

SUPPLEMENT SAFETY EVALUATION REPORT

CESSAR SYSTEM 80

STEAM GENERATOR TUBE RUPTURE

15.0 ACCIDENT AND TRANSIENT ANALYSIS

15.4 Radiological Consequences of Design-Basis Accidents

15.4.5 Steam Generator Tube Rupture

In Supplement 3 to the CESSAR System 80 Safety Evaluation Report (NUREG-0852) dated December 1987, the staff performed an independent evaluation of the offsite radiological consequences of the steam generator tube rupture (SGTR) accident analysis using the thermal-hydraulic information provided by CE with their transmittal letter dated July 22, 1983. In Supplement 3, the staff found the radiological consequences to be acceptable (76 rems thyroid and 1 rem whole body) even though the thyroid dose was higher than the acceptance criteria of 30 rems provided in Standard Review Plan (SRP) Section 15.6.3. The staff's acceptance was based on CE using more conservative assumptions than required. Such assumptions used were (1) the operator action to close the block valve associated with the stuck open atmospheric dump valve (ADV) would not occur for 30 minutes instead of 10 minutes previously used, (2) a loss of offsite power, and (3) the worst single active failure (failure of an ADV to close in the affected steam generator following the loss of offsite power). The current SRP Section 15.6.3 does not specify the above assumptions. Therefore, it was the staff's licensing position at the time that the radiological consequences of the CESSAR System 80 SGTR accident should meet 10 CFR 100 dose reference value (300 rem to the thyroid) rather than 10 percent of it (30 rem).

In this supplement safety evaluation, the staff independently evaluation the SGTR accident analysis for offsite radiological consequences using (1) the same assumptions and acceptance criteria used by the staff in Supplemental 3 of the CESSAR System 80 SER, (2) revised thermal-hydraulic information provided by CE with their transmittal letter dated September 18, 1987, and (3) the CE responses dated December 7, 1988 to the staff's licensing review questions on the steam generator tube uncover. The revised SGTR accident analyses submitted by CE are based on using the reactor coolant gas vent system for depressurization of the primary system instead of using the auxiliary pressurizer spray system.

The assumptions used in the staff's analyses are:

- (1) The primary coolant activity was assumed at the technical specification value of 1.0 mCi/gm dose-equivalent iodine-131 (DEI-131)
- (2) The secondary coolant activity was assumed at the technical specification limit of 0.1 mCi/gm DEI-131.

- (3) A spiking factor of 500 times the normal release rate from the fuel was assumed.
- (4) The technical specification leak rate of 1 gpm was assumed for the unaffected steam generator for the duration of the accident.
- (5) During the period when the ADV was stuck open, the tubes were uncovered for the period of approximately 9 minutes. During this period tube leakage was not subjected to any iodine removal process in the steam generator, i.e., the partition factor was assumed to be 1.0.
- (6) A partition factor of 0.01 for iodines was assumed between the steam generator water and steam phases to estimate the additional release of activity from the steam generator water.
- (7) The atmospheric dispersion factors used for the exclusion area boundary₃ and low population zone boundary in the staff's analyses were 2.0×10^{-3} and 1.5×10^{-4} sec/m³, respectively.
- (8) A breathing rate of 3.74×10^{-4} m³/sec was assumed.
- (9) An inhalation thyroid dose factor for an adult for iodine-131 of $1.49 \times 10 \times 10^{-7}$ millirem per picocurie was assumed.
- (10) The primary-to-secondary leakage and the flashing fraction (0.05) were assumed to be constant at their 2-hour value throughout the 2-8 hour time period.
- (11) Conservative iodine partition factors of 0.01 were used in the steam generator and condenser to account for that fraction of iodine present in the steam generator and condenser fluids which is carried with the fluid as it is converted to steam.

Using assumptions listed above, the staff estimated the potential offsite radiation doses to be 83 rem (thyroid) and 1 rem (whole body) at the exclusion area boundary (EAB) and 18 rem (thyroid) and less than 1 rem (whole body) at the low population zone boundary (LPZ). Since no specific site is associated with CESSAR System 80, the EAB and LPZ are only defined in terms of dispersion factors used in the staff's analysis as site interface requirements.

In summary, the staff concludes that the calculated radiological consequences of a postulated SGTR accident for the CESSAR System 80 design meet the 10 CFR 100.11 dose reference values. However, it should be noted that this analysis is limited exclusively to the CESSAR System 80 design and that any change to the System 80 design (such as the size of ADVs or not having block valves for the ADVs) could make a significant difference in the estimated offsite radiological consequences from the SGTR described above, and a plant-specific calculation may be required for those plants that deviate from the System 80 design. The staff, therefore, concludes that the radiological consequences of the steam generator tube rupture accident, as given in CE's letter of September 18, 1987, are acceptable.