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UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
VARGA,S.A. Operating Reactors Branch 1

SUBJECT: Forwards addl info re NUREG-0737,Item II.B.1, "RCS Vents," in response to NRC 820224 request.Three oversize drawings encl.Aperture cards are available in PDR.
SEE DRAWINGS

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FLORIDA POWER & LIGHT COMPANY

May 26, 1982
L-82-221

Office of Nuclear Reactor Regulation
Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Varga:

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 and 50-251
Post-TMI Requirements
NUREG-0737 Item II.B.1
Reactor Coolant System Vents

Attached is the Florida Power and Light response to your February 24, 1982 letter which contained a request for additional information concerning the RCGVS at Turkey Point Units 3 and 4. We trust that our response will allow the staff to complete their review.

Very truly yours,

J a de Mestre
for

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/PKG/mbd

cc: J.P. O'Reilly, Region II
Harold F. Reis, Esquire

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ATTACHMENT

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250, 50-251
Post TMI Requirements
NUREG-0737 Item II.B.1
Reactor Coolant System Vents

QUESTION 1

Verify that the reactor coolant gas vent system (RCGVS) flow restriction orifices are smaller than the size corresponding to the definition of a loss-of-coolant accident (10 CFR Part50, Appendix A) by providing the pertinent design parameters of the reactor coolant makeup systems and a calculation of the maximum rate of loss of reactor coolant through the RCGVS orifices (reference NUREG -0737 Item II.B.1 Clarification A.(4)).

Response:

The orifice used in the RCGVS (7/32" x 1") is the standard size orifice used throughout the C-E NSSS to limit mass loss from instrument line breaks to less than the makeup capacity of a single charging pump. Initial conditions upstream of the orifice were considered with pressures ranging from 1800 to 2250 psia at corresponding saturation temperatures to calculate the mass flow rate through the orifice. Under these conditions, the orifice will limit the mass loss to approximately 4 lbm/sec (29 gpm), which is well within the capacity of a single charging pump (77 gpm).

QUESTION 2

The following items apply to the portions of the RCGVS that form a part of the reactor coolant pressure boundary, up to and including the second normally closed valve (reference NUREG-0737 Item II.B.1 Clarification A.(7)).

a. Verify that the materials of construction will be fabricated and tested in accordance with SRP Section 5.2.3, "Reactor Coolant Pressure Boundary Materials."

b. Demonstrate that internal missiles and the dynamic effects associated with the postulated rupture of piping will not prevent the essential operation of the RCGVS (i.e., at least one vent path remains functional) (reference Appendix A to 10 CFR part 50, General Design Criterion 4).

RESPONSE

a. The RCGVS is a modification to the existing reactor vent, thus the change was performed in accordance with ASME Section XI. Therefore, the system was installed in accordance with the applicable FSAR committments in regard to the requirements of SRP Section 5.2.3. The components for the system were procured in accordance with SRP Section 5.2.3.

b. There are no postulated piping failures which would preclude the essential operation of the RCGVS. In the vicinity of the RCGVS there are no potential internal missiles or dynamic effects (pipe whip, jet impingement, etc.) that would preclude the essential operation of the RCGVS. The high energy lines inside containment are not in close proximity to the RCGVS.

QUESTION 3

Since your submittal of July 16, 1981 was based on the Combustion Engineering generic RCGVS design, verify that your final piping configurations have been "reviewed or analyzed to assure their capability in maintaining the integrity of the piping system" (reference p.23 of your submittal).

RESPONSE

Attached for your information is the stress report certificate for the piping stress analysis of Turkey Point Units 3 & 4 Reactor Head Vent System. When the "final as-built" configurations of the system are complete, the information will be transmitted to Combustion Engineering for final verification of the stress analysis. However, no major modifications of the system during installation is anticipated.

Stress Report Certificate

This is to certify that, in accordance with ASME Boiler and Pressure Vessel Code, Section III, Paragraph NA-3260, the following Stress Report has been reviewed and is based on the Design and Service Loadings stated in the Design Specification identified below.

Stress Report: Vendor: Nuclear Structures Inc.

Report: 2002-08 Revision: 00

Date: 11-17-81

Design Specification #: 96480-PE-141 Revision: 02

Date: 10-21-81

Plant Owner: Flordia Power & Light
(Turkey Point Units 3 & 4)

Designee: Combustion Engineering, Inc.
Power Systems Group
Nuclear Power Systems
Windsor, Connecticut

Certified by: [signature] Cognizant Engr 11/24/81
Name Title Date

Approved by: John Solinski IND. REV. 11/24/81
Name Title Date

QUESTION 4

Verify that the following RCGVS failures have been analyzed and found not to prevent the essential operation of safety-related systems required for safe reactor shutdown or mitigation of the consequences of a design basis accident:

a. Seismic failure of RCGVS components that are not designed to withstand the safe shutdown earthquake.

b. Postulated missiles generated by failure of RCGVS components.

c. Fluid sprays from RCGVS component failures. Sprays from normally unpressurized portions of the RCGVS that are Seismic Category 1 and Safety Class 1, 2, or 3 and have instrumentation for detection of leakage from upstream isolation valves need not be considered.

