WOLF CREEK
NUCLEAR OPERATING CORPORATION

February 4, 1987

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Re: Docket No. 50-482
Letter: WM 87-0029
Ref: 1)Letter dated 11/12/86 from PO'Connor, NRC, to GLKoester, KG&E
2)Letter KMLNRC 86-246 dated 12/26/86 from GLKoester, KG&E, to HRDenton, NRC
3)Letter SLNRC 86-01 dated 1/8/86 from NPetrick, SNUPPS, to HRDenton, NRC
Subj: Response to RAI Regarding the SGTR Analysis

Gentlemen:

Enclosed is the response to Enclosure 2 of Reference 1 which requested additional information regarding the Steam Generator Tube Rupture Analysis for Callaway and Wolf Creek Plants. This response is being submitted in accordance with a schedule established in Reference 2.

The enclosure to this letter is identical to that being submitted by Union Electric Company in response to a similar request. It is expected that the review of this response will continue to be a single review for both Callaway and Wolf Creek in the same manner as the review of the original Steam Generator Tube Rupture Analysis report submitted via Reference 3.

If you have any questions concerning this matter, please contact me or Mr. O. L. Maynard of my staff.

Yours very truly,

BDWithers

Bart D. Withers
President and Chief
Executive Officer

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RESPONSES TO ENCLOSURE 2
REQUEST FOR ADDITIONAL INFORMATION

1. The discussions in Sections 2.1 and 2.2 differentiate between identifying SGTR occurrence and identifying which steam generators (SGs) have ruptured tube(s), and suggest indications for these identifications. However, it is not clear that this distinction between the two different diagnostic activities is considered in the analyses reported. The symptoms you have identified, their alarms, and operator responses may not be appropriate for the event scenario assumptions. Include explicit consideration of the symptoms, indicating instrumentation, alarms or procedural directives, and operator responses, including times for each in the timetables and analyses for each diagnostic activity. Do this separately for the identification of SGTR occurrence and for the identification of which SG(s) have ruptured.

1. Response

A. Identification of SGTR Transient

Operator actions in response to a SGTR are assumed to follow plant specific emergency procedures. Depending whether or not a reactor trip had occurred, Off-Normal or Emergency Operating Procedures would direct the operator to identification of a SGTR.

Plant-specific Off-Normal procedures address some actions to take if an SG tube rupture is in progress with no reactor trip or safety injection. With condenser air removal radiation monitors or steam generator blowdown radiation monitors indicating above normal or alarming, the plant chemistry departments would start sampling generators to determine the faulted SG. Associated instruments, alarms, and setpoints are tabulated in Attachment 1.

The operator would enter E-0 on a reactor trip or safety injection, whether the signal was automatic or a result of manual actuation. Through symptom-based diagnosis, the operator is directed to the proper Optimal Recovery Guidelines to facilitate optimal recovery. As directed in E-0, the operator would review radiation levels in the SG blowdown and/or the condenser air removal systems. Abnormal levels in either of these areas indicates excessive primary-to-secondary leakage and directs the operator to E-3.

Once in EOP E-3, the operator would be directed to identify the ruptured SG(s).

Stuck-Open ARV Scenario

For the submitted Stuck-Open ARV case, reactor trip did not occur until nearly 8.4 minutes. Within three minutes of the SGTR, the operator would have observed abnormal radiation levels in the SG blowdown and condenser air removal and would be preparing for reactor trip and SG identification via Off-Normal Procedures (See Attachment 2).

1. Response (Cont'd.)

Overfill Scenario

For the submitted Overfill case, reactor trip occurs at 2.4 minutes. This may not be sufficient time to identify the SGTR via the Off-Normal Procedures. However, once in E-0 the operator would quickly identify a SGTR via abnormal radiation levels in the SG blowdown and condenser air removal, or by an increase in SG level after reactor trip (See Attachment 2, step 5).

