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October 12, 1989
ST-HL-AE-3236
File No.:G09.18
10CFR50

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project Electric Generating Station
Units 1 and 2
Dockets Nos. STN 50-0498, STN 50-499
<u>Steam Generator Tube Rupture Analysis</u>

References: 1. ST-HL-AE-2167 dated May 8, 1987

2. NRC Letter C. E. Rossi to A. E. Ladieu, WOG Chairman, dated March 30, 1987

In Reference 1, Houston Lighting and Power Company (HL&P) closed Safety Evaluation Report (SER) Confirmatory Item #28 based on a commitment to provide plant specific information regarding Steam Generator Tube Rupture (SGTR), which is a design basis accident evaluated in the STPEGS Final Safety Analysis Report (FSAR), Section 15.6.3. Reference 2 requested information which is provided in the attachments.

Reference 2, Enclosure 1, items (D)(1), (D)(3), (D)(4), and (D)(5) are addressed in Attachment 1. WCAP 12369, "LOFTTR2 Analysis for a Steam Generator Tube Rupture for the South Texas Project Units 1 and 2", provides the HL&P response for item (D)(2). Attachments 2 and 3 are five copies of WCAP 12369 (proprietary) and WCAP 12370 (nonproprietary), respectively.

The results of the STPEGS SGTR analysis show that steam generator overfill does not occur and calculated offsite radiological doses are within NUREG 0800-Standard Review Plan (SRP) and 10CFR100 limits. The staff was previously notified of a potential for an increase in the calculated radioactivity release to the environment following a SGTR and certain other accidents due to the possible uncovery of the steam generator tubes after reactor trip. The Westinghouse Owners Group (WOG) has initiated a program to address the steam generator tube uncovery issue and has met with the NRC on July 27, 1988 and March 29, 1989 to discuss the program.

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4 NON-PROP

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PDR ADOCK 05000498
P PDC

CHANGE	LTR	ENCL
LPDR	1	1NP
NSIC	1	1NP
NRC PDR	1	1NP

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The WOG program includes the development of methodology to calculate the extent of any steam generator tube uncovery for a SGTR and to determine the effect on the offsite radiation doses. It is expected that the program will demonstrate that any steam generator tube uncovery for a SGTR will not result in a significant increase in the calculated radiological consequences for the event. However, the results of the WOG program are not expected to be available until the second quarter of 1990. HL&P will evaluate the impact on the STPEGS analysis after completion of the WOG program.

As Attachment 2 contains information proprietary to Westinghouse Electric Corporation, it is supported by an affidavit signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to the proprietary aspects of the Application for Withholding or the supporting Westinghouse affidavit should reference CAW-89-100 and should be addressed to R. A. Wiesemann, Manager of Regulatory and Legislative Affairs, Westinghouse Electric Corporation, P. O. Box 355, Pittsburgh, Pennsylvania, 15230-0355.

The Application for Withholding and accompanying affidavit is included as Attachment 4.

If you should have any questions on this matter, please contact Mr. A. W. Harrison at (512) 972-7298.

M A McBurnett

M. A. McBurnett
Manager
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MAM/RAH/nl

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Attachments:

1. Response to Reference 2, Enclosure 1, Items (D)(1), (D)(3), (D)(4), and (D)(5).

2. WCAP 12369, LOFTTR2 Analysis for a Steam Generator Tube Rupture for the South Texas Project Units 1 and 2 (proprietary).

3. WCAP 12370, LOFTTR2 Analysis for a Steam Generator Tube Rupture for the South Texas Project Units 1 and 2 (nonproprietary).

4. Westinghouse Application For Withholding, CAW-89-100.

cc:

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ATTACHMENT 1

RESPONSE TO REFERENCE 2, ENCLOSURE 1

ITEMS (D)(1), (D)(3), (D)(4), and (D)(5)

ATTACHMENT 1

RESPONSE TO REFERENCE 2, ENCLOSURE 1
ITEMS (D)(1), (D)(3), (D)(4), (D)(5)

Item (D)(1)

Each utility in the SGTR subgroup must confirm that they have in place simulators and training programs which provide the required assurance that the necessary actions and times can be taken consistent with those assumed for the WCAP-10698 design basis analysis. Demonstration runs should be performed to show that the accident can be mitigated within a period of time compatible with overfill prevention, using design basis assumptions regarding available equipment, and to demonstrate that the operator action times assumed in the analysis are realistic.