RESPONSE

a. The entire reactor coolant head vent system at Turkey Point Units 3 & 4 will be seismically supported, thus this question is not applicable.

b. The normally closed isolation valves on the system which are the only components of the system which could generate a missile have been provided with backseats to preclude a missile. In accordance with the Turkey Point Units 3 & 4 FSAR, Page 5E-5, valves provided with backseats do not have to be considered to generate internal missiles. Hence, the ability to achieve and maintain a safe reactor shutdown is assured.

c. The normally unpressurized portions of the reactor coolant head vent system are entirely Seismic Category I and Safety Class 1, 2 or 3 up to the second isolation valve, and have leak detection capabilities from upstream isolation valves.

Fluid spray from the normally pressurized portion of the RCS head was not considered in accordance with SRP 3.6.2, since the pipe diameter is one inch or less.

Question 5

Describe the design features or administrative procedures, such as key locked closed valves or removal of power during operation, that will be employed to prevent inadvertent actuation of the RCGVS (reference NUREG-0737 Item II.B.1 Clarification A.(7)).

Response

The RCGVS at Turkey Point utilizes key locked closed valves during operation, to prevent inadvertant actuation.

QUESTION 6

Demonstrate, using engineering drawings (including isometrics) and design descriptions as appropriate, that the RCGVS paths to the containment atmosphere (both direct and via the quanch tank rupture disc) discharge into areas:

a. That provide good mixing with containment air to prevent the accumulation or pocketing of high concentrations of hydrogen, and

b. In which any nearby structures, systems, and components essential to safe shutdown of the reactor or mitigation of a design basis accident are capable of withstanding the effects of the anticipated mixtures of steam, liquid, and noncondensible gas discharging from the RCGVS (reference NUREG-0737 Item II.B.1 Clarification A.(9)).

RESPONSE

The flow path to be used during post accident operation is the vent to the containment atmosphere. The flow path to the pressurizer relief tank is provided as an aid during the filling and venting of the reactor. Therefore, our response is limited to the direct flow path to the containment.

a. The discharge point from the RCS vent is located at elevation 80'-0" (see Nuclear Structures, Inc. Drawing No. 2002-08-2, Rev. 0, Coordinates C-6). As can be seen on drawing 5610-M-60 and 5610-M-154 this discharge point is in an open area of the containment that is well suited for mixing. There is no equipment or structure above the discharge point that could form pockets of high concentrations of hydrogen.

b. As can be seen on the same drawings referenced above, there is no safety related equipment in the area that would be affected by the discharge from the RCS vent.

Question 7

1. Submit operating guidelines for use of the RCGVS including the following:

   a. Guidelines to determine when the operator should and should not manually initiate venting, and information and instrumentation required for this determination (reference NUREG-0737 Item II.B.1 Clarification A.(2)). The guidelines to determine whether or not to vent should cover a variety of reactor coolant system conditions (e.g., pressures and temperatures). The effect of the containment hydrogen concentration on the decision to vent or to continue venting should also be addressed considering the balance between the need for increased core cooling and decreased containment integrity due to elevated hydrogen levels.

   b. Methods for determining the size and location of a noncondensible gas bubble (reference Position (2) and Clarification A.(2)).

   c. Guidelines for operator use of the vents, including information and instrumentation available to the operator for initiating or terminating vent usage (reference Position (2)).

   d. Required operator actions in the event of inadvertent opening, or failure to close after opening, of the vents including a description of the provisions and instrumentation necessary to detect and correct these fault conditions (reference Position (2) and Clarification A.(2)).

   e. Methods which in lieu of venting will assure that sufficient liquid or steam will flow through the steam generator U-tube region so that decay heat can be effectively removed from the reactor coolant system (reference Clarification C.(2)).

