequacy as well as appropriate format. Thus, a licensee is required to have procedures to provide operator actions on failure to automatically scram and NRC inspectors are required to determine that these procedures are developed and are technically adequate.

In addition to the actions described above, the Commission has approved for issuance to all applicants and licensees NUREG-0737, "Implementation of Post-TMI Requirements." This NUREG provides clarification of requirements for emergency operating procedures to cope with ATWS events coupled with other postulated equipment failures.

We will continue to keep inspection of emergency procedures a high priority, and modify the inspection program as necessary to keep pace with current ATWS developments. I trust that the above has been responsive to your concerns.

Sincerely,

Original Signed By
John F. Ahearne

John F. Ahearne

cc: Rep. Steven Symms

ENCLOSURE 3

Submitted: _____ SP Number 29.024.01
(Section Head)

Approved: _____ Revision: C
(Plant Manager)

Date Eff: _____

TRANSIENT WITH FAILURE TO SCRAM
EMERGENCY PROCEDURE

1.0 SYMPTOMS

1.1 A valid scram signal due to a reactor transient is alarmed or indicated and all control rods do not insert as indicated on the full core display, rod position printout on the computer, or four rod display.

1.2 Reactor pressure and/or neutron flux indication increases abruptly and may go off-scale on recorders and meters.

1.3 Safety relief valves may lift.

2.0 AUTOMATIC ACTIONS

2.1 1115 psig reactor vessel pressure and above actuates various safety relief valves. _____

2.2 1120 reactor vessel pressure TRIPS the reactor recirculation pumps. _____

3.0 IMMEDIATE OPERATOR ACTIONS

3.1 Manually scram reactor. _____

3.1.1 Arm and depress manual scram pushbutton. _____

3.1.2 Place the mode switch in refuel. _____

3.1.3 Verify all rods are inserted. _____

3.2 If the reactor scrams, all rods insert, and power is decaying, refer to SP 29.010.01, Emergency Shutdown, and do not continue this procedure. _____

3.3 Trip the recirculation pumps. _____

3.4 Commence suppression pool cooling per SP 23.121.01, residual heat removal (RHR) system. _____

4.0 SUBSEQUENT OPERATOR ACTION

4.1 Determine if reactor power is 6% or greater.

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4.1.1 If reactor power is 6% or greater, continue this procedure at Step 4.2. _____

4.1.2 If reactor power is less than 6%, continue this procedure at Step 4.4. _____

4.2 Start either A or B standby liquid control pump and inject the entire contents of the tank. Verify isolation/isolate RWCU. _____

4.3 Terminate all injection into the RPV with the exception of CRD and RCIC or HPCI at a flow rate of approximately (Later) _____

4.4 The following attempts to scram the reactor are to be performed concurrently if manpower is available.

4.4.1 Confirm all scram valves are open by observation of scram valve position lights. If not, perform the following. _____

4.4.1.1 DE-ENERGIZE RPS Subchannel Logic by opening breakers on panel 1C71*PNL-ØØ1, CB2A, 2B, 7A, and 7B in the Relay Room. _____

4.4.1.2 Vent air from the scram air system by closing valve C11-Ø2V-Ø7Ø4 and opening vent valve downstream of C11-01V-7104. _____

4.4.1.3 Restore when all scram valves are open. _____

4.4.2 Bypass the scram discharge volume high level scram switches, reset the RPS trip and verify the vent and drain valves open. _____

4.4.2.1 Alternately RESET the Reactor Protective System and SCRAM the reactor until all rods are fully inserted. _____

4.4.3 Bypass the scram discharge volume (SDV) high level scram switches, reset the RPS trip and verify the vent and drain valves open. _____

4.4.3.1 INDIVIDUALLY SCRAM Control Rods at Local Hydraulic Control Units (HCU's) by placing both NORM-TEST-S.R.I. switches to the TEST position. _____

4.4.4 Insert those rods not fully inserted with the reactor manual control system as the Rod Sequence Control System (RSCS) permits. _____

4.5 SAMPLE reactor coolant frequently to verify boron concentration above the level determined to maintain the plant shutdown. _____

4.6 After the reactor is shutdown to the level where the only source of power is decay heat, PROCEED to stabilize Plant Condition in Hot Shutdown as follows; _____

> CAUTION
>
> Do not shutdown SBLC Injection once it has been started until the SBLC Solution Tank is verified to be empty.

4.7 PERFORM either steps 4.7.1, 4.7.2 or 4.7.3. _____

4.7.1 Maintain Reactor pressure between 800 and 1000 psig by use of Main Condenser Bypass Valves. _____

> CAUTION
>
> Consult with the Nuclear Engineer to confirm that boron concentration in the reactor will be sufficient to maintain the reactor shutdown after accounting for a normal startup of the Steam Condensing Mode of RHR.

4.7.2 Maintain reactor pressure between 800 and 1000 psig by use of the RHR steam condensing in accordance with SP 23.121.01, Residual Heat Removal (RHR) System. _____

4.7.3 Maintain reactor pressure between 900 and 1000 psig by opening safety relief valves and utilizing Suppression Pool Cooling to limit Suppression Pool temperature. _____

4.8 When the reactor is to be placed in COLD SHUTDOWN, PROCEED using the following considerations:

4.8.1 Confirm by sample results and consultations with the Nuclear Engineer that sufficient negative reactivity has been inserted into the reactor to account for the positive reactivity effects of temperature decrease and dilution. _____

4.8.2 Start the reactor recirc pumps in slow speed. _____

4.8.3 If the main condensor is available, Shutdown and Cooldown in accordance with SP 22.ØØ5.Ø1, Shutdown to Cold Shutdown. _____

CAUTION

Insure the unborated water in the RHR Shutdown Cooling lines does not temporarily dilute the boron in the core and allow inadvertent criticality.

CAUTION

The RHR pump minimum flow valve must be overridden in the closed position to prevent the loss of borate water when starting up Shutdown Cooling.