In either scenario, the operator has several other indications of an SGTR which are not specified in the initial procedures but which may be used to verify his findings. These include:

1. Uncontrolled SG Level Increase (as seen on control board indications or on level traces recorded prior to trip)

2. Turbine Driven Auxiliary Feedwater Exhaust High Radiation Monitor (identifies either B or C SG)

3. SG Atmospheric Relief Valve Radiation Monitors

4. SG Samples

   a. Conductivity increase due to boron additions to SG water

   b. Activity level increase

These indications are mentioned since their use has been observed in SGTR simulator exercises.

B. Identification of the Faulted SG

Once the operator has proceeded to EOP E-3, procedural guidance quickly requires identification of the faulted SG. This is accomplished by observing one of the following (Step 2, E-3):

1. Unexpected increase in any SG narrow range level, or

2. High radiation from any SG sample, or

3. High radiation from any SG atmospheric relief, or

4. High radiation from any SG blowdown line.

These indications are obtained by consulting instrumentation within the control room (except for the case of SG manual sampling where the information is communicated to the control room). High radiation indications are given by both alarms and displays.

1. Response (Cont'd.)

It should be noted that in both submitted scenarios the loss of off-site power (LOOP) is assumed to be coincident with reactor trip. Since the radiation monitors are not powered by Class 1E power supplies, updated information is not available after LOOP. As estimated in the response to question 2, the responsiveness of the required radiation alarms is on the order of 2-3 minutes. Although radiation alarms would occur prior to trip, given adverse impacts from LOOP and the requirement to differentiate between SGs, radiation monitors cannot be assumed for verifying the faulted SG. Thus identification of the faulted SG must be based on narrow range indication or manual SG liquid sampling.

Overfill Scenario
For the overfill case, uncontrolled narrow range rise would be recognized at approximately 6 minutes into the accident. This leaves ample time for operators to complete the isolation steps within 16 minutes (See Attachment 2).

Stuck-Open ARV Scenario
For the ARV case, level does not recover until 40 minutes after the SGTR. Therefore, faulted SG identification is achieved "procedurally" via manual SG liquid sampling. Manual sampling and faulted identification would take 15-20 minutes. Given that sampling is initiated when radiation monitors indicate abnormal levels (<3 minutes), operators have sufficient time to complete isolation activities by 28.4 minutes (See Attachment 2).

Note that emphasis was placed above on "procedural identification". Operators have available other indications outside the emergency procedural guidelines to identify the faulted SG including: initial feedwater/steam mismatch, SG liquid conductivity, SG pressures, and SG wide range indication.

2. The report references the Westinghouse Emergency Response Guidelines (ERGs) to identify which operator actions are performed in response to SGTR scenarios. There does not seem to be adequate plant specific information for the ERGs to provide adequate guidance, to adequately identify and quantify SGTR diagnostics. For instance, since the ERGs do not identify radioactivity control as a critical safety function, it is not clear that the operator would be properly directed to consult radiation monitoring equipment or that such consultation would be timely. Identify (1) instrumentation and controls which the analyses assume the operator will use for diagnostic purposes; (2) the procedures that will be signalled by each; (3) alarms or procedural directives which will alert the operator to use them.

Discuss the sensitivity, responsiveness, availability, and qualification of these instruments and controls.

2. Response

Although SG radioactivity control is not identified as a Criticality Safety Function, it is treated in Off-Normal and Emergency Operating Procedures as discussed in the previous response.

As outlined in Attachment 1, several indications are available for diagnosing a SGTR. These indications include:

1. SG Narrow and Wide Range Level,
2. SG Pressure,
3. Feed/Steam Flow,
4. SG Blowdown Radiation Monitors,
5. Condenser Air Discharge Monitor,
6. SG Liquid Radiation Monitor, and
7. Turbine AFW Exhaust Radiation Monitor.

