REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:7912200508 DOC.DATE: 79/12/13 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
AUTH.NAME AUTHOR AFFILIATION
UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Operating Reactors Branch 1

SUBJECT: Forwards info requested by NRC 781128 ltr re analyses & evaluations performed to resolve containment purge issue. Results of valve integrity evaluation anticipated by June 1980.

DISTRIBUTION CODE: A034S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 9
TITLE: Containment Purging

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
ACTION:	05 BC ORB#1	7	7			
INTERNAL	01 REG FILE	1	1	02 NRC PDR	1	1
	12 I&E	2	2	14 TA/EDO	1	1
	15 CORE PERF BR	1	1	17 ENGR BR	1	1
	18 REAC SFTY BR	1	1	19 PLANT SYS BR	1	1
	20 EEB	1	1	21 EFLT TRT SYS	1	1
	22 BRINKMAN	1	1	23 D SHUM	1	1
	24 E REEVES	1	1			
EXTERNAL:	03 LPDR	1	1	04 NSIC	1	1
	25 ACRS	16	16			

DEC 27 1979

MA
4

TOTAL NUMBER OF COPIES REQUIRED: LTTR 39 ENCL 39

KB

P.O. BOX 529100, MIAMI, FL 33152

FLORIDA POWER & LIGHT COMPANY

December 13, 1979
L-79-346

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

Dear Mr. Schwencer:

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 & 50-251
Containment Purge

References: (1) NRC letter dated August 28, 1979 from A. Schwencer to R. E. Uhrig (applicable to Docket Nos. 50-250 & 50-251)

(2) NRC letter dated September 27, 1979 from Darrell G. Eisenhut to All Light Water Reactors

(3) NRC letter dated October 23, 1979 from A. Schwencer to R. E. Uhrig (applicable to Docket Nos. 50-250 & 50-251)

In response to your letter of November 28, 1978, several analyses/evaluations have been performed in an effort to resolve the containment purge issue. A description of this effort, which is responsive to references (1) through (3), is given below.

Attachment 1 contains Westinghouse Electric Corporation's evaluation of the effect of containment purging on the Emergency Core Cooling System (ECCS) performance. The evaluation indicates that the effect of purge operation upon the calculated pellet cladding temperature is small.

An assessment of the incremental increase in radiological dose caused by containment purging during the initiation of a postulated Loss of Cooling Accident (LOCA) is presented in Attachment 2. The results clearly indicate the anticipated total LOCA dose to be well within the limits of 10 CFR 100.

A table of postulated containment purge valve failure modes is presented in Attachment 3. The unique scheme using double solenoid valves for the control air provides the assurance of purge valve closure in addition to the second valve in series.

Attachment 4 contains a response to the Reference (1) request for information.

In order to demonstrate purge valve integrity and operability when subjected to LOCA conditions, the valve manufacturer (Henry Pratt Company) has been

A034
S
1/1

contracted to perform the necessary analyses. The results of the analyses are anticipated by June 1980. However, for the interim period, FPL, in consultation with Henry Pratt Company, has determined that satisfactory operability under accident transient conditions is expected when the purge valve opening is limited. A plant change/modification is being processed to implement a purge valve modification restricting the valve opening to a maximum of 50 degrees.

In addition, the containment purge system was previously evaluated with respect to I&E Bulletins 79-01 and 79-01A. The FPL response concerning the qualification of class 1E electrical equipment was sent to you on July 3, 1979 (L-79-182). As indicated then, the investigation for data identified problems relating to qualification documentation generic to the nuclear industry. Those that apply to containment purging at the Turkey Point plant concern ASCO solenoid valves. The July 3, 1979 submittal provides justification for continued operation (section 3.3-6) until replacement solenoid valves (which have been ordered) can be installed.

In conclusion, Florida Power & Light Company intends to operate the containment purge system in compliance with our letter of June 8, 1979, which contained a commitment to limit our combined containment purges for Turkey Point Units 3 and 4 during power operation (>2% power) to 200 hours per year for the site (200 hours total for both units),until such time as the 50 degree modification is implemented. The effect of purging on ECCS performance and radiological dose has been shown to be minimal. The results of the valve integrity evaluation, to be performed by the valve vendor, are expected to be available by June, 1980.

