COMPARISON OF

DAVIS-BESSE ABNORMAL TRANSIENT

OPERATOR GUIDELINES

AND

EMERGENCY OPERATING PROCEDURE

EP 1202.01

ATTACHMENT II

SCOPE

This document contains sections corresponding to each major section of the Davis-Besse Emergency Procedure that was developed from the Davis-Besse ATOG Part I. Each section identifies differences between the Emergency Procedure and ATOG and explains the reasons for these differences. The Emergency Procedure was written in the same general format as previous Davis-Besse Emergency Procedures. The table below correlates the sections in the Emergency Procedure with the sections in ATOG Part I.

	EP 1202.01	ATOG Part I
1.	Symptoms	Section I
2.	Automatic Actions	None
3.	Immediate Operator Actions	Section I
4.	Supplementary Actions	Section II
5.	Lack of Adequate Subcoding Margin	Section IIIA
6.	Lack of Heat Transfer	Section IIIB
7.	Excessive Heat Transfer	Section IIIC
8.	Steam Generator Tube Rupture	Section IIID
9.	Inadequate Core Cooling	Section ICC
10.	A Large LOCA has Occurred and the Core Flood Tanks are Emptying	CP-101
11.	Transient Termination Following an Occurrence That Leaves The RCS Saturated With SG(s) Removing Heat.	CP-103
12.	Transient Termination Following An Occurrence That Leaves the RCS Being Cooled by MU/HPI Cooling.	CP-104
13.	Transient Termination Following An Occurrence That May Require Pressurizer Recovery or Solid Plant Cooldown With SG(s) Removing Heat and RCS Subcooled	CP-105
14.	Specific Rules	Specific Rules
15.	Attachments	None
16	Figures	Figures
17.	Tables	Tables
	None - Reference is made to the normal cooldown procedure when needed.	CP-102

1. Symptoms

This section defines the entry conditions for the procedure. Reactor trip and Steam Generator Tube Rupture are used as in ATOG Section I. Tube ruptures are defined in the symptoms as leaks greater than the available make up capacity. Leaks within the makeup capacity are covered by a separate Abnormal Procedure. Reactor trip includes occurrences where a trip condition exists and an automatic trip has not occurred. This incorporated NRC comments on the Oconee ATOG with respect to ATWS.

Safety Features Actuation System (SFAS) trip and Steam and Feedwater Rupture Control Systems (SFRCS) trip are additional entry conditions since trips of these systems either directly cause a reactor trip or have trip setpoints corresponding to reactor trip setpoints. These two conditions can also occur with the reactor initially shutdown and require entry into the procedure.

The procedure will also be entered if another Davis-Besse procedure directs a manual trip and implementation of the Emergency Procedure. The procedure will also be implemented, if, in the judgement of the operator, plant conditions require a manual trip and entry to the procedure.

2. Automatic Actions

This section is included because other Davis-Besse Emergency and Abnormal procedures have this section. It includes a description of the plant automatic response to reactor trip and a description by reference to tables of the equipment actuation for SFAS and SFRCS trips.

3. Immediate Operator Actions

This section includes ATOG steps a. and b. under "Reactor Trip" and step a. under "Forced Shutdown". It also includes a step to isolate letdown. The step for manually tripping the reactor has been expanded in response to NRC comments on the Oconee ATOG with respect to ATWS, to include information from "Supplement to ONS-3 Final ATOG" as described in enclosures to letter, D. D. Whitney to D. G. Eisenhut, July 2, 1983.

The step to isolate letdown was included at this point as a Davis-Besse preference to the ATOG locations (Step II.4) since delaying the step can undesirably affect pressurizer level response to the reactor trip.

ATOG steps c. and d. under "Reactor Trip" were not included at this point. Step c. is required by Administrative Procedures and was included as a reminder in the step in section 4 equivalent to ATOG step II.16. Step d. is an implied condition required by all Davis-Besse Emergency and Abnormal procedures.

4. <u>Supplementary Actions</u>

As discussed in ATOG Part II, Volume I, Chapter H, with the exception of four main symptom priorities, there is no particular importance placed on the sequencing of the steps as presented in ATOG Section II as long as all of them are performed. The steps in procedure Section 4 have been rearranged from ATOG Section II in a desirable sequence by groups.