After the SGTR is diagnosed, the following instruments may be used to identify the faulted SG:

1. SG Narrow and Wide Range Level,
2. SG Pressure
3. Feed/Steam Flow,
4. Manual SG Liquid Sampling by Chemistry Department, and
5. SG ARV Monitors.

The use of these instruments in the postulated SGTR scenarios has already been discussed in detail in the response to question 1.

For those instruments used for diagnosis in the submitted analyses, the sensitivity, responsiveness, availability, and qualification of these instruments are addressed in the Table 1. The procedures signalled by abnormal indications and the procedural steps in which the above controls were used are repeated in Table 1 for completeness. The bulk of this information was taken from the SNUPPS FSAR; references are included where appropriate.

3. The discussion of Section 2.0 refers to operator actions based on ERG Section E-3, SGTR; however, this section does not discuss event milestones and operator actions prior to entry into the ERGs and actions based on ERG Section E-0. Address this portion of the SGTR scenario.

3. Response
Milestones and operator actions prior to entry into the ERGs and actions based on E-0 were addressed in response to question 1.

4. The operator actions assumed in the analyses of the report are predicated on a predetermined course of operator action which is not detailed or justified. Observations reported in WCAP-10599 indicate that during the ERG validation program operator uncertainty and incorrect interpretations have occurred. Specific incidents cited in this report are particularly applicable to SGTR events. Justify for the SGTR Analysis scenarios the assumed course of operator actions, given NUREG-0800 assumptions and their consequent indications and ERG-instructed responses to those potential indications.

4. Response
The event symptoms, alarms, operator actions, and times have been itemized in Attachment 2 for the postulated scenarios.

For each scenario the operator's course of action is justified by procedural guidance as outlined in Attachment 2. Attachments 3, 4, and 5 are simplified versions of the major procedures the operators will use during the transient. These attachments are based on Callaway Plant procedures. Wolf Creek Plant procedures are very similar, with only minor variance in step numbering and cautionary notes.

In reference to operator uncertainty and incorrect interpretations reported in WCAP-10599, the majority of errors were attributed to limited procedural training and operator unfamiliarity with the control board. "Wrong-column" errors which are human-factor related were made infrequently (10 out of 2452 possible steps).

Since the WCAP-10599 verification and validation exercises, the Westinghouse ERGs have been developed into Callaway and Wolf Creek procedures. The application of these procedures in operations and training exercises has resulted in decreased incidence of errors and enhanced effectiveness. Indeed, the Revision 0 verification and validation of the SNUPPS generic procedures on the Callaway simulator showed that the procedures were very effective in limiting human errors.

Given Callaway and Wolf Creek operators' experience and familiarity with their equipment, incorrect actions and their consequences should be minimal. If errors are made, the redundant checks, independent safety status monitoring, and fundamental similiarity in recovery steps would provide ample opportunity to correct any errant actions.

4. Response (Cont'd.)
For an SGTR transient, several steps in the procedures ensure an operator's return to the proper action steps if an operator has progressed into the wrong recovery procedure. Emergency procedure ES-0.0, Re-Diagnosis, allows the operator to determine or confirm the most appropriate recovery procedure. Emergency Procedure E-0, Reactor Trip or Safety Injection, branches to Emergency Procedure E-3, SGTR, four separate times. The Functional Restoration Guidelines (FRGs) are entered as a result Critical Safety Functions monitoring by the operating crew. In the case of an SGTR, SG high level indications would lead the crew to FRG-H.3 and then back to EOP-3.

Given these considerations, operator errors are not expected to significantly impact the mitigation of the transient. Since recognition of an error would occur promptly, operator action times assumed in the analyses are enveloped.

5. Scenarios postulated in the SNUPPS SGTR analyses presume the identification by the operator that a SGTR event is in progress and that he has transitioned to the E-3 procedure. This presumption is not adequately justified for a NUREG-0800 scenario.

