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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Additional Information Regarding Proposed Special Test Exception 3.10.8
(TAC No. M92169/M92170)

In our letter dated May 1, 1995 (ST-HL-AE-5076), the South Texas Project proposed a change to the South Texas Project Units 1 and 2 Technical Specifications that would incorporate a Special Test Exception for an allowed outage of up to 21 days per cycle for each Standby Diesel. In our letter dated August 28, 1995 (ST-HL-AE-5141), the South Texas Project responded to Nuclear Regulatory Commission questions regarding the justification and implementation of the proposed Special Test Exception. The primary basis for the Special Test Exception is the South Texas Project's Probabilistic Safety Assessment, which demonstrates the risk of the Special Test Exception is acceptably small. The South Texas Project performed deterministic analyses to supplement the Probabilistic Safety Assessment basis for the proposed Special Test Exception. The Nuclear Regulatory Commission staff subsequently requested the South Texas Project to provide additional information on specific assumptions used in the dose calculations performed to support the Probabilistic Safety Assessment bases for the submittal. The attachment to this submittal responds to that request. Additionally, these dose calculations demonstrate that the off-site doses do not exceed the requirements of 10CFR100.

As noted in our letter dated January 4, 1996 (ST-HL-AE-5261), the South Texas Project's three train design bases is not changed by the proposed Special Test Exception, and the Probabilistic Safety Assessment provides the primary justification for the acceptability of the Special Test Exception.

The South Texas Project responses are attached. If you have any questions, please contact me at 512-972-7795, or Mr. A. W. Harrison at 512-972-7298.

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TCK/lf
Attachment: Response to Nuclear Regulatory Commission

A001 /1

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The following information documents the information requested on analysis assumptions.

1. The Large Break Loss of Coolant Accident model does not model a removal coefficient for containment sprays. Elemental plateout in containment and decay are the only removal mechanisms modelled. The Knudsen-Hillard model described in NUREG/CR-0009 (Reference 1) and adopted by the NRC in SRP 6.5.2, Rev. 2 (Reference 3) is utilized. This model provides the best agreement with available experimental data. As discussed in Reference 1, this model was developed based on the Containment Systems Experiment (CSE) tests and it, thus, applies for thermal conditions which would exist after blowdown transients are over and where heat transport takes place with gas film temperature differences of one or two degrees Fahrenheit. This is conservative in comparison with the post-LOCA environment which would have higher temperature differentials, forced air circulation, and containment spray operation; all of which would enhance the rate of deposition of elemental iodine.

   The determination of the deposition removal constant can take into account the various types of surfaces available for deposition as the value for the deposition velocity varies with the type of surface coating. For conservatism, all galvanized and painted surfaces are assumed to have the same deposition velocity of 0.137 cm/sec (4.9 m/hr). As discussed in Reference 1 this value is based on the CSE test and "its use assures that the predicted deposition rates remain within the range where the Knudsen-Hillard model applies." Other surfaces such as stainless steel are not assumed to participate as deposition sites. It should be noted that in the CSE tests, the surfaces at the test facility were coated with phenolic paint and that test of various coatings have shown that, while a deposition velocity of 0.137 cm/sec is appropriate for phenolic based coatings, significantly higher deposition velocities apply for epoxy based and zinc coatings (Reference 2).

   A significant increase in iodine deposition is predicted to occur due to the operation of the containment sprays. This phenomenon is attributed to the turbulence induced by the sprays in the bulk containment gas phase. All containment surfaces will be subjected to spray induced turbulence, not just the surfaces wetted by the sprays. The final value for the mass transfer coefficient (deposition velocity) should then be larger than 4.9 m/hr; however, no credit will be taken for the spray enhancement.

   Items considered to be in the post-LOCA flooded region were not used for surface deposition. Also, stainless steel surfaces were excluded as deposition sites because of its low mass transfer coefficient (deposition velocity). Baked enamel surfaces were also excluded because of the lack of deposition data for this material. For components with outside and inside surfaces, only the outside surfaces are considered for deposition.

   After the determination was made of which surfaces would be excluded as deposition sites, the surface areas of the remaining epoxy or zinc based paint or galvanized surfaces were determined. Ti se surfaces all have relatively higher mass transfer coefficients (deposition velocities As previously discussed, although a much higher rate of iodine deposition would exis for surfaces coated with epoxy or zinc based paints, the lower deposition velocity as ciated with phenolic paints is used for all surfaces.