The first group of systems checked are electrical power, instrument air and instrumentation systems. These systems are the operator's link with the plant equipment and he should know their status early in the event since they affect his ability to verify status or his method of equipment actuation. He also must know the status of the instrumentation systems in order to make decisions based on the instrument readings.

The next grouping is reverification of reactor and turbine trips and the preventative steps of starting the second MU pump and verification of proper MFW system response. Proper response for these two steps can in some cases prevent SFAS or SFRCS actuations after the reactor trip so these steps precede the steps for checking the status of SFAS and SFRCS.

The last grouping is the four main ATOG symptoms.

Considerable plant specific detail has been added to most steps, for example, if performance of a step is affected by loss of instrument air or NNI power sources the information is included. Information from the ATOG <u>"Remedial Action Column"</u> has been modified where necessary to include plant specific requirements or preferences to accomplish the same function.

All steps (except II.4 as previously mentioned in Section 3) in ATOG Section II are included in the Emergency Procedure section 4.

5. <u>Lack of Adequate Subcooling Margin</u>

Procedure Section 5 uses the same steps and the same sequence as ATOG Section IIIA. The wording of several steps has been modified to include necessary plant specific detail to perform the functional requirements of the ATOG steps. Also, some steps have been expanded to include information on how the step must be performed for contingency conditions such as loss of bus power, loss of NNI and the SFRCS actuation which results from tripping RCP.

Specific differences occur in the Emergency Procedure Steps for the following ATOG steps. III A.3 has the added requirement of verifying proper SFRCS response to the RCP trip performed in III.A.1. The reference to specific rule 4 is not included; this item is explained in the specific rules sections of this document. III.A.5 has had additional valves added for isolation. Steps III.A.12.2 and 3 were not included at this point since the required diagnostic hold could delay performance of the following steps which are of a higher priority. This function would be performed in Section 13 as part of the steps to re-establish pressurizer steam bubble control.

6. Lack of Heat Transfer

Procedure section 6 uses the same steps and the same sequence as ATOG section IIIB for all the functional steps. Some substeps of the functional steps have been modified as addressed below. Step wording has been modified to include contingency information and plant specific detail as in section 5.

Additional functional steps were added to the procedure at the points equivalent to the forward reference statement of ATOG step III.B.10.1 to eliminate the forward referencing as a human factors enhancement.

An additional functional step was added to the procedure between ATOG steps III.B.6 and III.B.7 to reduce RCP running combination to one. This will reduce the RCP heat input to the RCS if the SUFP is the only feedwater source available.

An additional functional step was added to check for Steam Generator Tube Rupture prior to the routing required by ATOG step III.B.18. This step was considered to be a required addition since the routing into section 6 from procedure section 4 (ATOG section II) would have bypassed this diagnostic step.

Specific differences occur in the Emergency Procedure steps for the following ATOG steps. III.B.1 reworded to include routing to step 2 if the start up feed pump (SUFP) is the only feed source available. III.B.2 substeps have additions of turning off pressurizer heaters, opening the hot leg and pressurizer high point vent valves to increase MU/HPI flow and verifying SFAS actuation if it actuates. Steps III.B.3 thru III.B.5 have been combined into 2 procedure sequences, one for attempting to establish SUFP flow for each SG independently if required since the plant specific analysis done for complete loss of main and auxiliary feed requires feeding only one SG with the SUFP. III.B.15 routing was modified for the case where SG level has been established and an RCP is running but no heat transfer exists. This condition would represent the onset of inadequate core cooling (ICC) so the procedure routes to section 9 vice section 12 (CP104). The initial steps of both sections are the same and the selected routing results in the least amount of section transfers by the operator. III.B.16 was modified to close the additional valves opened in step III.B.2. III.B.17.1 was modified to allow holding RCS temperature at present value or slightly decreasing. The intent of the ATOG step was to not allow a heatup.

7. Excessive Heat Transfer

After reviewing the ATOG flow chart for excessive heat transfer, Figure III.C, it was noted there was incomplete treatment of over-cooling from all possible causes. The guideline almost exclusively covers overcooling from steam leaks only.

The steps III.C.23 are inadequate, as closing a single MSIV is going to cause more operational problems and contingencies than it will solve.