4.9 When reactor pressure has decreased to 135 psig, Startup RHR Shutdown Cooling in accordance with SP 23.121.Ø1, Residual Heat Removal (RHR) System. _____

4.10 If flooding the reactor vessel up to the steam dome is necessary, use a source of water borated to at least the same concentration as the water in the reactor. The SBLC Solution Tank can be used. _____

4.11 Maintain boron concentration in the vessel between 750 and 1000 PPM. _____

5.0 FINAL PLANT CONDITIONS

5.1 The plant is in cold shutdown conditions. _____

5.2 Reactor level being maintained between 33.5" and 42.75" _____

Watch Engineer Review _____
(Watch Engineer)

6.0 DISCUSSION

An ATWS is extremely unlikely but will require prompt operator action to mitigate the consequences. Operator concerns are as follows:

6.1 Verify Recirc. pumps trip.

6.2 Shutdown the reactor.

6.3 Limit reactor pressure.

6.4 Maintain the core covered.

6.5 Limit Suppression Pool temperature.

6.6 Place plant in Cold Shutdown.

The operator must attempt to scram the reactor with the most readily available means. If the reactor cannot be maintained subcritical with Control Rods and reactor level falls below +12.5" or Suppression Pool temperature can't be maintained below 110°F, SBLC must be initiated to minimize containment heat-up. Suppression Pool Cooling should be initiated as soon as possible to ensure suppression pool temperature limits are not exceeded.

A Cooldown must not be initiated until control rods are inserted or Boron concentration is satisfactory to prevent a restart of the reactor.

Once Boron injection is started, it must be run to completion.

SP 29.024.01 Shoreham Transient with Failure to Scram Emergency Procedure

1.0	You need to give the operator a better idea of what constitutes a valid scram signal.
1.0	A determination of rod position needs to be made somewhere in the procedure.
1.1	An ATWS could also have all rods inserted but not fully.
3.1.2	Mode should be capitalized; In all cases the capitalizaton in the procedures should match that of the control panel (c.f. 4.4.3.5).
3.4	This should be the second subsequent operator action.
4.0	The first subsequent operator action should be to verify immediate operator action (c.f. 4.4.4.1.b).
4.0	Should the IRM's be driven into the reactor?
4.1	Rewrite this step in a standard IF..., IF NOT... logic format.
4.1.1-4.1.2	Need to be more specific on which indications to use for core power, and how many instruments are needed above 6%.
4.1.1-4.1.2	How many rods not fully inserted to below 0-6 position does it take to indicate 6% power in any part of the core.
4.2	Verify isolation of RWCU. Make separate step. Do not use "isolation/isolate" to make conditional steps.
4.2	Reword after starting SLC pump A. Check during SLC injection for system operation, flow meters, ammeters, etc. If not operating, start the B pump.
4.2	Which pump will be used to insure adequate mixing of the boron solution?
4.2	Specify which tank "the tank" refers to.
4.3	Reword to clarify which systems the flow rate refers to.

Shoreham Transient with Failure to Scram Emergency Procedure (Continued)

4.4	Are there enough operators to do all these substeps concurrently? If not, is there a preferred order?
4.4.1.1	Each breaker should appear on a separate line with its own checkoff.
4.4.1.3	Restore what?
4.4.2 and 4.4.3	Combine these 2 steps into 1 step with 2 subtasks and rewrite using standard logic format.
4.4.4	Is there a difference between steps 4.4.3.1 and 4.4.4?
4.6	How does the operator know he has this condition?
4.6	"Caution" - Be consistent in the use of acronyms SLC or SBLC.
4.7	Is there a preference for which of these steps should be tried or does the operator have to make that determination? If the latter, specify the information necessary to make that determination. Logic of the step is unclear.
4.7.1	Should this be the main turbine bypass valve?
4.8	How do you use a consideration?
4.8	How does operator determine when reactor is to be placed in cold shutdown?
4.8.2	Is "slow" speed marked on control panel? If so, capitalize, if not, indicate the range of speeds that corresponds to "slow".
4.8.2-4.8.3	Are these considerations or actions?
4.8.3	Rewrite the Caution and list action step separately. Also, specify the methods by which the operator can make the determination of temporary dilution of the boron in the core.
4.8.3	Second Caution: This is an action step and should be rewritten as such. Also, second Caution is not clear.

Shoreham Transient with Failure to Scram Emergency Procedure (Continued)

4.8.3 What if the main condenser is not available?

4.10 How does the operator find a source of water with the proper boron concentration? Should such information preced 4.10?

ENCLOSURE 5

Submitted: _____ SP Number 29.Ø24.Ø1
(Section Head)

Approved: _____ Revision E
(Plant Manager)

Date Eff. _____

TRANSIENT WITH FAILURE TO SCRAM

EMERGENCY PROCEDURE

1.0 SYMPTOMS

1.1 A valid scram signal or condition due to a reactor transient is alarmed or indicated and all control rods do not fully insert as indicated on the full core display, rod position printout on the computer, or four rod display.

1.2 Reactor pressure and/or neutron flux indication increases abruptly and may go off-scale on recorders and meters.

1.3 Safety relief valves may lift.

2.0 AUTOMATIC ACTIONS

2.1 1115 psig reactor vessel pressure and above actuates various safety relief valves. _____

2.2 1120 reactor vessel pressure TRIPS the reactor recirculation pumps. _____

3.0 IMMEDIATE OPERATOR ACTIONS

3.1 Manually scram reactor per SP 29.Ø1Ø.Ø1 (Emergency Shutdown) _____

3.1.1 Arm and depress manual scram pushbutton. _____

3.1.2 Place the Mode switch in refuel. _____

3.3.3 Verify all rods are inserted. _____

3.2 IF the reactor scrams AND all rods insert, AND power is decaying, THEN do not continue this procedure. _____

3.3 Trip the recirculation pumps. _____

3.4 Commence suppression pool cooling per SP 23.121.01 (Residual Heat Removal (RHR) System). _____

3.5 The following attempts to scram the reactor are to be performed concurrently if manpower is available.

Quiz #5

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3.5.1 Insert those rods not fully inserted with the reactor manual control system as the Rod Sequence Control System (RSCS) permits.

3.5.2 Bypass the scram discharge volume high level scram switches, reset the RPS trip and verify the vent and drain valves open.