STPEGS Response

HL&P has the required training program and simulator in place to satisfy the assumptions for operator times used in the STPEGS-specific (WCAP 12369) design basis Steam Generator Tube Rupture (SGTR) analysis. Licensed Operator Training Classroom Modules LOT 501.14, "Steam Generator Tube Rupture", and Simulator Training Module SSC.074 "Steam Generator Tube Leak", were used to prepare the operators for simulator demonstration runs which provided operator times assumed in the WCAP 12369 analysis. These courses are required for licensed operators at STPEGS. The modules are available on site.

Demonstration runs were performed to show the times to (a) identify and isolate a ruptured steam generator, (b) initiate cooldown after isolation, (c) initiate depressurization after cooldown, and (d) terminate safety injection after depressurization are consistent with overfill prevention assumptions. Demonstration runs were also the basis for the time assumed to isolate a failed Steam Generator PORV.

Available equipment for SGTR mitigation is listed in the response to Item (D)(4).

Item (D)(2)

Provide a site specific SGTR radiation offsite consequence analysis which assumes the most severe failure identified in WCAP-10698, Supplement 1. The analysis should be performed using the methodology in SRP Section 15.6.3, as supplemented by the guidance in Reference (1).

STPEGS Response

See WCAPs 12369 and 12370 in Attachments 2 and 3, respectively.

Item (D)(3)

Provide an evaluation of the structural adequacy of the main steam lines and associated supports under water-filled conditions as a result of SGTR overfill.

STPEGS Response

STPEGS calculations 5L209RC9981 and 5L349JC9512 were performed. They demonstrate the structural adequacy of the main steam lines and associated supports under water-filled conditions. These calculations are available on site.

Item (D)(4)

Provide a list of systems, components, and instrumentation that are credited for accident mitigation in the plant-specific SGTR emergency operating procedures (EOPs). Specify whether each system and component specified is safety grade. For primary and secondary power-operated relief valves and control valves, specify the valve motive power and state whether the motive power and valve controls are safety grade. For non-safety-grade systems and components, state whether safety-grade backups are available that can be expected to function or provide the desired information within a time period compatible with the prevention of SGTR overfill or justify that the non-safety-grade components can be used for the design-basis event. Provide a list of all radiation monitors that could be used for identification of the accident and the ruptured SG, and specify the quality and reliability of this instrumentation. If the EOPs specify SG sampling as a means of ruptured SG identification, provide the expected time period for obtaining the sample results and discuss the effect on the duration of the accident.

STPEGS Response

The list of equipment that are credited for identification and mitigation of the SGTR is given in Table 4A. The equipment listed is that used after reactor trip and safety injection (SI) signal generation have occurred due to low pressurizer pressure or overtemperature delta T. All of the equipment which automatically functions upon reactor trip and SI signal (e.g. turbine trip, normal feedwater isolation, auxiliary feedwater initiation,...) are not listed. The table includes only that equipment used to identify and mitigate a SGTR event after the initial automatic functions have occurred.

The equipment listed is that used in the EOP for Steam Generator Tube Rupture (1(2)POP05-EO-E030) as entered from the EOP for Reactor Trip or Safety Injection (1(2)POP05-EO-E000). The principal and backup equipment are given along with any limitations on use.

For this listing, the determination of the principal equipment used is based on the design basis event which includes the assumption that a loss of offsite power (LOOP) occurs. This is consistent with the margin to overfill and offsite dose analyses. The margin to overfill and offsite dose analyses also assume a worst single failure as described in WCAP 12369. The principal equipment includes only safety-related equipment.

The safety grade of the equipment is also indicated. Descriptions of valve motive power and valve controls are given as comments in the table.