Step III.C.4 as written would very likely cause a loss of MFW on a "normal" reactor trip as pressurizer level can often go below 50 inches. Also on this same step the single criterion for SG level be $\geq$ 95% on the operate range as the basis for MFW causing overcooling is inadequate since overcooling symptoms would be present before this level is reached.

The present overcooling section is based on a revised flow chart (attached) which addresses all potential overcooling causes. The philosophy used to make the flowchart was as follows: 1) overcooling can be caused from MFW overfill, AFW overfill, steam pressure control malfunction (i.e., TBV's) or steam leak; 2) an auto or manual SFRCS actuation, with no additional concurrent failures, will eliminate all causes except AFW overfill or non-isolable steam leak; 3) overall plant control with return to normal conditions is simplest if an SFRCS actuation can be prevented; 4) the operator should attempt to terminate overcooling without SFRCS actuation if possible; 5) the procedure steps were layed out such that routing only to a higher step number was required, so an operator wouldn't have to route forwards and backwards within the section. Item 5 requires the procedure to be longer but the operator is less likely to get lost in the procedure.

The procedure includes the sequences in ATOG IIIC along with several additional sequences. Plant specific information and contingency information has been added as in previous sections. A step by step comparison is not made as the number of differences would make it meaningless. The procedure flowchart is included to allow a scope comparison with ATOG.

8. Steam Generator Tube Rupture

The SGTR section of the procedure has a major deviation from the ATOG treatment of a SGTR after the point where the plant is cooled down and depressurized to 500° and 1000 PSIG. At this point in ATOG, if the non tube ruptured SG can be steamed for continued plant cooldown, the tube ruptured SG is only steamed as required to keep the water level from increasing above 95% on the operate range and, with RCPs not running, as required to maintain natural circulation in that loop. If the non tube ruptured SG cannot be steamed for continued plant cooldown, the cooldown is continued on the tube ruptured SG.

There are some problems associated with this method of treatment. The continued loss of RCS/BWST inventory has a potential for loss of BWST inventory before the RCS can get on DHR system cooling. Steaming the tube ruptured SG will cause continued offsite releases until the DHR system can be put in operation. In the event RCPs cannot be run, the problem associated with the reactor vessel head cooling on natural circulation will severely limit the cooldown and depressurization rate of the RCS which will magnify the effects of the previous problems.

In order to address these problems the procedure will direct closing the MSIV on the tube ruptured SG once the RCS has been cooled down and depressurized to 500° and 1000 PSIG. The RCS can then only leak into the SG until the SG and main steam lines are full up to the MSIV. Toledo Edison has looked at the effect on the main steam line from being filled with water and determined the condition is satisfactory as long as no seismic event were to occur with the main steam line filled with water. The probability of a seismic event occurring at the same time the main steam line was filled with water from a SG tube rupture is considered extremely low. Since treatment of the SG tube rupture by this method will effectively deal with the problems inherent in the ATOG method, this method has been chosen for the procedure.

A new problem exists using this method, however. If you assume for some reason you can't steam the non tube ruptured SG after the point of isolation of the tube ruptured SG (multiple failure scenario) and especially after the point where the tube ruptured SG secondary water level had increased to the point where it could no longer be steamed even if desired (water into the steam lines), then a method for core cooling must be provided. The method will be MU/HPI cooling, with flow throttled to maintain RCS pressure less than 1000 PSIG, through the PORV and supplemented if necessary by 140 gpm letdown flow. This method is supported by Toledo Edison Nuclear Engineering calculation "RCS pressure estimation for 2 HPI pump operation during PORV blowdown" dated 9-1-83 and an additional calculation to adjust for heat input from two running RCPs and heat removal from 140 gpm letdown. The calculations estimate this cooling method can match the core decay heat level about 22 minutes after reactor trip or shutdown. At the cooldown rate required by the procedure it will take a minimum of 30 minutes to reach the plant conditions requiring the transition to MU/HPI cooling. This method is therefore considered to be preferred to steaming the tube ruptured SG and then having to address the previously mentioned problems associated with steaming the tube rupture. The probability of this multiple failure scenario ever occurring is also considered extremely unlikely. The present procedure method is included within the scope of the new B&W Technical Basis Document. The procedure flowchart for Steam Generator Tube Rupture is included to allow a scope comparison with ATOG. A step by step comparison with the guideline is not made.