3.5.2.1 Alternately RESET the Reactor Protective System and SCRAM the reactor until all rods are fully inserted.

3.5.3 Confirm all scram valves are open by observation of scram valve position lights. IF not, THEN perform the following:

3.5.3.1 DE-ENERGIZE RP's subchannel logic by opening the following breakers on 1C71*PNL-ØØ1 in the relay room:

a) CB2A

b) CB2B

c) CB7A

d) CB7B

3.5.3.2 Vent air from the scram air system by closing valve C11-Ø2V-Ø7Ø4 and opening vent valve downstream of C11-Ø1V-71Ø4.

3.5.3.3 Restore the breakers and air valves to normal when all scram valves are open.

3.5.4 Bypass the scram discharge volume (SDV) high level scram switches, reset the RPS trip and verify the vent and drain valves open.

3.5.4.1 INDIVIDUALLY SCRAM Control Rods at Local Hydraulic Control Units (HCU's) by placing both NORM-TEST-S.R.I. switches to the TEST position.

3.6 IF reactor power is above 6% OR RPV level cannot be maintained OR suppression pool temperature reaches 110°F, THEN perform the following.

3.6.1 Start either A or B standby liquid control pump and inject the entire contents of the tank.

THEN manually isolate RWCU.

3.6.1.2 Terminate all injection into the RPV with the exception of CRD and RCIC or HPCI to maintain RPV water level above the top of active fuel (TAF).

4.0 SUBSEQUENT OPERATOR ACTION

4.1 Verify immediate operator actions.

4.2 IF reactor pressure is causing the safety relief valves (SRV's to cycle, THEN perform the following.

4.2.1 Manually open enough SRV's to reduce reactor pressure to between 800 and 960 psig.

4.2.2 For subsequent SRV operation, the valves should be cycled in order to minimize local heat loading of the suppression pool.

4.2.3 If the HPCI system is not in service, it may be placed in full flow test to minimize SRV cycling.

4.3 SAMPLE reactor coolant frequently to verify boron concentration above the level determined to maintain the plant shutdown.

4.4 After the reactor is shutdown, PROCEED to stabilize Plant Condition in Hot Shutdown by performing either steps 4.4.1, 4.4.2, or 4.4.3.

CAUTION

Do not shutdown SLC Injection once it has been started until the SLC Solution Tank is verified to be empty.

4.4.1 Maintain Reactor pressure between 800 and 960 psig by use of Main Turbine Bypass Valves.

CAUTION

Consult with the Nuclear Engineer to confirm that boron concentration in the reactor will be sufficient to maintain the reactor shutdown after accounting for a normal startup of the Steam Condensing Mode of RHR.

of the RHR steam condensing in accordance with SP 23.121.01 (Residual Heat Removal (RHR) System).

4.4.3 Maintain reactor pressure between 800 and 960 psig by opening safety relief valves and utilizing Suppression Pool Cooling to limit Suppression Pool temperature.

4.5 Place the reactor in COLD SHUTDOWN, by performing the following:

4.5.1 Confirm by sample results and consultations with the Nuclear Engineer that sufficient negative reactivity has been inserted into the reactor to account for the positive reactivity effects of temperature decrease and dilution.

4.5.2 Start the reactor recirc pumps at minimum speed.

4.5.3 Shutdown and Cooldown in accordance with SP 22.ØØ5.Ø1 (Shutdown to Cold Shutdown).

4.6 Override the RHR pump minimum flow valve to the closed position to prevent the loss of borated water when shutdown cooling is placed in service.

4.7 When reactor pressure has decreased to 135 psig, Startup RHR Shutdown Cooling in accordance with SP 23.121.01 (Residual Heat Removal (RHR) System).

4.8 If flooding the reactor vessel up to the steam dome is necessary, use the SLC system.

4.9 Maintain boron concentration in the vessel between 750 and 1000 PPM.

5.0 FINAL PLANT CONDITIONS

5.1 The plant is in cold shutdown conditions.

5.2 Reactor level being maintained in the normal operating range (between 34" and 42"

Watch Engineer Review _____
(Watch Engineer)

6.0 DISCUSSION

An ATWS is extremely unlikely but will require prompt operator action to mitigate the consequences. Operator concerns are as follows:

6.1 Verify Recirc. pumps trip.

6.2 Shutdown the reactor.

6.4 Maintain the core covered.

6.5 Limit Suppression Pool temperature.

6.6 Place plant in Cold Shutdown.

The operator must attempt to scram the reactor with the most readily available means. If the reactor cannot be maintained subcritical with Control Rods and reactor level falls below +12.5" or Suppression Pool temperature can't be maintained below 110°F, SBLC must be initiated to minimize containment heat-up. Suppression Pool Cooling should be initiated as soon as possible to ensure suppression pool temperature limits are not exceeded.

A Cooldown must not be initiated until control rods are inserted or Boron concentration is satisfactory to prevent a restart of the reactor.

Once Boron injection is started, it must be run to completion.

The applicant has met the requirement of GDC 10 that the [illegible] design limits are not exceeded, GDC 20 that reactivity control [illegible] are automatically initiated so that specified acceptable fuel design [illegible] are not exceeded, and GDC 25 that single malfunctions of the reactivity control system will not cause the specified acceptable fuel design limits to be exceeded. These requirements have been met by comparing the resulting extreme operating conditions for the fuel (i.e., fuel duty) with the acceptance criteria (peak fuel enthalpy) to assure that fuel rod failure will be precluded for this event. The basis for our acceptance is that the applicant's analyses of the maximum low power condition have been confirmed, that the analytical methods and input data are conservative, and that specified acceptable fuel design limits will not be exceeded.

15.2.4 Rod Withdrawal Error At Power

We have reviewed a postulated single failure of the reactor control system which could result in an uncontrolled withdrawal of control rods beyond normal limits under power operation conditions. The scope of the review included investigations of possible initial conditions and the range of reactivity insertions, the course of the resulting transient and the instrumentation response to the transient. We also examined the methods used to determine the peak fuel rod response and the initial conditions for that analysis.