Response

The Turkey Point Nuclear Safety Committee has approved a new procedure (OP 1008.10, Response to Voids in the Reactor Vessel) for the off-normal use of the reactor vessel head vent.

   a. The procedure directs the operator to initiate venting when needed and to terminate when not needed or when adverse RCS conditions exist. The procedure allows use of the head vent system under a variety of RCS conditions. Hydrogen concentration in containment is addressed in the procedure and is one of the parameter prerequisites governing RCS venting.

b. The procedure is primarily concerned with void formation in the reactor vessel and does not attempt to distinguish as to size and location of the non-condensible gas bubble.

c. The procedure offers adequate guidelines for operator use of the vents including information on instrumentation available to the operator for initiating and terminating vent usage.

d. The procedure does not address operator actions in the event of inadvertent opening or failure to close after opening. Due to the fact that the RCGVS is equipped with key locks and because it utilizes double valve protection, there exists more than adequate protection against inadvertent opening. The administrative procedural controls used in the procedure to prevent failure to close after opening are deemed adequate by the Turkey Point Plant Nuclear Safety Committee.

e. The procedure requires the operator to attempt to repressurize the RCS prior to venting in an attempt to collapse any existing voids. If this attempt and the head vent attempt fail, the RCS parameters should exceed the limits stipulated in the procedure. If this was the case, the operator is instructed to reinitiate safety injection to assure adequate core cooling.

A copy of procedure OP 1008.10 is enclosed for your information. The procedure was written utilizing, for the most part, the guidelines provided by the Westinghouse Owners Group.

QUESTION 8

Verify that all displays (including alarms) and controls, added to the control room as a result of the TMI Action Plan requirement for reactor coolant system vents, have been or will be considered in the human factors analysis required by NUREG-0737 Item I.D.I, "Control-Room Design Reviews."

RESPONSE

All displays and controls, added to the Control Room as a result of the TMI Action Plan requirement for reactor coolant system vents are being considered in the human factors analysis required by NUREG-0787, Item I.D.1, "Control Room Design Reviews."

1.0 Title:

RESPONSE TO VOID IN REACTOR VESSEL

2.0 Approval and List of Effective Pages:

2.1 Approval:

Reviewed by Plant Nuclear Safety Committee: 82-42

Approved by Plant Manager-Nuclear: 4/29/82

2.2 List of Effective Pages:

Page	Date	Page	Date	Page	Date
1	4/29/82	3	4/29/82	5	4/29/82
2	4/29/82	4	4/29/82	6	4/29/82
				7	4/29/82

3.0 Purpose and Discussion:

3.1 Purpose:

This procedure provides instructions when a void is detected in the reactor vessel and when the operator determines that it should be removed.

3.2 Discussion:

3.2.1 Any number of transients can result in a void, whenever saturation conditions exist in the vessel head, or gas is injected into or generated in the RCS.

3.2.2 Removal of a void in the reactor vessel should not be attempted until a stable, subcooled RCS exists.

3.2.3 This procedure describes steps to remove the void. An initial attempt is made to condense the void. This attempt will ultimately succeed if the void is steam. If the void is gaseous, a head vent operation must be performed to remove the void.

4.0 Symptoms:

4.1 Variations from the normal pressurizer pressure and level response due to normal charging and sparying operations may be observed if a void exists in the RCS. The pressurizer level may decrease during charging due to void contraction and level may rise rapidly during a spraying operation due to a void expansion.

4.2 Gases in the reactor coolant system may result from several types of plant events. An accumulator discharge or a core uncovery may result in non-condensible gases being trapped in the RCS.

4.3 A rapid RCS cooldown may result in the vessel head temperature being greater than the primary saturation temperature and result in a steam bubble being developed.

NOTE: The operator should suspect the presence of gases in the RCS if any of the above events occur.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.0	Instructions:	
5.1	Immediate Automatic Action: None	
5.2	Immediate Operator Actions: None	
5.3	Subsequent Operator Actions:	
CAUTION:	DO NOT stop any running RCP's or start any stopped RCP's until completion of this procedure.	
5.3.1	Record RCS Pressure: _____psig	
5.3.2	Verify SI System - NOT IN OPERATION	IF SI system is in operation, THEN go to Step 5.3.9.
5.3.3	Check Stable RCS Conditions:	
	a. Pressurizer Level - STABLE BETWEEN 40% and 60%	a. Manually adjust letdown and charging.
	b. RCS Pressure - STABLE	b. Operate heaters and spray
	c. RCS Hot Leg Temperature - STABLE	c. Adjust steam dump.
5.3.4	Try to Collapse Void in Reactor Vessel	
	a. Turn on pressurizer heaters to increase pressure by 50 psi.	
	b. Maintain balanced charging and letdown flow.	
	c. Maintain pressurizer level - GREATER THAN 20%	c. IF level less than 20%, THEN turn off pressurizer heaters AND return to Step 5.3.3.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.3.5	Verify Void Collapse in Reactor Vessel:	
	a. Pressurizer level changes in the direction and at a rate corresponding to RCS water inventory balance. (1) When charging plus seal injection exceeds letdown plus seal leakoff, pressurizer level should increase at a rate equivalent to the inventory difference. (2) When charging plus seal injection are less than letdown plus seal leakoff, pressurizer level should decrease at a rate equivalent to the inventory difference. (3) Pressurizer spray operation should not affect pressurizer level.	a. IF level changes indicate that the void has not collapsed, go to Step 5.3.6.
	b. Return to procedures in effect.	
5.3.6	Isolate Letdown	
5.3.7	Check Pressurizer Conditions	
	a. Pressurizer Level - GREATER THAN 10%	a. Increase charging flow. IF level cannot be maintained above 10% with maximum charging, THEN manually initiate SI and go to E-0, Step 5.1.
	b. Pressurizer Level - BETWEEN 20% and 90%	b. Adjust charging flow.
	c. RCS Pressure - GREATER THAN OR EQUAL TO PRESSURE RECORDED IN STEP 5.3.1	c. Energize heaters. IF pressure decreasing in an uncontrolled manner, THEN manually initiate SI and go to E-0, Step 5.1.

