POWER AUTHORITY OF THE STATE OF NEW YORK

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Director, Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Albert Schwencer, Chief
Operating Reactors Branch No. 1
Division of Operating Reactors

Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
Containment Purging/Normal
Plant Operating

Reference: 1. Thompson, C. M., Esposito, V. J., Pertubation Techniques for ECCS Cooling Performance, WCAP-3986

Dear Sir:

The Authority responded on March 2, 1979 to your letter of November 29, 1978. At that time we committed to performing a preliminary hand calculation to demonstrate that unlimited purging and continuous pressure relief will not interfere with the proper operation of the ECCS.

Such an analysis has been performed for Indian Point No. 3 based on the containment conditions defined in the limiting Final Acceptance Criteria (FAC) analysis case (DECLG break, C_D=1.0) obtained using the October, 1975 Westinghouse Evaluation Model updated with the correct zirconium/water heat of reaction.

The containment isolation signal received in that analysis will initiate valve closure shortly after inception of the LOCA.

The containment purge system at Indian Point No. 3 consists of two 36 inch diameter lines; in addition a single 10 inch pressure relief line exists. The 36 inch purge lines are conservatively represented in this analysis as follows:

1. A 3 second isolation valve closure time is assumed. No credit is taken for the reduction in effective flow area which occurs while the valve is in the process of closing.

2. The frictional resistance associated with duct entrance and exit losses, filters, 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 be exhausted from the containment through the purge lines during the time that the isolation valves are assumed to 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=1.0 break transient. Using these flow rates, critical flow was conservatively assumed to be in effect from time zero. The total mass released during the time period that the valves are presumed open is calculated as 5724 lbs. of air or 4094 lbs. of steam. The impact on containment pressure resulting from this loss of air or steam is less than 0.7 psi in either case. The effect of containment pressure reduction of this magnitude on the calculated peak clad temperature (PCT) is expected to be minor (less than 10°F).

The Indian Point No. 3 October, 1975 model ECCS performance analysis computed a PCT value of 2199°F at a peaking factor of 2.17. No credit was taken in that analysis for the improved 15 x 15 Full Length Emergency Cooling Heat Transfer Test (FLECHT) correlation adopted in the February, 1978 Westinghouse evaluation model. In a peaking factor assessment performed in conjunction with the zirconium/water heat of reactor error review, the NRC staff estimated that an Fq improvement of 0.06 would result from the application of the revised 15 x 15 FLECHT correlation. Per reference 1, for plants such as Indian Point No. 3 whose PCT occurs during FLECHT cooling, the PCT impact of a benefit in Fq is at minimum 5.2^{o}F/.01 in Fq. Therefore:

5.2^{o}F/.01 Fq (.06 Fq) = 31°F reduction in PCT from the February, 1978 model 15 x 15 FLECHT correlation.

The effect of containment pressure upon the calculated PCT of a plant whose PCT occurs during FLECHT cooling is typically 5-10°F/psi. Using this typical value, it is expected that the increase in calculated PCT due to the reduction in containment backpressure resulting from purging is less than the estimated reduction in PCT from application of the February, 1978 model 15 x 15 FLECHT correlation. Therefore, the Indian Point No. 3 October, 1975 model ECCS performance analysis provides a basis for operation at an Fq value of 2.17. A February, 1978 model ECCS performance analysis will be performed to quantify the peaking factor benefits available for Indian Point Unit No. 3, the results of this analysis should be available by early February, 1980.

An analysis of the radiological consequences of the limiting FAC analysis case during operation of the containment purge system was also performed. The resultant offsite doses were determined on the following basis:

- Plant operating at full power
- Containment purge during full power operation at 40,000 cfm
- RCS activity - 1.0 μCi/cc Dose Equivalent I-131 (Tech Spec)
  - 100/$\bar{E}$ μCi/cc for Noble Gases (Tech Spec)
- DECLG occurs at time zero
- RCS water inventory = 2.3 x 10^{8}grams (FSAR)
- The limiting consideration is if all the release were steam.

  Total steam to Containment 100698 lb.
  Total steam from Containment 4094 lb.

- Rod burst time for the lead fuel rod is 31.8 seconds after inception of the LOCA compared to completion of valve closure time at 5.15 seconds following the inception of LOCA. Therefore, only coolant activity is available for release during the time the purge valve is open.

Using the conservation assumptions of no containment mixing, no time delay for transport from the RCS to the atmosphere and no removal process for iodine release from containment, the analysis shows the resultant increased in offsite dose to be approximately as follows:

Site Boundary Thyroid Dose - 1.7 rem
Site Boundary Skin (β) Dose - <0.07 rem
Site Boundary Total Body (γ) Dose - < 0.014 rem

Procedures are being implemented to prohibit containment purging if the RCS iodine activity is greater than the technical specification "action" value of 1.0 μCi/cc.

The most recent analysis as discussed in the March, 1979 Emergency Plan for the Indian Point site, shows the two hours thyroid dose after initiation of a LOCA to be approximately 100 rem at the site boundary during a 5% (worst case) meteorological condition. Therefore, the 1.7 rem increase attributable to purging at initiation of LOCA, is for all practical purposes insignificant and well below the 300 rem maximum allowed by 10CFR100.11.

Based on the above analysis the Authority feels that purging through the 40,00 cfm purge line on a limited basis during power operation at times when the RCS iodine activity is below 1.0 μCi/cc of dose equivalent I-131 would not result in unacceptable consequences in the event of a coincident LOCA.

It should be noted also that I^{131} activity levels during operation typically are in the area of 10^{-3} to 10^{-2} μc/ml. Also the purge valves and pressure relief valves actually close within 2 seconds vice 3 seconds as assumed in these calculations.

Very truly yours,

Paul J. Early
Assistant Chief Engineer-Projects