We conclude that the requirements of General Design Criteria 10, 20, and 25 have been met. The applicant has met the requirement of GDC 10 that the specified acceptable fuel design limits are not exceeded for the anticipated transient; of GDC 20 that the reactivity control system is automatically actuated to prevent exceeding the specified acceptable design limits; and of GDC 25 that single malfunctions in the reactivity control system will not cause specified acceptable fuel design limits to be exceeded. These requirements have been met by comparing the resulting extreme operating conditions and response of the fuel (i.e., fuel duty) with the acceptance criteria for fuel damage (boiling transition and one percent plastic strain in the cladding) to assure that fuel rod failure will be precluded for this event. The basis for our acceptance is that the applicant's choice of maximum transients for single error control rod malfunctions has been confirmed, that the analytical methods and input data are reasonably conservative, and that specified acceptable fuel design limits will not be exceeded.

15.3 Anticipated Transients Without Scram

Anticipated transients without scram (ATWS) are events in which the scram system (reactor trip system) is postulated to fail to operate as required. This subject has been under generic review by the Commission staff for several years.

In December 1978, Volume 3 of NUREG-0460, "Anticipated Transient Without Scram for Light Water Reactors," was issued describing the proposed type of plant modifications the staff believes are necessary to reduce the risk from anticipated transients with failure to scram to an acceptable level. The staff issued requests for the industry to supply generic analyses to confirm the ATWS mitigation capability described in Volume 3 of NUREG-0460 and subsequently presented its recommendations on plant modifications to the Commission in September 1980. The Commission will determine required modifications to resolve anticipated transient without scram concerns as well as the required schedule

for implementation of such modifications. Shoreham is subject to the Commission decision in this matter.

It is our expectation that the necessary plant modifications will be implemented in one to four years following a Commission decision on anticipated transients without scram. As a prudent course, in order to further reduce the risk from anticipated transient without scram events during the interim period before completing the plant modifications determined by the Commission to be necessary, we have required that the following steps be taken:

(1) An emergency operating procedure should be developed for an ATWS event, including consideration of scram indicators, rod position indicators, average power range flux monitors (APRM), reactor vessel level and pressure indicators, relief valve and isolation valve indicators, and containment temperature, pressure and radiation indicators. The emergency operating procedures should be sufficiently simple and unambiguous to permit prompt operator recognition of an ATWS event.

(2) The emergency operating procedures should describe actions to be taken in the event of an ATWS including consideration of manually scramming the reactor by using the manual scram buttons, changing the operation mode switch to the shutdown position, stripping the feeder breakers on the reactor protection system power distribution buses, scramming individual control rods from the back of the control room panel, tripping breakers from plant auxiliary power supply feeding the reactor protection system, and valving out and bleeding off instrument air to scram solenoid valves. These actions must be taken immediately after detection of an ATWS event. Actions should also include prompt initiation of the residual heat removal system in the suppression pool cooling mode to reduce the severity of the containment conditions; and actuation of the standby liquid control system if a scram cannot be made to occur.

Early operator action as described above, in conjunction with the recirculation pump trip, would provide significant protection for some ATWS events, namely those which occur: (1) as a result of common mode failure in the electrical portion of the scram system and some portions of the drive system, and (2) at low power levels where the existing standby liquid control scram capability is sufficient to limit the pool temperature rise to an acceptable level.

The applicant agreed to develop emergency procedures for ATWS events. As agreed by the applicant, these procedures will be submitted to the staff for review. The applicant also agreed to train their operators for proper actions for ATWS events as part of the formal training program. A reactor recirculation pump trip system also will be implemented at Shoreham prior to fuel loading, which meets the criteria for an acceptable recirculation pump trip design as specified in Appendix C of Volume 3 of NUREG-0460, "Anticipated Transients Without Scram for Light Water Reactors."

In addition we required the applicant to conform to the conclusions of the generic study on scram discharge volume design which was initiated as a result of the June 28, 1980 incident at Browns Ferry. This issue is discussed further in Section 4.6.

we consider the above interim actions as an acceptable basis for [illegible] interim operation of Shoreham based on our understanding of the plant [illegible] to anticipated transient without scram events.

15.4 Design Basis Accidents

15.4.1 Radiological Consequences of Accidents

The applicant has calculated the offsite doses resulting from the various postulated design basis accidents in order to demonstrate the effectiveness of the engineered safety features. These design basis accidents represent the upper limits of a wide spectrum of accidents that are considered credible. In addition, we independently performed similar calculations for the loss-of-coolant, fuel handling, and control rod drop accidents (see Table 15-1). Our acceptance criteria are that the doses from these postulated accidents (as evaluated by the staff) be within the exposure guidelines of 10 CFR Part 100.

Table 15-1

Radiological Consequences of Design Basis Accidents

	0-2 Hour Doses, Exclusion Area Boundary, rem		0-30 Day Doses, Low Population Zone, rem	
Postulated Accident	Thyroid[1]	Whole Body	Thyroid	Whole Body
Loss-of-Coolant[2]	56	4	234	2.5
Fuel Handling	15	2	< 10	< 1.0
Control Rod Drop	11	2.5	2	< 1.0

On the basis of our experience with the evaluations of the steam line break accident for boiling water reactor plants of similar design, we have concluded that the consequences of this accident can be controlled by limiting the permissible radioactivity concentrations in the reactor coolant so that potential offsite doses will be small. We will include limits in the technical specifications on the coolant activity concentrations such that the potential two-hour doses at the minimum exclusion distance, as calculated by the staff for this accident, will be fractions of the guideline values of 10 CFR Part 100.

15.4.2 Loss-of-Coolant Accident (Radiological Considerations)

A design basis loss-of-coolant accident has been postulated for the Shoreham Nuclear Power Plant. The plant includes secondary containment systems to mitigate the offsite doses resulting from a loss-of-coolant accident.

The radiological consequences of the loss-of-coolant accident as a result of leakage from the containment were evaluated. The analysis of the containment leakage doses following a postulated design basis loss-of-coolant accident included the influence of fission product removal and holdup systems and the containment leakage routes on the estimated radiological consequences.

[1] Includes contribution from main steam isolation valve leakage.

Surveillance
Emergency Plan
Health Physics
Chemistry
Reactor Engineering
Plant Security
Radioactive Waste Management

Our review disclosed that the applicant's program for use of operating and maintenance procedures meets the relevant requirements of 10 CFR 50.34, and is consistent with the guidance provided in Regulatory Guide 1.33 and ANSI N18.7-1976/ANS 3.2. Therefore, we concluded that the applicant's program is acceptable.