For a NUREG-0800 scenario itemize step-by-step, from time of tube rupture to time of event termination, i.e., cold shutdown, all events accompanying symptoms, alarms, operator actions, and times associated with each. This description should include details prior to entry into the ERGs and all transitions in the ERGs. All operator behavior should be justified, including assumptions that the operator would not make erroneous transitions. Assumptions required by NUREG-0800, e.g., loss of offsite power, stuck rod, and their impact on operator actions should be considered. Also, other activities appropriate to operation during SGTR scenarios (e.g., interaction with Emergency Plan Emergency Action Levels) should be accounted for.

5. Response
The event symptoms, alarms, operator actions, and times have been itemized on Attachment 2 for the postulated scenarios.

For each scenario the operator actions are justified by procedural guidelines. As noted in response to question 4, the inherent structure of the emergency procedures with redundant checks, independent safety status monitoring, and fundamental similarity in recovery steps provides several redundant steps to correct any incorrect actions.

Assumptions required by NUREG-0800 have been considered in the course of the transient. In the case of loss of off-site power coincident with reactor trip, updated radiation monitoring is not accounted for after the trip. The assumption that the highest worth control rod is stuck in the fully withdrawn position has no effective impact on the SGTR scenarios, since there is no fuel failure.

5. Response (Cont'd)

In reference to the Radiation Emergency Response Plan (RERP) actions, implementation of the RERP is the responsibility of the Emergency Coordinator (Duty Emergency Director at Wolf Creek). Although he has overall responsibility for the plant, he is not directly involved in the recovery. Implementation of the Emergency Operating procedures will be by the on-shift crew. The event will be classified and the necessary notifications will be made in accordance with the plant specific approved RERP. The Emergency Classification would probably be either an ALERT or a SITE EMERGENCY (SITE AREA EMERGENCY at Wolf Crek). In any event, the RERP does not effect operator recovery actions.

TABLE 1 INSTRUMENTS AND RADIATION MONITORS USED FOR SGTR DIAGNOSIS (NOTE 7)

Monitor	Procedural Step Requiring Use(8)	Sensitivity MDC $\frac{uCi}{cc}$	Sensitivity Range $\frac{uCi}{cc}$	Responsiveness	Availability	Qualification	References
1. SG Blowdown Radn Monitor (BM-RE-52)	Note 1 E-0 Steps 23b, 29b E-3 Step 2d	$1x10^{-6}$	10^{-7} to 10^{-2}	Note 3 2-3 minutes	Notes 4, 5	NSR/NS	FSAR Table 11.5-2
2. SG Blowdown Proc. System Monitor (BM-RE-25)	Note 1 E-0 Steps 23b, 29b E-3 Step 2d	$1x10^{-6}$	10^{-7} to 10^{-2}	Note 3 2-3 minutes	Notes 4, 5	NSR/NS	FSAR Table 11.5-2
3. Condensor Air Discharge Monitor (GE-RE-92)	Note 1 E-0 23a E-0 29a	$2x10^{-7}$	10^{-7} to 10^{-2}	Note 3 2-3 minutes	Note 4, 5	NSR/NS	FSAR Table 11.5-3
4. Manual Blowdown Sampling by Chem Department	Note 2 E-3 Step 2b	Not Applicable		15-20 minutes	Note 6	Not Applicable	Not Applicable

Instrument	Procedural Step Requiring Use (8)	Sensitivity Accuracy(% Range)	Sensitivity Range	Responsiveness	Availability	Qualification	
5. 1. SG Narrow Range Level A: AE-L-517,518, 519,551 B: AE-L-527,528, 529,552 C: AE-L-537,538, 539,553 D: AE-L-547,548, 549,554	E-0 Step 28a E-3 Step 2a	± 4%	0-100%	< 2 seconds	4 channel available, 1 required per SG CB,SC, LP	Class IE-pressure, temperature, radiation, spray, etc. (see FSAR 3.11(B))	FSAR Table 7.5.1 7.5.2, and 3.11(B)

NSR - Non-Safety Related Component; NS - Non-Siesmic Qualification; CB-Control Board (Main);
SC - Systems Cabinets in Control Room; LP - Local Panel

NOTES TO TABLE 1

NOTE 1: On alarm or alert, the operator would consult plant-specific alarm response procedures. The alarm response procedures direct the operator to Off-Normal Procedures.