The procedure has two entry combinations to the SGTR section. If the reactor trip occurs before the SGTR is known, the procedure will be entered in Section 3 as on any reactor trip, the plant will be stabilized, and a step will be reached to check for SGTR; i.e., 4.14. At this point, Section 8 will be entered at Step 8.7, which is the entry point from all other sections of the procedure when the reactor is already tripped. This entry point bypasses all the rapid shutdown steps since the reactor is tripped. Step 8.7 will piggyback HPI/LPI if necessary and then the rest of the procedure is the same, independent of entry method.

If the procedure is entered based on symptom for SGTR, immediate operator action Step 3.1 directs Section 8 be entered. Steps 8.1 through 8.6 will direct a rapid plant shutdown. The initial objective of these steps is to reduce power, without a reactor trip if possible, to prevent or minimize any release through lifting of the MSSVs. The rapid power reduction is required since, by definition, the pressurizer level is decreasing during the power reduction. The secondary objective is to get the RCS pressure down to a window above the SFAS setpoint but sufficiently below the shut off head of piggy-backed HPI/LPI to allow keeping up with the tube leak. This pressure is nominally 1700 PSIG. This will allow plant control without the complication of SFAS actuation and by maintaining subcooling margin, the RCPs will also be available. Since RCS pressure cannot be manually reduced to this pressure so HPI can keep up with the leak without causing a low pressure reactor trip, the pressurizer level will decrease during the power reduction and will not, by itself, be a reason for a manual trip. The 100" minimum level is conservatively calculated to be the minimum level at which the reactor trip post trip cooldown would cause a complete loss of pressurizer level, leading to a loss of subcooling margin.

9. Inadequate Core Cooling

Section 9 of the procedure uses the same steps and same sequence as ATOG Section ICC except as described below. As in previous procedure sections considerable plant specific information has been added. Procedure steps corresponding to the following ATOG steps were modified as follows.

ICC 1.0 was modified to move substep 1.2 to a major step immediately following ICC 4.0. This makes actions more sequentially related to RCS pressure response.

ICC 3.1 was broken into 2 substeps for clarity and the reference to incore thermocouple temperature was modified to TSAT for existing RCS pressure per NRC comment on ONS-3 ATOG.

A major step was added ahead of ICC 5 per NRC comment on ONS-3 ATOG, using Davis-Besse plant specific values.

ICC 8.0 and 10.1 were combined into one procedure step at the ICC 8.0 location. This appears to be a more logical location for ICC 10.1 and it also agrees with the Davis-Besse Small Break LOCA Guideline (rev. 1).

ICC 9.0 and 10.0 were written as one contingency logic step to be more consistent with the procedure format.

ICC 11.0 has had a substep added to address the NRC comment on ONS-3 ATOG substep 11.3. This was in lieu of deletion of the substep as in Davis-Besse ATOG.

ICC 13.3, the requirement to close the high point vents when all non-condensible gases are vented, is not included since there is no way the operator could make this determination. The high point vents will therefore remain open until a procedure or station management directs closing.

ICC 14, 15 and 16 were combined into one procedure step. ICC 14 is a conditional statement with the actions being ICC 15 and 16. An additional condition was added to the procedure for LPI flow to be present since this is what is going to restore saturated conditions at this point. ICC 16.0 modified to close CFT isolations after the tanks are empty. A substep was added to close the PORV and reopen it if RCS pressure increases above 150 PSIG. This will limit inventory loss while maintaining pressure low enough to insure LPI flow.

The routing at step 18.0 has been modified such that if SG heat transfer is present transfer to section 11 is made and if SG heat transfer is not present, transfer will be made to section 12.

This is how the ATOGs after Davis-Besse were done. The referenced sections contain all the required information from the rest of the ICC section.

Cooldown Sections

Procedure sections 10 through 13 correspond to the ATOG CP sections as described in the scope section of this document.

There is no section in the emergency procedure for CP-102 Normal Cooldown. The information in this ATOG section is included in the present plant procedure for normal cooldown. The normal plant cooldown procedure is referenced in the appropriate sections of the emergency procedure.