3.2.C. Reanalysis of Transients and Accidents; Development of Emergency Operating Procedures

In letters of September 13 and 27, October 10 and 30, and November 9, 1979, the Office of Nuclear Reactor Regulation required Licensees of operating plants, applicants for operating licenses and licensees of plants under construction to perform analyses of transients and accidents, prepare emergency procedure guidelines, upgrade emergency procedures, and to conduct operator retraining (see also item I.A.2.1). Emergency operating procedures are required to be consistent with the actions necessary to cope with the transients and accidents analyzed. Analyses of transients and accidents were to be completed in early 1980 and implementation of procedures and retraining were to be completed three months after emergency procedure guidelines were established; however, some difficulty in completing these requirements has been experienced. Clarification of the scope of the task and appropriate schedule revisions were included in NUREG-0737, Item I.C.1.

Pending staff approval of the revised analysis and guidelines, the staff will continue the pilot monitoring of emergency operating procedures described in Task Action Plan Item I.C.8 (NUREG-0660). The adequacy of the BWR Owners' Group Guidelines will be identified for each near term operating license (NTOL) during the emergency operating procedure review.

In a submittal dated June 30, 1980, the BWR Owners' Group provided a draft of the generic guidelines for Boiling Water Reactors. The guidelines were developed to comply with Task Action Plan Item I.C.1(3) as clarified by NUREG-0737 and incorporated the requirements of short term reanalysis of small break loss-of-coolant accidents and inadequate core cooling (Task Action Plan Items I.C.1(1) and I.C.1(2)). In a letter dated October 21, 1980, from D. G. Eisenhut to S. T. Rogers, the staff indicated that the generic guidelines prepared by General Electric and the BWR Owners' Group were acceptable for trial implementation at the Shoreham Nuclear Power Station. Additional information was requested by the staff and was submitted by the Owners' Group on January 31, 1981. This additional information is still under review prior to the staff making a final conclusion on the acceptability of the guidelines for implementation on all Boiling Water Reactors. The guidelines are still considered acceptable for trial implementation at the Shoreham Nuclear Power Station.

Based on our review of the emergency operating procedures developed from the BWR Owners' Group Guidelines and our observation of the procedures being implemented on a simulator and in a walk-through in the control room, we have

concluded that the guidelines have been adequately incorporated into the procedures. This fulfills the requirements of Item I.C.1 of NUREG-0737.

In accordance with NUREG-0737, Item I.C.7, NSSS vendor review of the low power testing, power ascension testing, and emergency operating procedures is necessary to further verify adequacy of the procedures.

This requirement must be met before issuance of a full power license.

The NSSS vendor, General Electric Corporation, will review the startup tests and emergency operating procedures prior to these procedures being implemented. The startup tests encompass the low power testing and the power ascension testing phases. The applicant has committed to ensuring these reviews are complete prior to fuel load. The staff must review the applicant's resolution of vendor comments to confirm vendor review and implementation of vendor comments into the procedures. The staff will confirm that this review is completed prior to issuance of a full power license.

In accordance with NUREG-0737, Item I.C.8, correct emergency procedures as necessary based on the NRC audit of selected plant emergency operating procedures (e.g., small-break LOCA, loss-of-feedwater, restart of engineered safety features following a loss of ac power and steam-line break). This action will be completed prior to issuance of a full power license.

The staff and personnel from Battelle Pacific Northwest Laboratories reviewed the procedures forwarded by the applicant to the NRC to ensure that the procedures were consistent with the plant's design, the BWR Owner's Group guidelines, and incorporated applicable human factors considerations. The review resulted in two pages of general comments and numerous specific detailed comments on the procedures. The general comments included human factors consideration on the use of standard logic format, procedure identification, interaction with non-emergency procedures, inconsistency between emergency procedures and control room displays and the inadequacy of the graphs that were included in the procedures. The specific comments include clarification and the locations of caution statements, the inclusion of action steps in cautions, the need for the addition of specific information to reduce operator judgments such as the preferred sequence for starting various systems, the need to add decision points to aid operator actions, and numerous references to changing words and using standard logic format to clarify action steps. A meeting was held with the applicant on September 16, 1981, to discuss the results of the review. During the meeting many of the comments were resolved by incorporating the recommended changes.

On October 16, 1981, a simulator exercise was held at the Limerick Training Center. Operators used the revised emergency operating procedures to respond to simulated transients and accidents. Scenarios were designed to require the concurrent use of procedures and transition among procedures. The scenarios varied from minor transients to accidents involving multiple system failures. The simulated transients and acidents included:

1) Loss of feedwater from leaks or breaks in feed lines, faulty valve operation, and pump failure.

2) Various initiating events followed by failure of various injection systems (e.g., RCIC, HPCI, LPCI) when needed for level control, level restoration and containment control.

3) Turbine trip followed by a reactor trip.

4) Failure of off-site power with subsequent failure of a diesel generator.

5) Stuck open relief valves resulting in loss of Reactor Pressure Vessel Water inventory and emergency conditions in containment.

All of the emergency operating procedures were tested in responding to the simulations. The review team observed the exercises and discussed them in detail with the operators. Special emphasis was placed on the need to use written emergency procedures and evaluating the clarity and usability of the procedures. Several changes were made to the procedures as a result of the exercises and subsequent discussions. The changes involved sequencing of steps, labeling to help locate specific steps, and clarifying priorities of actions.

On October 17, 1981, the team of reviewers that had participated in the simulator exercises conducted a walk-through of the emergency operating procedures in the control room. The operators were presented with the initiating event (an intermediate-size break), with the desired sequence of steps. The operators then walked through the scenario, while the team of reviewers evaluated the operators' use of the procedures, the interaction of the operators with the control panels, and the interaction between the operators. The entire sequence was discussed in detail with the control room operators and the plant operations staff at the conclusion of the simulated event. The effective manner in which the operators used the emergency operating procedures indicates that they are clear, properly sequenced, and compatible with the control room and its equipment.