NOTE 2: Various steps in the plant-specific alarm response procedures require notification of the plant chemistry department for manual sampling and/or evaluation.

NOTE 3: Local microprocessor receives pulse signal from the detector. It processes the signal and transmits a one minute average to the RRIS computer. The control room computer polls the whole system every 2 seconds through 2 independent chains. Data can be displayed for present, 10 min, 1 hour, 1 day, and monthly averages.

NOTE 4: The operator has this information available via control room digital radiation display SP-056A.

NOTE 5: Power supply is Non-1E. Monitor lost on loss of off-site power.

NOTE 6: Allows differentiation between individual SG(s).

NOTE 7: The parameters listed are defined as follows:

Sensitivity - the accuracy and range over which the instrument operates.

Responsiveness - delays associated with receipt of signal (process or electronic).

Availability - operability and accessibility of the instrument.

Qualification - conditions under which instrument was tested and remained operable.

NOTE 8: Procedural steps based on Callaway EOPs. Wolf Creek procedures are very similar, with only minor variance in step numbering and cautionary notes.

RESPONSES TO ENCLOSURE 2
REQUEST FOR ADDITONAL INFORMATION

ATTACHMENT 1

INDICATIONS

The operator has several indications of an SGTR. Since primary-to-secondary, leakage adds additional inventory to the ruptured SG, the faulted SG level may be higher than normal prior to trip. This change in level can be seen in the recorded levels and can be utilized after trip by reviewing these records. This information assists in confirming an SGTR and also is useful in identifying the affected SG(s). After reactor trip, the level in the ruptured SG should return to narrow range significantly earlier than the unaffected SGs.

In addition, the following annunciators would provide the operators with feedback on the progression of the accident:

Annunciator	Title	Setpoint
108B	S/G "A" LEV DEV	±5% Program
109B	S/G "B" LEV DEV	±5% Program
110B	S/G "C" LEV DEV	±5% Program
111B	S/G "D" LEV DEV	±5% Program
108C	S/G "A" FLOW MISMATCH	$7x10^5$ lbm/hr Mismatch
109C	S/G "B" FLOW MISMATCH	$7x10^5$ lbm/hr Mismatch
110C	S/G "C" FLOW MISMATCH	$7x10^5$ lbm/hr Mismatch
111C	S/G "D" FLOW MISMATCH	$7x10^5$ lbm/hr Mismatch

RESPONSES TO ENCLOSUSRE 2
REQUEST FOR ADDITIONAL INFORMATION

ATTACHMENT 1

INDICATIONS

Although these symptoms will be evident soon after reactor trip for a large tube rupture, the SG level response may not be noticeably different from normal for small ruptures or leaks. In that case, high radiation indications may be necessary for positive identification of the ruptured SG.

Alarms associated with high radiation indications are listed below:

RM-11 Chan	Monitor	Process	Alarm Setpoint
111	AB-RE-111	Steam Line "A"	40 mr/hr
112	AB-RE-112	Steam Line "B"	40 mr/hr
113	AB-RE-113	Steam Line "C"	40 mr/hr
114	AB-RE-114	Steam Line "D"	40 mr/hr
256	BM-RE-25	S/G Blowdown	$1x10^{-4}$uc/ml
526	BM-RE-52	S/G B/D Disch Pumps	Variable
506	FB-RE-50	Aux Stm Cond Recovery	$1x10^{-4}$uc/ml
381	FC-RE-385	TDAFP Exh	40 mr/hr
925	GE-RE-92	Condenser Air Disch	$2x10^{-5}$uc/ml
026	SJ-RE-02	S/G Letdown	$1x10^{-4}$uc/ml