The equipment is listed for the following major actions needed for accident recovery:

1) Identify the Ruptured Steam Generator
2) Isolate the Ruptured Steam Generator
3) Cooldown RCS
4) Depressurize RCS
5) Terminate SI

Following SI termination, the plant conditions will be stabilized and the primary to secondary break flow will be terminated. Subsequent actions are performed to cooldown and depressurize the RCS to cold shutdown conditions. These actions include dumping steam from the intact steam generators thus decreasing RCS pressure, placing the Residual Heat Removal System into operation, and decreasing pressure in the faulted steam generator by backfill, blowdown, or steam release. These subsequent actions are not described in the equipment listing since safety related equipment is available to perform the various functions which have already been listed or which are not unique to the SGTR accident recovery.

The radiation monitors that could be used for identification of the accident and the ruptured SG are given in Table 4A and also described in more detail in Table 4B.

Sampling is given as one of three methods in the EOP (1(2)POP05-EO-EO30) to identify the ruptured SG based on radiation measurements. However the timely mitigation of the design basis SGTR event is based on the use of radiation monitors and SG level instrumentation to identify the affected SG. Thus the time to obtain and measure a sample is not used for the margin to overfill and offsite dose analyses and does not affect the results.

The tables give the equipment designations for Unit 1. The equipment for Unit 2 is the same except for the unit designation.

Item (D)(5)

Provide a survey of plant primary system design and balance-of-plant system design to determine the compatibility with the bounding plant analysis in WCAP-10698. Note major design differences. Identify the worst single failure if it is different from the WCAP-10698 analysis, and provide the effect of the difference on the margin of overfill.

STPEGS Response

One of the major concerns for a SGTR is the possibility of steam generator overfill since this could potentially result in a significant increase in the offsite radiation doses. Therefore a STPEGS specific analysis (WCAP 12369) was performed to demonstrate margin to steam generator overfill assuming the limiting single failure with respect to overfill. An analysis was also performed to determine the offsite radiation doses assuming the limiting single failure for offsite doses without steam generator overfill. The limiting single failure assumptions in WCAP 12369 for these analyses are consistent with the methodology in References 1 and 2.

For the margin to overfill analysis, the worst single failure is identified in WCAP 12369. The LOFTTR2 analysis to determine the margin to overfill was performed for the time period from the tube rupture until the primary and secondary pressures are equalized and the break flow is terminated. The water volume in the secondary side of the ruptured steam generator was calculated as a function of time to demonstrate that overfill does not occur. The results of this analysis demonstrate that there is margin to steam generator overfill for STPEGS.

REFERENCES

1. Lewis, Huang, Behnke, Fittante, Gelman, "SGTR Analysis Methodology to Determine the Margin to Steam Generator Overfill", WCAP-10698-P-A, [PROPRIETARY]/WCAP-10750-A [NON-PROPRIETARY], August 1987.

2. Lewis, Huang, Rubin, "Evaluation of Offsite Radiation Doses for a Steam Generator Tube Rupture Accident", Supplement 1 to WCAP-10698-P-A, [PROPRIETARY]/WCAP-10750-A [NON-PROPRIETARY], March 1986.

Major Action: Identify the Ruptured Steam Generator

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Main Steamline Radiation Monitor	Y	Meets R.G. 1.97	SG Blowdown Radiation Monitor	Y	Meets R.G. 1.97
SG 1A A1RA-RT-8046 1B C1RA-RT-8047 1C A1RA-RT-8048 1D C1RA-RT-8049			SG 1A C1RA-RT-8022 1B A1RA-RT-8023 1C C1RA-RT-8024 1D A1RA-RT-8025		
			Condenser Vacuum Pump Radiation Monitor N1RA-RT-8027	N	Cannot identify which SG is ruptured; only that primary to secondary leakage has occurred
SG N/R Level	Y	Four channels per SG	Non-Safety Grade indication on main control panel (two channels)	N	
SG 1A D1FW-LT-519 A1FW-LT-571 1B D1FW-LT-529 A1FW-LT-572 1C D1FW-LT-539 A1FW-LT-573 1D D1FW-LT-549 A1FW-LT-574		Safety grade indication from QDPS (all four channels)			