We will keep you informed of our progress in this matter.

Very truly yours,

Robert E. Uhrig

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/MAS/cph

Attachments (4)

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

According to Branch Technical Position CSB6-4, evaluation of a containment purge system design should include "an analysis of the reduction in containment pressure resulting from the partial loss of containment atmosphere during the accident for ECCS backpressure determination". Such an analysis has been performed for Turkey Point Units 3 and 4 based on the containment conditions defined in the limiting FAC analysis case (DECLG break, C_D = 0.4) assuming 22% tube plugging using the modified February, 1978 Westinghouse Evaluation Model. The containment isolation signal received in that analysis will initiate valve closure shortly after inception of the LOCA. The plant purge systems utilized during reactor operation consist of two lines, one 48 inches in diameter and one 54 inches in diameter. They are conservatively represented in this computation as follows:

1. A 5 second isolation valve closure time is assumed. Credit is taken for the reduction in effective flow area which occurs while the valve is in the process of closing. The flow area is reduced linearly with time as the valve position moves from fully open to fully closed.

2. The frictional resistance associated with duct entrance and exit losses, filters. ductwork bends and skin friction has not been considered.

3. No fan coastdown effects are considered.

4. No inertia is considered. Steady state flow out the purge system ducts is established immediately at the time of the LOCA.

A mixture of steam and air will exhaust from the containment through the purge lines during the time that the isolation valves remain open. The effect of the composition of the gas being exhausted on containment pressure has been bounded by investigating the two extreme cases. air alone and steam alone. Within several seconds of the inception of the LOCA, containment pressure will have increased to the point that critical flow will occur in the purge lines. To conservatively bound the calculated containment gas mixture exhausted through the purge lines, critical flow rates of steam and air were calculated during the C_D - 0.4 DECLG break transient. Using these flowrates critical flow was conservatively assumed to be in effect from time zero. Equation (4.18 in Reference (1), was employed to calculate the critical flow rate of air through the Turkey Point purge lines.

Figure 14 of Reference (2) was applied to compute the critical flow rate of steam through the purge lines. The total mass released during the time period that the valves are presumed open is conservatively calculated as 11299 lbs. air or 8588 lbs. steam. The containment pressure reduction resulting from this loss of air is computed to be 1.84 psi; the pressure reduction associated with the loss of steam is 2.36 psi.

The most recent ECCS performance analysis executed for Turkey Point resulted in a calculated peak clad temperature (PCT) of 2161°F at a peaking factor of 1.89. The effect of containment pressure upon the calcuated PCT of a plant whose PCT is computed to occur during FLECHT cooling (i.e. flooding rate greater than 1 inch per second) is typically 5°F/psi. Applying this backpressure sensitivity factor to Turkey Point indicates the calculated PCT will continue to exhibit margin to 2200°F for the limiting containment pressure reduction of 2.36 psi. Overall, the effect of purge operation upon the calculated PCT is small, and the most recent Turkey Point ECCS performance analysis provides an appropriate basis for operation at an F_Q value of 1.89 with no restrictions on the operation of the containment purge system.

REFERENCES:

1) Shapiro, A. H.. The Dynamics and Thermodynamics of Compressible Fluid Flow. Volume 1, p. 85.

2. 1967 ASME Steam Tables, p. 301.

Radiological Assessment of Containment Purge

The radiological doses due to a postulated Loss of Coolant Accident (LOCA) were originally presented in Section 14.3.5 of the FSAR. The original FSAR analyses assumed there was no containment purging occurring at the onset of the accident. A new evaluation was performed to determine the incremental radiological dose at the site boundary and low population zone assuming the purge valves are fully open when the accident initiates and close upon receipt of signal as designed. These incremental doses, when added to those presented in the FSAR, provide a maximum set of doses for a LOCA with containment purge. The results of this evaluation are presented in the following tables:

THYROID DOSE (rem)

Location	LOCA	Increment due To Purging	Total
Site boundary - (0-2 hour)	93	10	103
Low Population Zone - (0-2 hour)	9	1	10

Whole Body (rem)

Site boundary - (0-2 hour)	3.1	.002	3.1
Low Population Zone - (0-2 hour)	.4	.0002	.4

The major assumptions which were used in the evaluation of the incremental dose are listed below:

1. The containment purge valves are closed 5 seconds after the containment high pressure signal is transmitted. There is a 2.7 second delay before the increased containment pressure is detected which results in a total of 7.7 seconds for valve closure (8 seconds was conservatively assumed).