The Safety Assessment System (SAS) can provide information to detect a leak. This information aid is packaged in displays (Example: SGTR) which present critical parameters for the accident. The SGTR parameters are:

1. RCS Pressure
2. Pressurizer Pressure
3. Containment Temperature*
4. Containment Pressure*
5. Containment Humidity*
6. Containment Sump Level*
7. Condenser Air Discharge Radiation
8. SG Blowdown Radiation
9. Highest SG Level
10. SG Levels (30 minute graph and numerical form)
11. SG AFW Flow
12. SG Pressure

The balance of Plant computer can display various points or trends which could serve to identify the problem.

* Note: Presence of these indications may be indicative of steam line break or LOCA as opposed to an SGTR.

RESPONSES TO ENCLOSURE 2
REQUEST FOR ADDITIONAL INFORMATION

ATTACHMENT 2

Analysis Steps for SGTR - Overfill Case

Analysis Step [1]	Assumed Operator Action to Support Step	Time After SGTR (Minutes) [2]	EOP Guidance
1. SGTR	None	0.	
2. High Radiation Indications SG Blowdown/Condenser Air Removal	None	2-3	
3. Rx Trip on OTΔT	A. Go to E-0.	2.4	
4. LOOP - no steam dump - RCPs tripped - FW terminated	None	2.4	
5. SGTR Identified	Either: A. Identify NR in one SG increasing, uncontrolled,	6-10	E-0 Step 28
	or B. Identify high radiation indications in Blowdown and Condenser Air Removal	8-10	E-0 Step 22 or 29
	AND		
	C. Proceed to E-3		E-0 Step 28, 22, or 29
6. Isolate Faulted SG	A. Identify an unexpected increase in a SG NR level	<16	E-3 Step 2a
	B. Check ruptured SG(s) atmospheric steam dump - CLOSED	<16	E-3 Step 3c
	C. Terminate AFW	16.	E-3 Step 4b

Note 1: Procedural steps based on Callaway EOPs. Wolf creek procedures are very similar with only minor variance in step numbering and cautionary notes.

Note 2: Times given by ranges or limiting values represent actions which required no physical manipulation and/or was not a direct analysis step. Times given by decimal numbers indicate analysis steps in which an action occurred to change the course of the transient.

RESPONSES TO ENCLOSURE 2
REQUEST FOR ADDITIONAL INFORMATION

ATTACHMENT 2

Analysis Steps for SGTR - Overfill Case

Analysis Step	Assumed Operator Action to Support Step	Time After SGTR (Minutes)	EOP Guidance
7. Check intact SG level	A. Control AFW flow to maintain NR between 4- 50%.	19.2	E-3 Step 7b
8. RCS Cooldown	A. Check Ruptured SG Pres >615 psig	<24	E-3 Step 13
	B. Determine required RCS temp	<24	E-3 Step 14a
	C. Initiate steam dump using ARV	24.	E-3 Step 14b
	D. Verify RCS wide range temp less than required temperature	<31	E-3 Step 14c
	E. Stop RCS cooldown (close ARV)	31.	E-3 Step 14d
9. RCS Depressurization	A. Check ruptured SG pressure	<34	E-3 Step 15
	B. Check RCS Subcooling (compare core exit temp to wide range pressure)	<34	E-3 Step 16
	C. Depress. using PZR PORV	34.	E-3 Step 18a
	D. Close PZR PORV when RCS Pressure = SG Pressure	35.	E-3 Step 18b
10. SI Termination	A. Check RCS Subcooling (compare core exit temp to wide range pressure)	<38	E-3 Step 20a