* Y for safety grade
N for non-safety grade

TABLE 4A

Major Action: Isolate the Ruptured Steam Generator

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Close SG PORV	Y	Electric-hydraulic actuator Class 1E power	Locally Close PORV Block Valve	Y	Manual Valve
SG 1A A1MS-PV-7411 1B B1MS-PV-7421 1C C1MS-PV-7431 1D D1MS-PV-7441		Safety grade controls by QDPS	1-MS-0021 1-MS-0038 1-MS-0055 1-MS-0072		
If SG 1D ruptured close Steam Supply to AFW Pump		Class 1E power safety grade controls	Trip the trip and throttle valve for the AFW pump turbine		
1-MS-MOV-0143	Y		1-MS-MOV-0514	Y	Class 1E power safety grade controls
Close SG Blowdown Valve	Y	Each has two redundant solenoid vent valves powered by separate Class 1E power sources safety grade controls			
SG 1A A1SB-FV-4153 1B B1SB-FV-4152 1C C1SB-FV-4151 1D A1SB-FV-4150					

* Y for safety grade
N for non-safety grade

Major Action: Isolate the Ruptured Steam Generator (Cont.)

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Close MSIV SG 1A A1MS-FSV-7414 1B A1MS-FSV-7424 1C A1MS-FSV-7434 1D A1MS-FSV-7444	Y	MSIV's vent air to close and have two redundant solenoid vent valves powered by separate Class 1E power sources	1) Close all remaining MSIV's and MSIV bypass valves (MSIB's)	Y	Used if loss of offsite power (LOOP) occurs to isolate the ruptured SG from the intact SG's if MSIV of ruptured SG fails to close
			2) Close downstream isolation valves	N	Used if no LOOP
Close MSIV bypass valve (MSIB) SG 1A A1MS-FV-7412 1B A1MS-FV-7422 1C A1MS-FV-7432 1D A1MS-FV-7442	Y	MSIV bypass valve vents air to close. Each has two solenoid vent valves powered by separate Class 1E power sources			
Close MSIV above seat drain valve SG 1A A1MT-FV-7900A 1B A1MT-FV-7901A 1C B1MT-FV-7902A 1D B1MT-FV-7903A	Y	Solenoid actuator Class 1E power Safety grade controls	Close MSIV above seat drain block valve SG 1A 1-MS-0543 1B 1-MS-0544 1C 1-MS-0545 1D 1-MS-0546	Y	Locally close manual valve

* Y for safety grade
N for non-safety grade

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Major Action: Isolate the Ruptured Steam Generator (Cont.)

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Stop feed flow to ruptured SG by closing AFW Reg valve	Y	Electric actuator Class 1E power safety grade controls	Stop the AFW Pump	Y	
			SG 1A Pump No. 11		Motor driven
			1B Pump No. 12		Motor driven
SG 1A A1AF-FV-7525			1C Pump No. 13		Motor driven
1B B1AF-FV-7524			1D Pump No. 14		Turbine driven
1C C1AF-FV-7523					
1D D1AF-FV-7526					
Check SG pressure	Y	Three channels per SG			
SG 1A A1MS-PT-0514		Safety grade indication from QDPS	Non-Safety grade indication on main control panel	N	
D1MS-PT-0515					
B1MS-PT-0516					
1B A1MS-PT-0524					
D1MS-PT-0525					
B1MS-PT-0526					
1C A1MS-PT-0534					
D1MS-PT-0535					
B1MS-PT-0536					
1D A1MS-PT-0544					
D1MS-PT-0545					
B1MS-PT-0546					