During the review, it was noted that: 1) some plant specific data were not available and noted by a "(Later)", 2) the graphs referenced in the procedures need revision to improve their usability, and 3) there are a few additional changes required in the procedures as noted during the simulator exercises. The applicant has committed to incorporate the plant specific data when they are available and to make the agreed to changes to the procedures and graphs. The staff will verify that the missing data and changes have been included in the procedures before issuance of an operating license.

15 ACCIDENT ANALYSIS

15.3 Anticipated Transients Without Scram

We stated in the Safety Evaluation Report that the applicant agreed to develop an emergency procedure for an ATWS event. The Shoreham ATWS procedure was reviewed by members of the NRC staff and contractor personnel from Battelle Pacific Northwest Laboratories and comments were discussed with the operations personnel. Based on our evaluation, we conclude that the Shoreham ATWS procedure provides an acceptable basis for licensing and interim operation of Shorenam pending the outcome of the proposed rulemaking on ATWS in accordance with General Design Criteria 10, 15, 26, 27, and 29 of 10 CFR Part 50 Appendix A. The staff has recommended to the Commission that rulemaking be used to determine any future modifications necessary to resolve ATWS concerns and the required schedule for implementation of such modifications.

ENCLOSURE 8

LONG ISLAND LIGHTING COMPANY
SHOREHAM NUCLEAR POWER STATION
P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

October 19, 1979 SNRC-437

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Denton:

In response to your request for additional information 212.105, dated March 19, 1979 (SER Open Item No. 22) and your letter of August 17, 1979, the follcwing interim actions will be implemented at Shoreham:

1. A reactor recirculation pump trip system will be implemented at Shoreham which meets the criteria for an acceptable recirculation pump trip design as specified in Appendix C of Volume 3 of NUREG-0460, "Anticipated Transients Without Scram for Light Water Reactors."

2. Emergency procedures will be developed for ATWS events. These procedures will be similar to emergency procedures developed for use at Shoreham which consist of the following six sections:

   a) Symptoms
   b) Automatic actions
   c) Immediate actions
   d) Subsequent actions
   e) Final conditions
   f) Discussion

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3. Operators will be trained to perform the proper actions for ATWS events as part of the formal operator training program.

Since Shoreham is not an operating unit, these emergency procedures will not be available by October 19, 1979 as requested in your letter of August 17, 1979. However, we anticipate completion and submittal of these procedures six months prior to our November 1980 fuel load date; that is by May 1980.

Very truly yours,

J. P. Novarro

J. P. Novarro,
Project Manager
Shoreham Nuclear Power Station

JPM:mp

ENCLOSURE 9

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

February 11, 1982

Docket No. 50-322

MEMORANDUM FOR: Robert L. Tedesco, Assistant Director
for Licensing
Division of Licensing

FROM: Joel J. Kramer, Deputy Director
Division of Human Factors Safety

SUBJECT: SAFETY EVALUATION REPORT INPUT:
SHOREHAM NUCLEAR POWER STATION - UNIT 1 (SNPS-1)
EMERGENCY OPERATING PROCEDURES AND ANTICIPATED
TRANSIENTS WITHOUT SCRAM

Enclosed are our SER inputs for Section 13.5.2, Operating and Maintenance Procedures, which include the TMI Task Action Plan (TAP) Items I.C.1 - Short-Term Accident Analysis and Procedures Revision, I.C.7 - NSSS Vendor Review of Procedures, and I.C.8 - Pilot Monitoring of Selected Emergency Procedures for Near-Term Operating License Applicants. Also enclosed is Section 15.3, Anticipated Transients Without Scram (ATWS).

The applicant's program for developing Operating and Maintenance Procedures is generally consistent with the guidance provided in Regulatory Guide 1.33 and ANSI 18.7-1976/ANS 3.2, and therefore is acceptable for issuance of a full power license. The enclosed supplement input for Section 13.5.2 completes our review of this item.

The Emergency Operating Procedures are consistent with the requirements of I.C.1 and I.C.8 for the issuance of a full power license pending incorporation of the following items: (1) making the changes that were identified during the reactor simulator exercise, and (2) adding information to specific areas in the procedures that was not available when they were written; these areas were denoted by the word "Later".

This input completes our review for Items I.C.1 and I.C.8. The applicant has committed to having procedures reviewed by the NSSS vendor as required by Item I.C.7. This will be confirmed by DHFS review of the applicant's resolution of vendor comments prior to issuance of a full power license and by routine inspection by Region I. This item must be completed prior to issuance of a full power license.

The purpose of our ATWS review was to determine if interim requirements to mitigate ATWS events have been completed. Our technical review was performed as required by Frank Schroeder's memo of June 9, 1980 to you.

Although the ATWS procedure could not be fully exercised because of limitations of the simulator, the ATWS procedure is consistent with the guidance provided in the June 23, 1980 memo from Frank Schroeder to you, and is acceptable for issuance of a full power license. The enclosed SER input for Section 15.3 completes our review of the applicant's ATWS procedure.

The review of Section 13.5.2 was performed by J. W. Clifford, R. J. Urban and M. J. Goodman of the Procedures and Test Review Branch. The review of Emergency Operating Procedures including ATWS was performed by J. W. Clifford, R. J. Urban, and M. J. Goodman of the Procedures and Test Review Branch, and M. Morganstern, L. Defferding, R. Shikiar and S. Crowell of Battelle Pacific Northwest Laboratories (PNL).

There are no dissenting opinions within DHFS on the conduct or outcome of this review.

Joel J. Kramer, Deputy Director
Division of Human Factors Safety

Enclosure:
SER - Operating and
Maintenance Procedures
and ATWS

cc w/enclosure:
H. Thompson
A. Schwencer
J. Wilson
J. Higgins
L. Phillips

SAFETY EVALUATION REPORT INPUT

SHOREHAM NUCLEAR POWER STATION, UNIT 1

OPERATING AND MAINTENANCE PROCEDURES

AND

ANTICIPATED TRANSIENTS WITHOUT SCRAM

13.5.2 OPERATING AND MAINTENANCE PROCEDURES

A. General

A review has been conducted of the applicant's plan for development and implementation of operating and maintenance procedures. The review was conducted to determine the adequacy of the applicant's program for assuring that routine operating, off-normal, and emergency activities are conducted in a safe manner. The following description and evaluation are based on information contained in the applicant's FSAR and the applicant's response to NRC TMI Action Plan Items (NUREG-0660 and NUREG-0737).