2. Radioactive releases via the purge valves during closure is from the Reactor Coolant System only.

3. The primary coolant iodine activity corresponds to the maximum limit of 30 μCi/gm Dose Equivalent which is specified in the Turkey Point License.

4. It is conservatively assumed during the initial 8 seconds that 50% of the blowdown (worst FSAR case) from the break flashes and becomes homogeneously mixed in the containment atmosphere. All of the iodine in the flashed steam is assumed to become airborne.

5. The flow through the purge valves is assumed to be a mixture of steam and water. Frictionless flow through the valves is assumed.

6. FSAR meteorology is assumed.

7. Standard TID 14844 methodology was used to calculate the incremental doses.

The results clearly indicate that the anticipated dose caused by a LOCA with containment purging at the onset of the accident is well within the limits of 10 CFR 100.

Attachment 3

CONTAINMENT PURGE VALVE

SINGLE FAILURE ANALYSIS TABLE

COMPONENT	FAILURE MODE	RESULTS
Main Valve or Operator	Fails to close or fails to seat or signal to close not received.	2nd purge air valve in series will provide the required isolation.
Instrument Air Supply to the Operator	Failure of air.	Purge air valves are closed by spring, air is NOT required for closure.
Solenoid Valve	Fails to operate (i.e., does NOT isolate the operator cylinder from air supply and does NOT provide air bleed off for the cylinder).	Two solenoid valves in series are used, thus 2nd solenoid valve would isolate air supply and dump operator air. Further back-up is provided by the 2nd purge air valve in series.

Attachment 4

1a) The non-seismic duct work, which has the openings covered by expanded metal face plates or by grilles and dampers, provide limited protection inside the containment against only low density debris such as foil insulation, paper, or rags. No missile protection is provided for duct work.

1b) No safety related equipment is located in the flow stream beyond the outboard purge isolation valves, at the supply or exhaust penetrations. At Turkey Point the outboard valves are outdoors. The safety related structures beyond the valves have been designed against tornado missiles as described in the FSAR, Section 5E.2.

1c) The purge valves are listed among the five types of penetrations to be given local leak detection tests at not less than 50 psig, using pressure decay, soap bubble, halogen detection, or equivalent methods, at each refueling (See FSAR, Section 15, Technical Specification 4.4.2). The stated acceptance criteria is that the sum of all local leak rate tests shall not exceed 60 percent of the total containment allowable leak rate. FSAR Figure 14.3.4-2 indicates no pressure transient in excess of 50 psig for double ended, 6 square feet, 3 square feet, and 0.5 square feet pressure spectrum of potential breaks, against which the valves must close. Valve leakage is only applicable to a closed (zero flow) valve. For release prior to closure see response to 1d below.

1d) The total release through the containment purge system assuming initially fully open valves, single valve failure, and conservative low friction high flow rates, has been calculated for the spectrum of break sizes illustrated in FSAR Figure 14.3.4-2, titled "Containment Pressure Transients". The results of the calculation show that the 0.5 ft^2 break resulted in less total release than the double ended break, taking into account the longer time scale due to slower pressure rise. Hence, the double ended break remains the worse case for total release through the containment purge system. Mass release for the double ended break is less than the 17,000 lb. figure which was used in the dose calculations. Realistic valve flow calculations has resulted in a further mass flow reduction to less than 9,000 lbs.

STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

Robert E. Uhrig, being first duly sworn, deposes and says:

That he is a Vice President of Florida Power & Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this said document are true and correct to the best of his knowledge, information, and belief, and that he is authorized to execute the document on behalf of said Licensee.

Robert E. Uhrig

Robert E. Uhrig

Subscribed and sworn to before me this

13 day of December, 1979

Theresa M. Miranda

NOTARY PUBLIC, in and for the county of Dade, State of Florida

Notary Public, State of Florida at Large
My Commission Expires May 5, 1981
Bonded thru Maynard Bonding Agency

My commission expires: _____