The procedure sections are written to provide high level guidance as is provided in the ATOG major steps. The plant specific information to accomplish substeps that are already included in Davis-Besse plant specific procedures is referenced rather than being included in the emergency procedure. Plant specific information from the event type emergency procedures replaced by this procedure is included when required. Steps for notification of the Shift Technical Advisor and implementation of the Station Emergency Plan have also been included. The functional requirements and sequence of the ATOG CPs have been maintained.

The containment vessel environmental conditions are monitored via reference to an emergency procedure table which contains monitoring and control functions. References to this table are included instead of specific steps in the procedure. This reduces the amount of information that has to be repeated in each section.

Specific Rules

The procedure has four specific ru s. Specific rules 1 through 3 in the procedure are basically a reorganization of the information in the ATOG rules 1 through 4 into more specific functional headings. The procedure specific rule 4 was added as a way to include miscellaneous information that was included in the event specific procedures, that doesn't fit into the procedure body easily at any specific point. Specific rule 4 is meant to be a general "catch all" type rule and will probably be modified as needed in the future.

Specific rule 1, Actions for loss of Adequate Subcooling Margin, has 4 parts. The first part uses ATOG rule 1.I.1 but has been modified to be required only when RCS pressure is above the shut off head of the HPI pumps and only while sufficient BWST water volume is available to provide suction to the Make-up pumps. The second part uses ATOG rule 1.I.1.6 at the functional level of requiring HPI initiation but the details of system operation are in specific rule 2. Two additional parts have been added. The third part requires immediate trip of RCPs. The fourth part requires raising SG level as in ATOG rule 4.I.1 but the "exception" statement is not used. The Davis-Besse SFRCS System will perform this function automatically if it is required, therefore this instruction is inherent in the procedure instructions to verify SFRCS response is proper for the trip parameters actually present.

Specific rule 2 MU/HPI Flow Initiation, Throttling and Termination, has four parts. The first part is for initiation and is basically the information from ATOG rule 1.I.1.b. The reference to ATOG Figure 1 in substep b.1 has been deleted. If the pumps are verified running and the valves are verified fully open, Figure 1 has no value to the operator in the control room. Since he can't do anything further to increase the system flow, trying to find out where he's at on the curve is a meaningless distraction. ATOG Figure 4 is Figure 3 in the procedure. A plant specific addition of information on the MU pump injection causing a low flow indication on HPI line 2-1 has been added.