In determining the acceptability of the applicant's program, the ~~following~~ of NUREG-0800, Standard Review Plan, Section 13.5.2 criteria were used:

10 CFR Part 50 §50.34

ANSI 18.7-1976/ANS 3.2

Regulatory Guide 1.33, Rev. 2, March 1978

Standard Review Plan Section 13.5.2

NUREG-0660 as clarified by NUREG-0737

NUREG-0799

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The review consisted of an evaluation of (1) the applicant's procedure classification system for procedures that are performed by licensed operators in the control room, and the classification

for other operating and maintenance procedures; (2) the applicant's plan for completion of operating and maintenance procedures during the initial plant testing phase to allow for correction prior to fuel loading; (3) the applicant's program for compliance with the guidance contained in Regulatory Guide 1.33, Rev. 2, March 1978 regarding the minimum procedural requirements for safety-related operations; (4) compliance with the guidance contained in ANSI 18.7-1976/ ANS 3.2; and (5) the applicant's program for compliance with Task Action Plan (NUREG-0660) Item I.C.1, "Guidance for the Evaluation and Development of Procedures for Transients and Accidents", for the development of Emergency Operating Procedure Guidelines.

B. Operating and Maintenance Procedure Program

The applicant has committed in the FSAR to a program in which all activities are to be conducted in accordance with detailed written and approved procedures meeting the requirements of Regulatory Guide 1.33, Rev. 2, March 1978, "Quality Assurance Program Requirements (Operation)", and ANSI 18.7-1976/ANS 3.2. The applicant uses the following categories of procedures for those operations performed by licensed operators in the control room:

- General Operating Procedures
- System Operating Procedures
- Emergency Operating Procedures
- Alarm Response
- Temporary Procedures

Other procedures include the following areas:

- Initial Test
- Maintenance
- Instrument and Control Systems
- Surveillance
- Emergency Plan
- Health Physics
- Chemistry
- Reactor Engineering
- Plant Security
- Radioactive Waste Management

Our review disclosed that the applicant's program for use of operating and maintenance procedures meets the relevant requirements of 10 CFR Part 34, and is consistent with the guidance provided in Regulatory Guide 1.33 and ANSI 18.7-1976/ ANS 3.2. Therefore, we conclude that the applicant's program is acceptable.

C. Reanalysis of Transients and Accidents; Development of Emergency Operating Procedures

In letters of September 13 and 27, October 10 and 30, and November 9, 1979, the Office of Nuclear Reactor Regulation required licensees of operating plants, applicants for operating licenses and licensees of plants under construction to perform analyses of transients and accidents, prepare emergency procedure guidelines, upgrade emergency procedures, and to conduct operator retraining (see also Item I.A.2.1). Emergency operating procedures are required to be consistent with the actions necessary to cope with the transients and accidents analyzed. Analyses of transients and accidents were to be completed in early 1980 and implementation of procedures and retraining were to be completed three months after emergency procedure guidelines were established; however, some difficulty in completing these requirements has been experienced. Clarification of the scope of the task and appropriate schedule revisions were included in NUREG-0737, Item I.C.1.

Pending staff approval of the revised analysis and guidelines, the staff will continue the pilot monitoring of emergency operating procedures described in Task Action Plan Item I.C.8 (NUREG-0660). The adequacy of the BWR Owners' Group Guidelines will be identified for each near term operating license (NTOL) during the emergency operating procedure review.

In a submittal dated June 30, 1980, the BWR Owners' Group provided a draft of the generic guidelines for Boiling Water Reactors. The guidelines were developed to comply with Task Action Plan Item I.C.1(3) as clarified by NUREG-0737 and incorporated the requirements for short term reanalysis of small break loss of coolant accidents and inadequate core cooling (Task Action Plan Items I.C.1(1) and I.C.1(2). In a letter dated October 21, 1980, from D. G. Eisenhut to S. T. Rogers, the staff indicated that the generic guidelines prepared by General Electric and the BWR Owners' Group were acceptable for trial implementation at the Shoreham Nuclear Power Station, Unit 1. Additional information was requested by the staff and was submitted by the Owners' Group on January 31, 1981. This additional information is still under review prior to the staff making a final conclusion on the acceptability of the guidelines for implementation on all Boiling Water Reactors. The guidelines are still considered acceptable for trial implementation at the Shoreham Nuclear Power Station, Unit 1.

Based on our review of the emergency operating procedures developed from the BWR Owners' Group Guidelines and our observation of the procedures being implemented on a simulator

and in a walk-through in the control room, we have concluded that the guidelines have been adequately incorporated into the procedures. This fulfills the requirements of Section I.C.1 of NUREG-0737.

In accordance with NUREG-0737, Item I.C.7, NSSS vendor review of low power testing, power ascension testing, and emergency operating procedures is necessary to further verify adequacy of the procedures.

This requirement must be met before issuance of a full power license.

The NSSS vendor, General Electric Corporation, will review the startup tests and emergency operating procedures prior to these procedures being implemented. The startup tests encompass the low power testing and the power ascension testing phases. The applicant has committed to ensuring these reviews are complete prior to fuel load. The staff must review the applicant's resolution of vendor comments to confirm vendor review and implementation of vendor comments into the procedures. The staff will confirm that this review is completed prior to issuance of a full power license.

In accordance with NUREG-0737, Item I.C.8, correct emergency procedures are necessary based on the NRC audit of selected plant emergency operating procedures (e.g., small-break LOCA, loss of feedwater, restart of engineered safety features

following a loss of ac power and steam-line break). This action will be completed prior to issuance of a full power license.