NOTE: Venting of the RPV may result in RCS pressure decreasing below SI initiation setpoint.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.3.8	Check Low Pressurizer Pressure SI Signal Status:	
	a. Pressurizer Pressure SI Signal - BLOCKED	a. Manually block.
5.3.9	Check RCS Subcooling:	
	a. RCS Subcooling - GREATER THAN 80 °F	a. IF less than 80 °F, THEN increase steam dump. IF 80 °F subcooling cannot be obtained, THEN go to E-0, Step 5.1.
5.3.10	Prepare Containment for Reactor Vessel Venting:	
	a. Source Check R-11 or R-12 and Verify Containment Ventilation Isolation:	
	(1) CV-*-2819 Cont. Instrument Air Bleed - CLOSED (2) CV-*-2826 Cont. Instrument Air Bleed - CLOSED (3) POV-*-2600 Cont. Purge Air Supply Isol. - CLOSED (4) POV-*-2601 Cont. Purge Air Supply Isol. - CLOSED (5) POV-*-2602 Cont. Purge Air Exhaust Isol. - CLOSED (6) POV-*-2603 Cont. Purge Air Exhaust Isol. - CLOSED (7) FAN *-V 9 Cont. Vent Supply - TRIPPED (8) FAN *-V20 Cont. Vent Exhaust - TRIPPED	
	b. Start Containment Air Circulation Equipment:	
	(1) Start all operable Normal Containment Coolers (2) Start all operable Emergency Containment Coolers (3) Start all operable Emergency Containment Filters	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5.3.11	Determine Maximum Allowable Venting Period:	
	a. Containment Hydrogen Concentration - LESS THAN 3%	
	b. Calculate Maximum Venting Period:_____ (See Graph on Page 7)	
CAUTION:	IF ANY vent termination criterion in Step 5.3.12 is reached or exceeded while venting, IMMEDIATELY stop venting.	
5.3.12	Review RPV Vent Termination Criteria:	
	a. Containment Hydrogen Concentration-GREATER THAN 3% BY VOLUME	
	b. RCS Subcooling - LESS THAN 30°F	
	c. Pressurizer Level - LESS THAN 20%	
	d. RCS Pressure - DECREASES BY 200 PSI	
	e. Venting Period - GREATER THAN PERIOD CALCULATED IN STEP 5.3.11	
5.3.13	Vent Reactor Vessel	
	a. Open Vent Valves to Containment:	a. Open Vent Valves to PRT.
	(1) Open 6318A or 6318B	(1) Open 6318A or 6318B
	(2) Open 6320B	(2) Open 6320A

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

5.3.13 (cont'd)

b. Close Vent Valves When:

(1) Pressurizer level responds in a normal manner as described in Step 5.3.5.b

OR

(2) Any termination criterion of Step 5.3.12 is reached.

c. IF venting stopped because of ANY criterion in Step 5.3.12, THEN return to Step 5.3.7.

5.3.14 Check Pressurizer Level – STABLE — Adjust injection and letdown, as required.

5.3.15 Return to Procedure In Effect

6.0 References:

6.1 Westinghouse Functional Recovery Guideline (FRG) Basis dated September 1, 1981.

6.2 Emergency Procedure 20000 (E-0), Immediate Actions and Diagnostics

7.0 Records, Reports and Notifications:

7.1 Log Entries

7.2 Voids in the reactor vessel may be reportable occurrences or significant events, or may require initiating the Emergency Plan. The Operations Supervisor – Nuclear, Operations Superintendent – Nuclear or Plant Manager – Nuclear, should be notified as soon as possible.

A = Containment Volume (at STP)

$= (1.55 \times 10^6\ Ft^3) \times \frac{492^\circ R}{(\text{Cont. Temp.}^\circ F + 460^\circ)}$

B = Maximum H_2 Volume to be Vented

$= \frac{(3.0\% - \text{Present Cont. } H_2 \text{ Concntration}) \times A}{100\%}$