The initial rate of pla out continues until the airborne concentration is reduced by a factor of 100 or more; the long term removal rate is typically less than ten percent of the initial rate (Reference 1 . For this analysis, the deposition removal rate is assumed to continue at its initial va. e until a decontamination factor (DF) of 100 is reached (i.e., the airborne concentration is one percent of its initial value). The removal rate is then assumed to continue at f ve percent of the initial value until a DF of 200 is reached, at which point no additiona credit is taken for iodine deposition. Reference 3 limits the DF for elemental iodine to 200. This assumption and the methodology utilized to calculate the plateout removal coefficient are consistent with what is currently in the South Texas Project UFSAR. The time at which the DF of 200 is reached is approximately 4.1 hours after the event initiation utilizing a single volume containment model (see 2 below) and the calculated elemental plateout of 4.5 hr^{-1}.

2. One Reactor Containment Fan Cooler unit (RCFC) out of 6 is available. The mixing rate between regions designated in the UFSAR Table 15.6-10 as "sprayed and unsprayed" therefore is assumed to be 50,825 cubic feet per minute (cfm). This value is 1/3 of the 152,475 cfm currently in the UFSAR (CN-1944) for 3 out of 6 units. The mixing rate between the "sprayed and unsprayed" regions is assumed to be limited to only the forced convection induced by the Reactor Containment Fan Cooler (RCFC) units. This assumed minimum flow rate conservatively neglects the effects of natural convection, steam condensation, and diffusion, although these effects are expected to enhance the mixing rate between the sprayed and unsprayed volumes. Because of this mixing and the assumption that plateout is the only removal mechanism, the containment volume is modelled as one volume. This is used rather than splitting containment into the "sprayed and unsprayed" volumes used in the design bases calculation.

3. The modelling of the control room filtration efficiency is different from that utilized in the design basis calculation. Design basis calculations are restricted to an effective filtration of 99% for two 2" filters in series, per Regulatory Guide 1.52. Each of the control room 2" filters are tested to 99% filtration efficiency for methyl iodide, per Technical Specifications. The actual effective efficiency of two-2"- 99% efficient filters in series is 99.99%. This calculation conservatively assumes that the 2" filter efficiency is 95%. The effective filter efficiency for two 2" filters utilized is, therefore, 99.75%.

4. The control room HVAC is modelled assuming one train is operable. The assumed flow rates for one train operation are 1100 cfm intake flow, 4750 cfm for recirculation through the cleanup filter, and 1110 cfm exhaust. These values reflect the -5% /+ 10% flow

variation allowed by design specifications. The intake flow is +10% of the design flow in order to maximize radioactivity in the control room and the recirculation flow is -5% of design in order to minimize cleanup. The 1110 cfm exhaust reflects the 1100 cfm intake plus the 10 cfm unfiltered in-leakage currently utilized in the design calculation.

5. The surface area used for plate-out credit is $1x10^6$ ft^2 (or 92,900 m^2). The containment volume used for the surface deposition calculations is conservatively bounded at $3.56x10^6$ ft^3 ($1.01x10^5$ m^3). For this calculation, a larger volume minimizes plate-out rates.

6. The net free volume used for source term dilution is $3.38x10^6$ ft^3 (the calculated volume range including error is $3.38x10^6$ to $3.41x10^6$ ft^3). For this calculation, a smaller containment volume is conservative.

7. As discussed with the staff on January 4, 1996, an additional assumption became necessary. It was determined that an allowance for once-filtered makeup inleakage into the control room HVAC envelope was needed during single-train control room HVAC operation. A value of approximately 250 cfm was assumed. With this additional inleakage, it is necessary to analyze a scenario with two-train operation with a postulated single failure in the control room HVAC charcoal filter heaters. (For these cases, the containment spray system parameters as described in the STP UFSAR were used.) Therefore, scenarios based on a single failure of a standby diesel generator (i.e. one control room HVAC train in operation) and on a single failure of a control room HVAC charcoal filter heater (i.e. two control room HVAC trains in operation) are being analyzed (both with one standby diesel generator out of service).

References

1. Postma, A. K., et al, "Technological Bases for Models of Spray Washout of Airborne Contaminants in Containment Vessels," NUREG/CR-0009, October 1978.
2. Rosenberg, H. S., et al, "Fission Product Deposition and its Enhancement Under Reactor Accident Conditions," Battelle Memorial Institute, BMI-1865, May 1969.
3. "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG-0800, Section 6.5.2, Rev. 2, December 1988.