The staff and personnel from Battelle Pacific Northwest Laboratories reviewed the procedures forwarded by the applicant to the NRC to ensure that the procedures were consistent with the plant's design, the BWR Owners' Group guidelines, and incorporated applicable human factors considerations. The review resulted in two pages of general comments and numerous specific detailed comments on the procedures. The general comments included human factors consideration on the use of standard logic format, procedure identification, interaction with non-emergency procedures, inconsistency between emergency procedures and control room displays and the inadequacy of the graphs that were included in the procedures. The specific comments include clarification and the locations of caution statements, the inclusion of action steps in cautions, the need for the addition of specific information to reduce operator judgements such as the preferred sequence for starting various systems, the need to add decision points to aid operator actions, and numerous references to changing words

and using standard logic format to clarify action steps. A meeting was held with the applicant on September 16, 1981, to discuss the results of the review. During the meeting many of the comments were resolved by incorporating the recommended changes.

On October 16, 1981, a simulator exercise was held at the Limerick Training Center. Operators used the revised emergency operating procedures to respond to simulated transients and accidents. Scenarios were designed to require the concurrent use of procedures and transition among procedures. The scenarios varied from minor transients to accidents involving multiple system failures. The simulated transients and accidents included:

1) Loss of feedwater from leaks or breaks in feed lines, faulty valve operation, and pump failure.
2) Various initiating events followed by failure of various injection systems (e.g., RCIC, HPCI, LPCI) when needed for level control, level restoration and containment control.
3) Turbine trip followed by a reactor trip.
4) Failure of off-site power with subsequent failure of a diesel generator.

5) Stuck open relief valves resulting in loss of Reactor Pressure Vessel Water inventory and emergency conditions in containment.

All of the emergency operating procedures were tested in responding to the simulations. The review team observed the exercises and discussed them in detail with the operators. Special emphasis was placed on the need to use written emergency procedures and evaluating the clarity and usability of the procedures. Several changes were made to the procedures as a result of the exercises and subsequent discussions. The changes involved sequencing of steps, labeling to help locate specific steps, and clarifying priorities of actions.

On October 17, 1981, the team of reviewers that had participated in the simulator exercises conducted a walk-through of the emergency operating procedures in the control room. The operators were presented with the initiating event (an intermediate-size break), with the desired sequence of steps. The operators then walked through the scenario, while the team of reviewers evaluated the operators' use of the procedures, the interaction of the operators with the control panels, and the interaction between the operators. The entire sequence was discussed in detail with the control room operators and the plant operations staff at the conclusion

of the simulated event. The effective manner in which the operators used the emergency operating procedures indicates that they are clear, properly sequenced, and compatible with the control room and its equipment.

During the review, it was noted that: 1) some plant specific data were not available and noted by a "(Later)", 2) the graphs referenced in the procedures need revision to improve their usability, and 3) there are a few additional changes required in the procedures as noted during the simulator exercises. The applicant has committed to incorporate the plant specific data when they are available and to make the agreed to changes to the procedures and graphs. The staff will verify that the missing data and changes have been included in the procedures before issuance of an operating license.

15.3 ANTICIPATED TRANSIENTS WITHOUT SCRAM

Anticipated Transients Without Scram (ATWS) are events in which the scram system (reactor trip system) is postulated to fail to operate as required. This subject has been under generic review by the NRC staff for several years.

In December 1978, Volume 3 of NUREG-0460, "Anticipated Transient Without Scram for Light Water Reactors" was

issued describing the proposed type of plant modifications we believe are necessary to reduce the risk from anticipated transients with failure to scram to an acceptable level. We issued requests for the industry to supply generic analyses to confirm the anticipated transients without scram mitigation capability described in Volume 3 of NUREG-0460. Subsequently, we recommended to the Commission that rulemaking be used to determine any future modifications necessary to resolve anticipated transients without scram concerns as well as the required schedule for implementation of such modifications. Shoreham Nuclear Power Station, Unit 1 is subject to the Commission's decision in this matter.

It is our expectation that the necessary plant modifications will be implemented in one to four years following a Commission decision on anticipated transients without scram. As a prudent course, to further reduce the risk from anticipated transient without scram events during the interim period before completing the plant modifications determined by the Commission to be necessary, we require that the following steps be taken:

1. An emergency operating procedure should be developed for an anticipated transient without scram event,

including consideration of scram indicators, rod position indicators, average power range flux monitors, reactor vessel level and pressure indicators, relief valve and isolation valve indicators, and containment temperature, pressure and radiation indicators. The emergency operating procedures should be sufficiently simple and unambiguous to permit prompt operator recognition of an anticipated transient without scram event.

2. The emergency operating procedure should describe actions to be taken in the event of an anticipated transient without scram including consideration of manually scramming the reactor by using the manual scram buttons, changing the operation mode switch to the shutdown position, tripping the feeder breakers on the reactor protection system power distribution buses, scramming individual control rods from the back of the control room panel, tripping breakers from plant auxiliary power source[5] feeding the reactor protection system, and valving out and bleeding off instrument air to scram solenoid valves. These actions must be taken immediately after detection of an ATWS event. Actions should also

include prompt initiation of the residual heat removal system in the suppression pool cooling mode to reduce the severity of the ~~containment~~ containment conditions and actuation of the standby liquid control system if a scram cannot be made to occur.

The Shoreham ATWS procedure was reviewed by members of the NRC staff and contractor personnel from Battelle Pacific Northwest Laboratories (PNL) and comments were discussed with the operations personnel. Based on its evaluation, the staff concludes that the Shoreham 1 ATWS procedure provides an acceptable basis for licensing and interim operation of Shoreham Unit 1 pending the outcome of the proposed rulemaking on ATWS in accordance with General Design Criteria 10, 15, 26, 27, and 29 of 10 CFR 50 Appendix A. The staff has recommended to the Commission that rulemaking be used to determine any future modifications necessary to resolve ATWS concerns and the required schedule for implementation of such modifications.

INSERT - PAGE 10

I.C.1 GUIDANCE FOR THE EVALUATION AND DEVELOPMENT OF PROCEDURES FOR TRANSIENTS AND ACCIDENTS

The position, discussion, and conclusion for this TMI-2 item are contained in Section 13.5.2.

I.C.7 NSSS VENDOR REVIEW OF PROCEDURES

The position, discussion, and conclusion for this TMI-2 item are contained in Section 13.5.2.

I.C.8 PILOT MONITORING OF SELECTED EMERGENCY PROCEDURES FOR NTOL APPLICANTS

The position, discussion, and conclusion for this TMI-2 item are contained in Section 13.5.2.