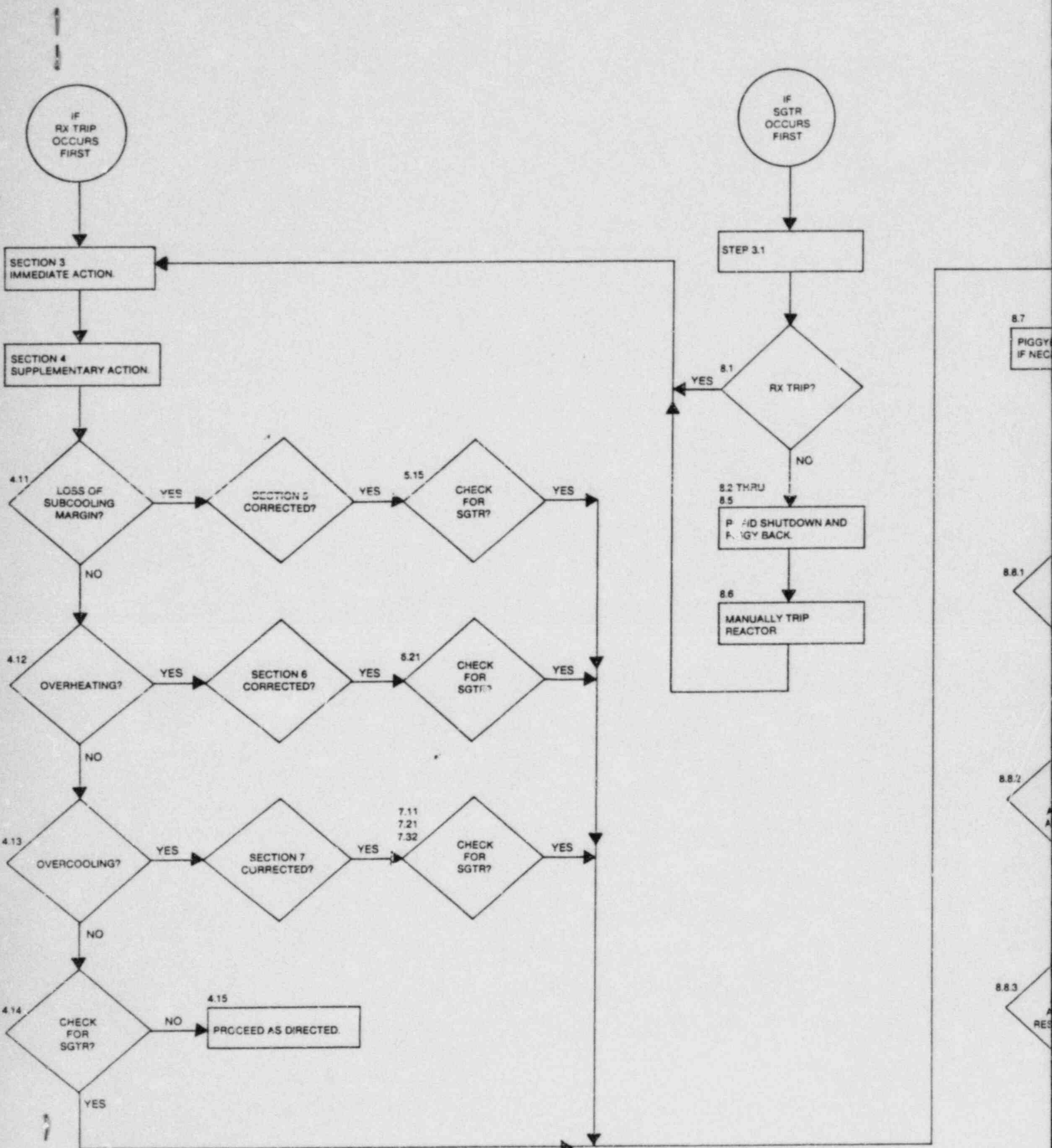
Part two is for throttling and is basically the information from ATOG rule 2.II. ATOG figure 2 is procedure Figure 1. The flow balance information is in part one and is not repeated. Plant specific information to throttle HPI and Make-up to prevent pump runout has been added.