* Y for safety grade
N for non-safety grade

TABLE 4A

Major Action: Cooldown RCS

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Reset SI	Y				
Verify AC Busses Energized Emergency Diesel Generators	Y				
DG 11 (Train A) DG 12 (Train B) DG 13 (Train C)					
Core Exit Temperature	Y	Safety grade indication from QDPS	N1II-TR-0001 and ERFDADS	N	Non-Safety grade indication
A1II-TE-0001 to 0025 C1II-TE-0026 to 0050					
Use Intact SG PORV's SG 1A A1MS-PV-7411 1B B1MS-PV-7421 1C C1MS-PV-7431 1D D1MS-PV-7441	Y	Electric-hydraulic actuator Class 1E power Safety grade controls by QDPS.	Steam Dump to Condenser	N	If LOOP, then condenser not available

* Y for safety grade
N for non-safety grade

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Major Action: Depressurize RCS

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Pressurizer PORV's A1RC-PCV-0655A B1RC-PCV-0656A	Y	Redundant PORV's and block valves Solenoid actuator Class 1E power safety grade manual controls; Non Safety grade automatic controls	1) Normal Pressurizer Spray Subsystem	N	If no LOOP then can use RCP's for Normal Pressurizer Spray.
			2) Auxiliary Pressurizer Spray Subsystem	N	Use of centrifugal charging pumps and portions of CVCS and BOP diesel that are not all safety related
PRZR PORV block valves 1-RC-MOV-0001A 1-RC-MOV-0001B	Y	Class 1E power safety grade controls			

* Y for safety grade
N for non-safety grade

Major Action: Terminate SI

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Check RCS Pressure B1RC-PT-406 C1RC-PT-407	Y	Safety grade indication from QDPS	Non-safety grade indication on main control panel	N	
Check RCS Subcooling A1II-TE-0001 to 0025 C1II-TE-0026 to 0050	Y	Safety grade indication from QDPS	Non-safety grade indication on main control panel	N	
Check AFW Flow SG 1A A1AF-FT-7525 1B B1AF-FT-7524 1C C1AF-FT-7523 1D D1AF-FT-7526	Y	Safety grade indication from QDPS	Safety grade indicators on main control panel	Y	
Check SG Level	Y	Four Channels per SG			
SG 1A D1FW-LT-519 A1FW-LT-571 1B D1FW-LT-529 A1FW-LT-572 1C D1FW-LT-539 A1FW-LT-573 1D D1FW-LT-549 A1FW-LT-574		Safety grade indication from QDPS (all four channels)	Non-safety grade indication on main control panel (two channels)	N	

* Y for safety grade
N for non-safety grade

TABLE 4A

Major Action: Terminate SI (Cont.)

Principal Equipment	Safety Grade*	Comment	Backup Equipment	Safety Grade*	Comment
Check Pressurizer Level A1RC-LT-0465 D1RC-LT-0466 B1RC-LT-0467 C1RC-LT-0468	Y	Safety grade indication from QDPS	Non safety grade indication on main control panel	N	
Stop HHSI Pumps	Y				

* Y for safety grade
N for non-safety grade

TABLE 4B

Radiation Monitor	Safety Grade*	Comment
Main Steam Line Monitor SG 1A A1RA-RT-8046 1B C1RA-RT-8047 1C A1RA-RT-8048 1D C1RA-RT-8049	Y	Each steamline has an adjacent-to-line monitor which consists of a Geiger-Mueller tube detector and an ion chamber detector with overlapping ranges. The detectors are safety related in function, are seismic Category I supported, and Class 1E qualified and powered. The detectors meet the requirements of RG 1.97
SG Blowdown Monitors SG 1A C1RA-RT-8022 1B A1RA-RT-8023 1C C1RA-RT-8024 1D A1RA-RT-8025	Y	Each SGBD line has an adjacent-to-line monitor which is identical to the main steam line monitors. The detectors are safety related in function, are seismic Category I supported, and Class 1E qualified and powered. The detectors meet the requirements of RG 1.97.
Condenser Vacuum Pump Monitor N1RA-RT-8027	N	This monitor draws a gas sample through an off-line system by a pump from the discharge of the vacuum pump exhaust header of the condenser. Any radioactivity detected would be indicative of a SG tube leak. However the particular affected SG cannot be identified with this monitor. It is classified as non safety.

* Y for safety grade
N for non-safety grade

ATTACHMENT 4

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE