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

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Containment Spray System

Reference: NRC Letter of 2/27/87 (ST-AE-HL-91184); N. P. Kadambi (NRC) to J. H. Goldberg (HL&P)

In the reference, the NRC requested additional information regarding the South Texas Project containment spray system design. The information requested is provided in the attachment.

If you should have any questions on this matter, please contact Mr. J. S. Phelps at (713) 993-1367.

M. R. Wisenburg
Deputy Project Manager

JSP/yd

Attachment: Response to Request for Additional Information

L1/NRC/cd

B001
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cc:

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South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Additional Information on Containment Spray System

Standard Review Plan Sections 6.2.2, 6.5.2 and 15.6.5

Question 1. Provide justification for using the maximum value of 12 for the iodine decontamination factor in the analysis of iodine removal by the containment spray operation.

Response:

According to NUREG 0800, pg. 6.5.2-10 the maximum DF for the containment atmosphere achieved by the spray system is determined by:

$$DF = 1 + \frac{Vs}{Vc} H$$

where Vs is volume of sump,

Vc is containment net free volume less Vs

H is equilibrium iodine partition coefficient.

H is taken from figure 6.5.2-1 in NUREG-0800.

Interpolating for a sump pH of 7.5 H = 500.

(An analysis using conservative estimates of boric acid concentration in the source of spray and safety injection water, total amount of spray and safety injection water, and total sodium hydroxide added shows the minimum sump pH to be 7.5.)

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STP FSAR table 6.5-3 gives the input parameters used to determine minimum sump pH (7.5). If different values are used sump pH would not be 7.5; it would be higher.

RWST deliverable volume	-	486,100 gal
Accumulator water vol	-	9,193 gal
No. of accumulators	-	3
Reactor coolant system mass	-	626,000 lb

$$Vs = (486100\ gal + 3 \times 9193\ gal) \times 1\ ft^3/7.48\ gal + 626000\ lb \times 1\ ft^3/62.3\ lb\ m$$

$$= 78700\ ft^3$$

$$Vc = 3.56 \times 10^6\ ft^3 - 78700\ ft^3 = 3.48 \times 10^6$$

Substituting these values into the equation for DF:

$$DF = 1 + \frac{78700\ ft^3}{3.48 \times 10^6\ ft^3} \times 500 = 12.3$$

During the injection phase the calculated elemental iodine spray removal coefficient is 18.6 hr^{-1}.

The offsite and control room radiation dose analysis accounted for spray removal of elemental iodine only until the elemental iodine DF reached 12.3. From that point on, no further removal of elemental iodine by the spray system was accounted for. We feel this is a conservative simplification of the SRP 6.5.2 model.

Using the pump flow rate from FSAR table 6.5-3 and an RWST volume consistent with the pH estimates yields a recirculation onset of 22.2 minutes.

high head pump flow	-	1600 gpm
low head pump flow	-	2900 gpm
spray pump flow	-	2800 gpm

For all three trains operating combined flow is 21,900 gpm.

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For an RWST deliverable volume of 486,100 gal, end of injection is 22.2 min.

Because not all of the containment is assumed to be covered by the spray system (for example, those regions below concrete floor slabs) the overall containment elemental iodine DF is calculated to be reached at 0.2 hrs (12 mins.). The STP analysis does not account for spray removal of elemental iodine beyond this point. Our interpretation of SRP 6.5.2 is that elemental iodine removal by the sprays could be accounted for until the end of injection at 22.2 minutes. At that point the iodine distribution between the sump and the atmosphere would be reassigned so that the resulting elemental iodine DF would be 12.3.

The simplification in the STP analysis means that more iodine is available for release between the point at which the DF reaches 12.3 and the end of injection and is therefore conservative. By not taking credit for the higher DF which would have been attained at the end of injection we believe that the potential for reevolution of iodine during recirculation is accounted for.

Question 2. Provide the numerical values of the following parameters:

a. The total surface area, inside the containment building, that is wetted by the containment spray solution during post-accident spray operation;

b. The average time of fall of the spray solution drops from the spray nozzles to the containment sump; and

c. The mass-mean diameter of the spray solution drops.

Response:

a. The total surface area of equipment and structures assumed to be wetted by the spray solution during post-accident spray operation is 193,312 square feet.

b. The fall time of the spray solution drops is 11.9 seconds

c. The mass-mean diameter of the spray solution drops in 1330 microns.

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