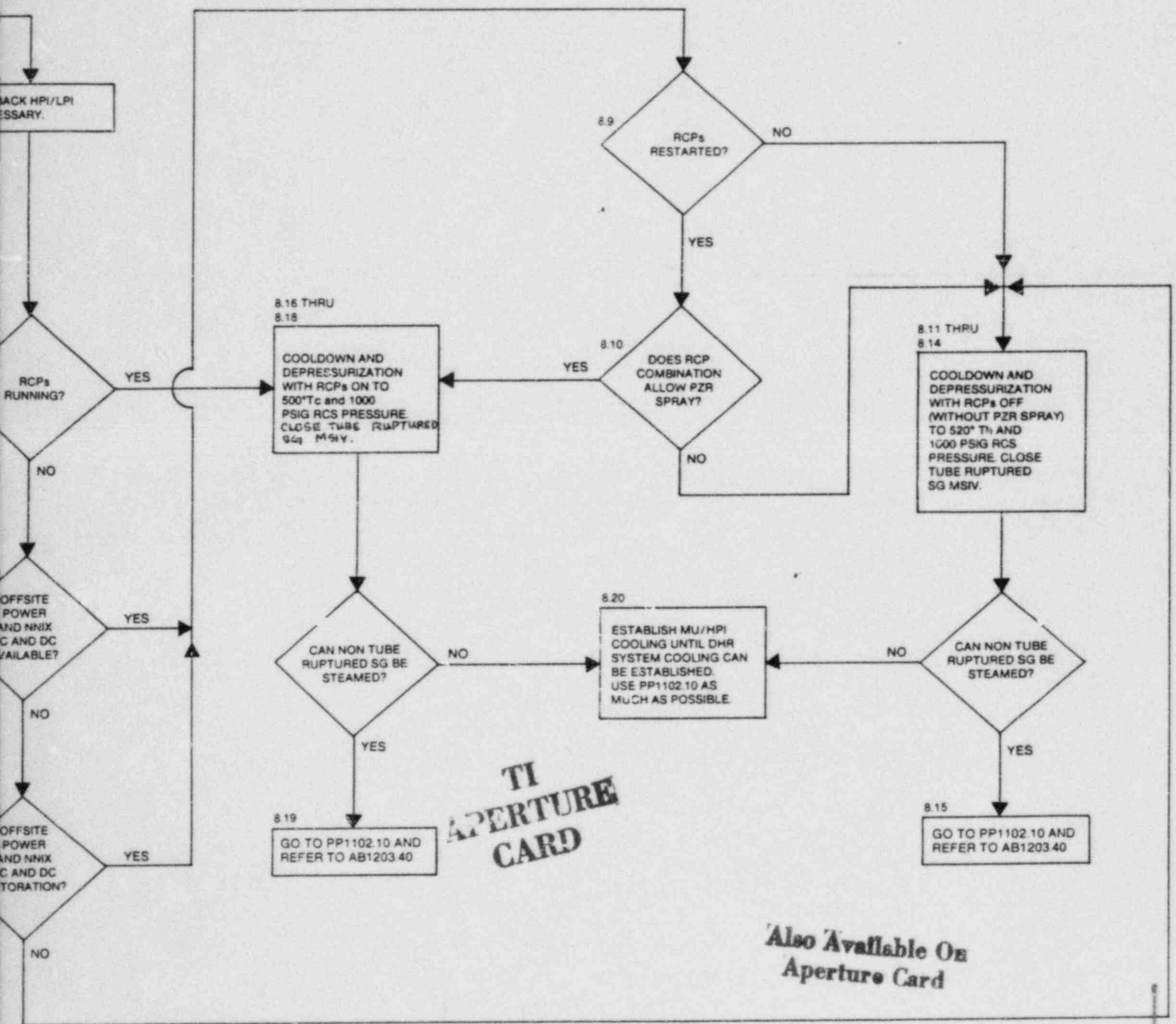
Part three is for termination and uses the information from ATOG rule 2.I.

Part four is a plant specific addition to allow piggyback operation of HPI/LPI to increase the shutoff head of the HPI pumps as an aid to RCS inventory control.

Specific Rule 3, SG level Setpoints has 5 parts. This rule combined ATOG rules 3 and 4. The first part uses ATOG rule 4.II.3. The second part uses ATOG rule 4.II.4. The third part uses ATOG rule 4.II.1. The fourth part uses ATOG rule 3.I.1 without the "exception" statement. Again the SFRCS system will perform this function if needed and additionally this action will be directed if required in section 7 where excessive primary to secondary heat transfer is specifically addressed. The fifth part uses ATOG rule 4.II.5. ATOG rule 4.II.2 is not a separate part since RCP trip will cause an SFRCS trip. This information is inherent in part one.

Specific rule 4, Miscellaneous Post Accident Actions, contains plant specific information that was contained in Davis-Besse event procedures. Information is contained on the requirements that must be met to block and override SFAS actuated components after an auto actuation and information on re-actuation of equipment after it has been blocked. It also contains information on how elevated containment temperature can affect pressurizer level indication.


IF RX TRIP OCCURS FIRST
SECTION 3 IMMEDIATE ACTION.
SECTION 4 SUPPLEMENTARY ACTION.
4.11
LOSS OF SUBCOOLING MARGIN?
YES
SECTION 5 CORRECTED?
YES
5.15
CHECK FOR SGTR?
YES
NO
4.12
OVERHEATING?
YES
SECTION 6 CORRECTED?
YES
6.21
CHECK FOR SGTR?
YES
NO
4.13
OVERCOOLING?
YES
SECTION 7 CORRECTED?
YES
7.11
7.21
7.32
CHECK FOR SGTR?
YES
NO
4.14
CHECK FOR SGYR?
NO
4.15
PROCEED AS DIRECTED.
YES
IF SGTR OCCURS FIRST
STEP 3.1
8.1
RX TRIP?
YES
NO
8.2 THRU 8.5
8.6
MANUALLY TRIP REACTOR
8.7
8.8.1
8.8.2
8.8.3



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