RESPONSES TO ENCLOSURE 2
REQUEST FOR ADDITIONAL INFORMATION

ATTACHMENT 2

Analysis Steps for SGTR - Overfill Case

Analysis Step	Assumed Operator Action to Support Step	Time After SGTR (Minutes)	EOP Guidance
	B. Check NR Level in Intact >4%	<38	E-3 Step 20b
	C. Check RCS Wide Range Pressure Increasing	<38	E-3 Step 20c
	D. Check PZR Level >5%	<38	E-3 Step 20d
	E. Stop SI Pumps	38.	E-3 Step 21a
	F. Stop all but one CCP	38.	E-3 Step 21b
11. Pressure Re-Equalization	A. Equalize pressures	43.	E-3 Step 29
12. Post-SGTR Cooldown	A. Go to ES-3.1 or ES-3.2		E-3 Step 38
	B. Initiate RHR Cooling	120.	ES-3.1 or ES-3.2

RESPONSES TO ENCLOSURE 2
REQUEST FOR ADDITIONAL INFORMATION

ATTACHMENT 2

Analysis Steps for SGTR - Stuck-Open ARV

Analysis Step	Assumed Operator Action to Support Step	Time After SGTR (Minutes)	EOP Guidance
1. SGTR	None	0.	
2. High Radiation Indications in SG Blowdown/Condenser Air Removal	A. Operator coordinates with Chemistry Department to sample SG for activity	2-3	Plant Specific Off-Normal Procedures
3. Rx Trip on OTΔT	A. Go to E-0.	8.4	
4. LOOP - no steam dump - RCPs tripped - FW terminated	None	8.4	
5. Faulted SG ARV Fails Open	None	8.4	
6. SGTR Identified	A. Identify high radiation alarms in Blowdown and Condenser Air Removal B. Proceed to E-3	8-10	E-0 Step 22 or 29
7. Isolate Stuck-ARV	A. Equipment Operator dispatched to manually isolate failed ARV	<16	E-3 Step 3c
8. Identify Faulted SG	A. Identify via SG sampling results (contact with Chemistry)	18-23	E-3 Step 2
9. Isolate Faulted SG	A. Terminate AFW [3] B. Failed ARV isolated	16. 28.4	E-3 Step 4b

Note 3: AFW terminated to faulted SG prior to 28.4 minutes in order to maximize off-site dose.

Analysis Steps for SGTR - Stuck-Open ARV

Analysis Step	Assumed Operator Action to Support Step	Time After SGTR (Minutes)	EOP Guidance
10. RCS Cooldown	A. Check Ruptured SG Pres >615 psig	<40	E-3 Step 13
	B. Determine required RCS temp	<40	E-3 Step 14a
	C. Initiate steam dump using ARV	40.	E-3 Step 14b
	D. Verify RCS wide range temp less than required temperature	<50	E-3 Step 14c
	E. Stop RCS cooldown (close ARV)	50.4	E-3 Step 14d
11. RCS Depressurization	A. Check ruptured SG pressure	<53	E-3 Step 15
	B. Check RCS Subcooling (compare core exit temp to wide range pressure)	<53	E-3 Step 16
	C. Depress. using PZR PORV	53.4	E-3 Step 18a
	D. Close PZR PORV when RCS Pressure = SG Pressure	55.	E-3 Step 18b
12. SI Termination	A. Check RCS Subcooling (compare core exit temp to wide range pressure)	<58	E-3 Step 20a
	B. Check NR Level in Intact SGs >4%	<58	E-3 Step 20b

Analysis Steps for SGTR - Stuck-Open ARV

Analysis Step	Assumed Operator Action to Support Step	Time After SGTR (Minutes)	EOP Guidance
	C. Check RCS Wide Range Pressure Increasing	<58	E-3 Step 20c
	D. Check PZR Level >5%	<58	E-3 Step 20d
	E. Stop SI Pumps	58.	E-3 Step 21a
	F. Stop all but one CCP	58.	E-3 Step 21b
13. Pressure Re-Equalization	A. Equalize pressures	63.	E-3 Step 29
14. Post-SGTR Cooldown	A. Go to ES-3.1 or ES-3.2		E-3 Step 38
	B. Initiate RHR Cooling	120.	ES-3.3